
**Thursday, May 5th, 2005 –**
**Saturday, May 7th, 2005**

**Boston Marriott Copley Place**
**Boston, Massachusetts**

# I M F A R

## Welcome

Welcome to Boston and to the annual **I**nternational **M**eeting for **A**utism **R**esearch! **IMFAR** has been held in San Diego, Orlando, and Sacramento. **IMFAR** is the child of the **I**nternational **S**ociety of **A**utism **R**esearch. The goal of **INSAR** and the meeting is to bring together autism researchers from around the world who investigate all aspects of basic and clinical research on autism. Both the Society and the meeting are designed to be inclusive of all areas of autism research. While explicitly focused on the science of autism, attendance at the meeting is open to all members of the autism community. We urge all attendees at the meeting to come to the INSAR Business Meeting to celebrate the election of new officers and to assist in broadening the activities of our society.

This fourth IMFAR is the largest and longest of our meetings, with an extra day added to the meeting in order to allow for our expanding field of research. A number of individuals and organizations have made this meeting possible. I would like to take this opportunity to acknowledge the remarkable contributions of Helen Tager-Flusberg, Ph.D. to planning the local arrangements as well as unique characteristics of the scientific meeting. Katherine Loveland, Ph.D. and the Program Committee have dedicated themselves to creating a fascinating and enlightening program. We really appreciate the continuing support provided by CAN, NAAR, and the M.I.N.D Institute over the years that we have been holding meetings. In addition, we owe a debt of gratitude to Dr. Sally Rogers, Vice-President of INSAR for writing a conference grant application and to NICHD, NIDCD, NIMH, and NINDS for their financial support. Finally, the field of autism research is enriched by the participation of the Interagency Autism Committee to NIH activities.

The field of autism research sets a high standard for the integration of research across disciplines. This integration is manifested each year by the heterogeneity of the work that is presented at IMFAR. As the representative of the retiring Executive Board of INSAR, I hope that the shared experiences of the next few days stretch your knowledge and your perspectives in ways that accelerate our progress in our collective understanding of autism.

Marian Sigman, Ph.D.
Retiring President of the International Society for Autism Research

## Welcome

Welcome to Beautiful Boston in Spring Time!

It is a pleasure to welcome all of you to Boston for IMFAR 2005! We are located in the heart of Back Bay, an area rich with history, universities, music, libraries – and of course wonderful restaurants and shops. I hope you will all get a chance to see the spring flowers and enjoy the many parts of the city that are within walking distance of the Marriott Copley.

The program for IMFAR 2005 is wide-ranging and very exciting. I would like to echo Marian Sigman's thanks to Kate Loveland for her work as Program Chair, and to the Program Committee and reviewers for organizing an outstanding and well-balanced program for all of us to enjoy over the next three days. I also want to thank Sally Rogers for overseeing the awards, her efforts in obtaining NIH-funding for this conference, and her wise counsel and help offered over the past year. A special note of appreciation to Teresa Brown of UC Davis, without whom this meeting simply could not happen, and Laura Stetser, my administrator at Boston University School of Medicine, who took care of all the details on the local front.

Among all the awards we present each year at IMFAR, perhaps the most special is the Lifetime Achievement Award. I am delighted that this year the Program Committee chose to honor Dr. Lorna Wing, one of the true pioneers in this field. Although Dr. Wing is not able to travel to Boston from her home in England to be with us in person, I had the privilege of being able to present her with the award and attend her talk (which you will hear on Friday afternoon) in early March.

There are a number of changes and new additions to the program this year. First, we are holding a reception for students on Thursday evening – all students, pre-doctoral and post-doctoral fellows are encouraged to attend. Our goal is to encourage you to meet one another and foster new collaborations. Second, on Friday morning, program officers from the National Institutes of Health will be holding a workshop on NIH autism research funding opportunities - please bring your breakfast and questions to the meeting! Finally, in response to your feedback last year, we have dedicated specific times for the 4 poster sessions that do not overlap with other presentations or events.

A special thanks to all of you who will be presenting at the meeting. The abstracts in this volume reflect the remarkable advances in our understanding of autism that have been made over the past year by scientists from all over the world.

Let me end by wishing you all a stimulating and enjoyable stay in Boston!

Helen Tager-Flusberg, PhD
Chair, IMFAR 2005
Boston University School of Medicine

# IMFAR

**Table of Contents**

## IMFAR: International Meeting For Autism Research

The International Meeting for Autism Research (IMFAR) was convened for the first time in November 2001, to provide autism researchers from around the world with a focused opportunity to share the rapidly moving scientific investigation of autism.

It was the brainchild of Dr. David Amaral, Research Director of the MIND Institute at the University of California, Davis. Dr. Amaral and his colleagues at the MIND Institute provided the financial support, energy, and hard work to get IMFAR off the ground.

Under the leadership of Dr. Sally Rogers, Professor at the MIND Institute and UC Davis, the MIND Institute continues to provide important support through the NIH conference grant for which Dr. Rogers is the Principal Investigator.

## Acknowledgements

This project was supported by NIH Research Grant 1 R13 MH70772-01 funded by the National Institute of Mental Health and NIDCD, NICHD, NINDS

## Thematic Guide

| Title | Type | Session | Day | Time | Room |
|---|---|---|---|---|---|
| Basic Science & Population Approaches I | Poster | P1A.1 | Thursday | 4:00 – 5:30 pm | 3rd Floor Atrium |
| Basic Science & Population Approaches II | Slide | S1 | Friday | 8:30 am – 12:25 pm | Salons A - B |
| Basic Science, Psychopharmacology & Population Approaches | Poster | P1B.1 | Thursday | 4:00 – 5:30 pm | Suffolk |
| Brain Structure & Structural Neuroimaging I | Poster | P1A.2 | Thursday | 4:00 – 5:30 pm | 3rd Floor Atrium |
| Brain Structure & Structural Neuroimaging II | Slide | S2 | Friday | 8:30 am – 12:25 pm | Salons C - D |
| Broader Phenotype & Families I | Poster | P2B.1 | Friday | 12:30 – 2:00 pm | Suffolk |
| Broader Phenotype & Families II | Slide | S7 | Saturday | 8:30 am – 12:25 pm | Simmons |
| Cognition & Neuropsychology I | Poster | P2A.1 | Friday | 12:30 – 2:00 pm | 3rd Floor Atrium |
| Cognition & Neuropsychology II | Slide | S8 | Saturday | 8:30 am – 12:25 pm | Salons A - B |
| Cognitive Neuroscience & Functional Neuroimaging I | Poster | P3A.1 | Friday | 5:00 – 6:00 pm | 3rd Floor Atrium |
| Cognitive Neuroscience & Functional Neuroimaging II | Slide | S9 | Saturday | 8:30 am – 12:25 pm | Salons C - D |
| Early Detection & Diagnosis I | Slide | S4 | Friday | 8:50 am – 12:25 pm | Salons H - I |
| Early Detection & Diagnosis II | Poster | P3B.1 | Friday | 5:00 – 6:00 pm | Suffolk |
| Early Development I | Poster | P2B.2 | Friday | 12:30 – 2:00 pm | Suffolk |

## Thematic Guide

| Title | Type | Session | Day | Time | Room |
|---|---|---|---|---|---|
| Early Development II | Slide | S10 | Saturday | 8:30 am – 12:25 pm | Salon E |
| Emotions & Behavior I | Slide | S3 | Friday | 8:30 am – 12:25 pm | Salon E |
| Emotions & Behavior II | Poster | P4A.2 | Saturday | 12:30 – 2:00 pm | 3rd Floor Atrium |
| Emotions & Behavior III | Poster | P4B.1 | Saturday | 12:30 – 2:00 pm | Suffolk |
| Genetics I | Slide | S5 | Friday | 8:30 am – 12:25 pm | Cape Cod |
| Genetics II | Poster | P4A.1 | Saturday | 12:30 – 2:00 pm | 3rd Floor Atrium |
| Intervention & Education I | Slide | S6 | Friday | 8:30 am – 12:25 pm | Salons J - K |
| Intervention & Education II | Poster | P3A.2 | Friday | 5:00 – 6:00 pm | 3rd Floor Atrium |
| Intervention & Education III | Poster | P3B.2 | Friday | 5:00 – 6:00 pm | Suffolk |
| Social Behavior & Play I | Slide | S12 | Saturday | 8:30 am – 12:25 pm | Salons J - K |
| Social Behavior & Play II | Poster | P4B.2 | Saturday | 12:30 – 2:00 pm | Suffolk |
| Verbal & Nonverbal Communication I | Poster | P1B.2 | Thursday | 4:00 – 5:00 pm | Suffolk |
| Verbal & Nonverbal Communication II | Slide | S11 | Saturday | 8:30 am – 12:25 pm | Salons H - I |

**Thursday, May 5, 2005**

| Title | Type | Session | Time | Room |
|---|---|---|---|---|
| Basic Science & Population Approaches | Poster | P1A.1 | 4:00 – 5:30 pm | 3rd Floor Atrium |
| Basic Science, Psychopharmacology & Population Approaches | Poster | P1B.1 | 4:00 – 5:30 pm | Suffolk |
| Brain Structure & Structural Neuroimaging | Poster | P1A.2 | 4:00 – 5:30 pm | 3rd Floor Atrium |
| Verbal & Nonverbal Communication | Poster | P1B.2 | 4:00 – 5:00 pm | Suffolk |

**Friday, May 6, 2005**

| Title | Type | Session | Time | Room |
|---|---|---|---|---|
| Basic Science & Population Approaches | Slide | S1 | 8:30 am – 12:25 pm | Salons A - B |
| Brain Structure & Structural Neuroimaging | Slide | S2 | 8:30 am – 12:25 pm | Salons C - D |
| Emotions & Behavior | Slide | S3 | 8:30 am – 12:25 pm | Salon E |
| Genetics | Slide | S5 | 8:30 am – 12:25 pm | Cape Cod |
| Intervention & Education | Slide | S6 | 8:30 am – 12:25 pm | Salons J - K |
| Early Detection/Diagnosis | Slide | S4 | 8:50 am – 12:25 pm | Salons H - I |
| Cognition & Neuropsychology | Poster | P2A.1 | 12:30 – 2:00 pm | 3rd Floor Atrium |
| Broader Phenotype & Families | Poster | P2B.1 | 12:30 – 2:00 pm | Suffolk |
| Early Development | Poster | P2B.2 | 12:30 – 2:00 pm | Suffolk |
| Cognitive Neuroscience & Functional Neuroimaging | Poster | P3A.1 | 5:00 – 6:00 pm | 3rd Floor Atrium |
| Intervention & Education | Poster | P3A.2 | 5:00 – 6:00 pm | 3rd Floor Atrium |
| Early Detection/Diagnosis | Poster | P3B.1 | 5:00 – 6:00 pm | Suffolk |
| Intervention & Education | Poster | P3B.2 | 5:00 – 6:00 pm | Suffolk |

**Saturday, May 7, 2005**

| Title | Type | Session | Time | Room |
|---|---|---|---|---|
| Broader Phenotype & Families | Slide | S7 | 8:30 am – 12:25 pm | Simmons |
| Cognition & Neuropsychology | Slide | S8 | 8:30 am – 12:25 pm | Salons A - B |
| Cognitive Neuroscience & Functional Neuroimaging | Slide | S9 | 8:30 am – 12:25 pm | Salons C - D |
| Early Development | Slide | S10 | 8:30 am – 12:25 pm | Salon E |
| Verbal & Nonverbal Communication | Slide | S11 | 8:30 am – 12:25 pm | Salons H - I |
| Social Behavior & Play | Slide | S12 | 8:30 am – 12:25 pm | Salons J - K |
| Genetics | Poster | P4A.1 | 12:30 – 2:00 pm | 3rd Floor Atrium |
| Emotions & Behavior | Poster | P4A.2 | 12:30 – 2:00 pm | 3rd Floor Atrium |
| Emotions & Behavior | Poster | P4B.1 | 12:30 – 2:00 pm | Suffolk |
| Social Behavior & Play | Poster | P4B.2 | 12:30 – 2:00 pm | Suffolk |

## Thursday, May 5, 2005

Poster Session 1A: Topic 1

### *Basic Science & Population Approaches*

P1A.1.1 **NEW EVIDENCE OF MERCURY TOXICITY IN AUTISM.** J. Adams and J. Romdalvik. Arizona State University, PO Box 876006, Tempe, AZ 85287-6006.

P1A.1.2 **BEHAVIORAL DEVELOPMENT OF THE EN2-/- MOUSE: RELEVANCE TO AUTISTIC DISORDER.** M. Cheh, J. Millonig, S. Kamdar, X. Ming, L. Roselli and G. Wagner. Neuroscience Dept. Rutgers University, 152 Frelinghuysen Rd., Piscataway NJ 08854.

P1A.1.3 **GABRB3 GENE DISRUPTION IN MICE: A POTENTIAL MODEL OF AUTISM.** T. DeLorey, E. Hashemi, P. Sahbaie and G. Homanics. Molecular Research Institute, 2495 Old Middlefield Way, Mountain View, CA 94043.

P1A.1.4 **THE DEVELOPMENT OF MONKEY MODELS FOR THE STUDY OF AUTISM.** L. Martin, P. Ashwood, J. Van de Water and D. Amaral. The M.I.N.D. Institute and Dept. of Psychiatry UC Davis, California National Primate Research Center, One Shields Ave., Davis, CA 95616.

P1A.1.5 **BEHAVIORAL TESTS TO EVALUATE DEVELOPMENTAL DISORDERS USING EXPERIMENTAL MONKEYS.** T. Negishi, K. Kawasaki, A. Nakagami, T. Koyama, Y. Kuroda and Y. Yoshikawa. Department of Chemistry and Biological Science, Faculty of Science and Engineering, Aoyama Gakuin University, Sagamihara, Kanagawa 229-8558, Japan.

P1A.1.6 **ENGRAILED2, AN AUTISM ASSOCIATED GENE, REGULATES NEUROGENESIS DURING BRAIN DEVELOPMENT.** I. Rossman, E. Pasorek, J. Millonig and E. DiCicco-Bloom. UMDNJ-Robert Wood Johnson Medical School/Dept Neuroscience and Cell Biology, 675 Hoes Lane, RWJSPH 354, Piscataway, NJ 08854.

P1A.1.7 **THE ARUBA TREATED PREVALENCE STUDY OF AUTISM SPECTRUM DISORDERS.** I. van Balkom, M. Bresnahan, M. Vogtlander and H. Hoek. Child & Adolescent Psychiatry Clinic, P.O. BOX 49, Caya Punta Brabo 13-I, Eagle, Aruba, Dutch West Indies.

P1A.1.8 **A STUDY OF BEHAVIORS ASSOCIATED WITH FEVER IN CHILDREN WITH AUTISM/PDD.** L. Curran, S. Crawford, C. Newschaffer and A. Zimmerman. Kennedy Krieger Institute and Johns Hopkins Bloomberg School of Public Health, 707 North Broadway, Baltimore, MD 21205.

P1A.1.9 **SLEEP PATTERNS AND DEVELOPMENT AMONG CHILDREN WITH AUTISM.** P. Krakowiak, R. Hansen, L. Croen and I. Hertz-Picciotto. University of California, Davis, M.I.N.D. Institute, 2825 50th Street, Sacramento, CA 95817.

P1A.1.10 **A COMPARISON OF HEALTHCARE UTILIZATION AND COSTS OF CHILDREN WITH AND WITHOUT AUTISM SPECTRUM DISORDERS IN A LARGE HMO.** D. Najjar, P. Bernal and L. Croen. Kaiser Permanente Division of Research, 2000 Broadway, Oakland, CA 94612.

P1A.1.11 **PHENOTYPIC FEATURES OF PERVASIVE DEVELOPMENTAL DISORDER (PDD) FOLLOWING EXPOSURE TO POLYVALENT MEASLES CONTAINING VACCINE DATA FROM A UK LITIGATION COHORT.** C. Stott. University of Sunderland, Autism Research Unit, Low Row, Sunderland, SR1 3PT.

P1A.1.12 **BIRTH DATE DISTRIBUTION AND AUTISM SPECTRUM DISORDERS.** A. Zimmerman, L. Lee, B. Lee, R. Shah and C. Newschaffer. Kennedy Krieger Institute, Kennedy Krieger Institute, 707 N. Broadway, Baltimore, MD 21205.

Poster Session 1A: Topic 2

### *Brain Structure & Structural Neuroimaging*

P1A.2.1 **SEROTONIN RECEPTORS IN THE AUTISTIC BRAIN.** E. Antzoulatos, T. Gibbs, J. Pugh, M. Bauman, T. Kemper and G. Blatt. Boston University School of Medicine, Boston University School of Medicine, Department of Anatomy and Neurobiology, 715 Albany Street, R-1003, Boston, MA 02118.

P1A.2.2 **RIGHTWARD VOLUME ASYMMETRY IN MENTALIZING NETWORKS IN AUTISTIC CEREBRAL CORTEX.** J. Bentwich, H. Benveniste, D. Ziegler, M. Maletic-Savatic, P. Filipek, D. Kennedy, N. Makris, V. Caviness and M. Herbert . Cody Autism Center, c/o Medical Department, Brookhaven National Lab, Upton NY, 11973.

P1A.2.3 **INVESTIGATION OF STRUCTURAL CONNECTIVITY IN AUTISM USING DIFFUSION TENSOR IMAGING AND PROBABILISTIC TRACTOGRAPHY: METHODOLOGY.** S. Carrington, N. Voets, A. Bailey and P. Matthews. Child and Adolescent Psychiatry, University of Oxford, University Section of Child and Adolescent Psychiatry, Park Hospital for Children, Old Road, Headington, Oxford, OX3 7LQ.

P1A.2.4 **DIFFUSION TENSOR IMAGING SUGGESTS EARLY MATURATION OF GLOBAL WHITE MATTER AND CORPUS CALLOSUM IN YOUNG CHILDREN WITH AUTISM.** C. Cascio, M. Jomier, M. Poe, H. Hazlett, R. Smith, G. Gerig and J. Piven. University of North Carolina, UNC Neurodevelopmental Disorders Research Center, CB #3367, Chapel Hill, NC 27599-3367.

P1A.2.5 **BEHAVIORAL TRAINING OF YOUNG CHILDREN FOR MRI.** J. Chappell, H. Hazlett and J. Piven. University of North Carolina at Chapel Hill, NDRC, UNC CB #3367, Chapel Hill, NC 27599.

P1A.2.6 **AFFECTIVE INSTABILITY IN AUTISM.** J. Day, G. Voelbel, J. Hamstra, D. Nguyen, S. Chiu, M. Bates, M. Iman and R. Henden. M.I.N.D. Institute, 2825 50th Street, suite 2322, Sacramento, CA 95817.

P1A.2.7 **FRONTAL-SUBCORTICAL CIRCUITRY IN AUTISM.** K. Dominick, K. Lindgren, N. Shaffer, A. Silver, D. Kim and H. Tager-Flusberg. Lab of Developmental Cognitive Neuroscience, Boston University School of Medicine, 715 Albany Street, L-814, Boston, MA 02118.

P1A.2.8 **BRAIN VOLUME IN PARENTS FROM MULTIPLEX AUTISM FAMILIES.** J. Goldberg. McMaster University, Department Psychiatry and Behaioural Neurosciences, McMaster University, Hamilton, ON, L8N 3Z5.

P1A.2.9 **REGIONAL DIFFERENCES IN THE CORTICAL THICKNESS OF THE MIRROR NEURON NETWORK IN AUTISM SPECTRUM DISORDER.** N. Hadjikhani, R. Joseph, J. Syder, G. Harris and H. Tager-Flusberg. Martinos Center for Biomedical Imaging, MGH, Harvard Medical School, Building 36, First Avenue, #417, Charlestown, MA 02129.

P1A.2.10 **INCREASED DENSITY OF PARVALBUMIN LABELED HIPPOCAMPAL INTERNEURONS IN AUTISM.** Y. Lawrence, T. Kemper, M. Bauman and G. Blatt. Boston University School of Medicine, Department of Anatomy and Neurobiology, Boston, MA 02118.

P1A.2.11 **STRUCTURAL INTEGRITY OF LANGUAGE AREA CONNECTIONS IN AUTISM.** K. Lindgren, R. Joseph, T. Knaus, K. Dominick, N. Shaffer, A. Silver, D. Kim and H. Tager-Flusberg. Lab of Developmental Cognitive Neuroscience, Boston University School of Medicine, 715 Albany St., L-814, Boston, MA 02118.

P1A.2.12 **STRUCTURAL MAGNETIC RESONANCE IMAGING OF THE MIDSAGITTAL VERMIS IN AUTISM SPECTRUM AND BIPOLAR DISORDERS.** J. Marble, J. Day, J. Hamstra, S. Chiu, G. Voelbel, M. Bates, G. Pandina and R. Hendren. UC Davis MIND Institute, 2825 50th Street, Suite 2322, Sacramento, CA 95817.

P1A.2.13 **AMYGDALA VOLUME AND VISUAL FIXATION OF FAMILIAR AND UNFAMILIAR FACES IN INDIVIDUALS WITH AUTISM.** B. Nacewicz, K. Dalton, M. Long, E. McAuliff, M. Nersesian, T. Oakes, A. Alexander and R. Davidson. Waisman Laboratory for Brain Imaging and Behavior, University of Wisconsin, Madison, S109 Waisman Center, 1500 Highland Ave, Madison, WI 53705.

P1A.2.14 **CORTICAL SHAPE DIFFERENCES IN LOW FUNCTIONING AUTISM.** C. Nordahl, I. Mostafavi, D. Hanlon, C. Schumann, D. Amaral and D. VanEssen. The M.I.N.D. Institute, UC Davis, 2805 50th Street, Sacramento, CA 95817.

P1A.2.15 **CORTICAL NEURONS ARE MORE NUMEROUS IN AUTISM.** S. Palmen, P. Hof, H. Heinsen, H. Steinbusch, H. van Engeland and C. Schmitz. Rudolf Magnus Institute of Neuroscience, Department of Child and Adolescent Psychiatry, University Medical Center Utrecht, HP A01.468, 3584 CX Utrecht, The Netherlands.

P1A.2.16 **STEREOLOGICAL STUDY OF THE NUMBER AND SIZE OF NEURONS IN THE PRINCIPAL OLIVE IN AUTISM.** S. Thevarkunnel, M. Bauman, T. Kemper and G. Blatt. Boston University School of Medicine, Department of Anatomy and Neurobiology, R-1013, 715 Albany Street, Boston, MA 02118.

## Thursday, May 5, 2005

P1A.2.17 **QUANTITATIVE ANALYSIS OF CEREBELLAR BASKET AND STELLATE CELLS IN AUTISM.** E. Whitney, T. Kemper, M. Bauman and G. Blatt. Boston University School of Medicine, Department of Anatomy and Neurobiology, 715 Albany St, Boston, MA 02118.

P1A.2.18 **THE OLIVOCEREBELLAR PROJECTION IN AUTISM: USING THE INTERMEDIATE FILAMENT PROTEIN PERIPHERIN AS A MARKER FOR CLIMBING FIBERS.** J. Yip, R. Marcon, T. Kemper, M. Bauman and G. Blatt. Boston University School of Medicine, Department of Anatomy and Neurobiology, R-1003, 715 Albany Street, Boston, MA 02118.

Poster Session 1B: Topic 1

***Basic Science, Psychopharmacology & Population Approaches***

P1B.1.1 **LEVELS OF CLUSTERIN AND ±-1-MICROGLOBULIN IN PLASMA OF AUTISTIC CHILDREN.** H. Aposhian, A. van Tilburg, R. Zakharyan, M. Thomas, U. Chowdhury and P. Haynes. The University of Arizona, Life Sciences South, Room 444, P. O. Box 210106, Tucson, Arizona 85721.

P1B.1.2 **ALTERED CYTOKINE PROFILE IN CHILDREN WITH AUTISTIC SPECTRUM DISORDER (ASD): EVIDENCE FOR IMMUNE DYSREGULATION.** P. Ashwood, C. Kwong, J. Schauer, M. Cress and J. Van de Water. Paul Ashwood, Department of Rheumatology, Allergy and Clinical Immunology, Genome and Biomedical Sciences Facility, #6502, 451 E. Health Sciences Drive, University of California at Davis, California, 95616.

P1B.1.3 **THE ASSOCIATION OF HLA-A2 WITH AUTISTIC DISORDER IN CAUCASIAN SUBJECTS.** T. Sweeten, A. Cutler, J. Odell and A. Torres. Utah State University, 6895 Old Main Hill, Logan, UT 84322.

P1B.1.4 **FREE PLASMA SEROTONIN IN AUTISM.** S. Connors, K. Matteson, G. Sega, C. Lozzio and A. Zimmerman. Kennedy Krieger Institute, 707 North Broadway, Baltimore, MD 21205.

P1B.1.5 **AGE OF MENARCHE IN WOMEN WITH AUTISM SPECTRUM CONDITIONS.** R. Knickmeyer, R. Hoekstra, S. Wheelwright and S. Baron-Cohen. The Autism Research Centre, Douglas House, 18b Trumpington Rd., Cambridge, CB2 2AH.

Poster Session 1B: Topic 2

***Verbal & Nonverbal Communication***

P1B.2.1 **PARENT PERCEPTION OF MOOD RELATED MOVEMENT AS A FUNCTION OF OVERALL LEVEL OF SPEECH.** R. Abramson, A. Hall, S. Ravan, H. Cope, J. Gilbert, M. Cuccaro, H. Wright and M. Pericak-Vance. Department of Neuropsychiatry, 3555 Harden St. Ext. Suite 104A, Columbia, SC 29203.

P1B.2.2 **CONTEXT AND READING IN INDIVIDUALS WITH AUTISM: AN MEG STUDY.** B. Ahtam, A. Bailey, S. Swithenby and S. Braeutigam. Oxford University, University Section of Child and Adolescent Psychiatry, Oxford University, University Section of Child and Adolescent Psychiatry, Park Hospital for Children, Old Road, Headington, Oxford OX3 7LQ, UK.

P1B.2.3 **IMPORTANCE OF CONTEXTUAL CUES FOR SPEECH-IN-NOISE PROCESSING IN AUTISM.** J. Alcántara, E. Weisblatt, C. Clarke, M. McLaughlin, N. Minakaran and B. Moore. University of Cambridge, Department of Experimental Psychology, Downing Street, Cambridge CB2 3EB, United Kingdom.

P1B.2.4 **LONGITUDINAL PATTERNS OF GROWTH IN LANGUAGE ABILITIES AMONG CHILDREN WITH AUTISTIC SPECTRUM DISORDER.** D. Anderson, C. Lord and S. Heinz. University of Michigan Autism and Communication Disorders Center (UMACC), 1111 E. Catherine St., Ann Arbor, MI 48109-2054.

P1B.2.5 **EVIDENCE FOR INTACT SYNTACTIC REPRESENTATION DESPITE IMPAIRED SEMANTIC INTEGRATION IN CHILDREN WITH AUTISM.** K. Boser and B. Gordon. Johns Hopkins University, School of Medicine, 1629 Thames Street, Suite 350, Baltimore, MD 21231.

P1B.2.6 **INVESTIGATING LINGUISTIC PROCESSING IN AUTISM USING LANGUAGE-MEDIATED EYE-MOVEMENTS.** J. Brock, K. Kinsey and K. Nation. Department of Experimental Psychology, University of Oxford, Department of Experimental Psychology, University of Oxford, Oxford, OX1 3UD, U.K.

## Thursday, May 5, 2005

P1B.2.7 **PROSODY AND LANGUAGE IN CHILDREN WITH AUTISM.** L. Carroll, J. McCann, S. Peppe, F. Gibbon, A. O'Hare and M. Rutherford. Queen Margaret University College, Speech and Language Sciences, Clerwood Terrace, Edinburgh EH12 8TS, Scotland, U.K.

P1B.2.8 **ACOUSTIC AND PERCEPTUAL ANALYSIS OF PROSODY IN HIGH-FUNCTIONING AUTISM.** J. Diehl, D. Watson, J. McDonough, C. Gunlogson, E. Young and L. Bennetto. University of Rochester, Joshua J. Diehl, Department of Clinical & Social Sciences in Psychology, Meliora Hall, RC Box 270266, Rochester, NY 14627.

P1B.2.9 **A COMPARISON OF GENERALIZED TREATMENT GAINS FOR PIVOTAL RESPONSE TRAINING (PRT) AND THE PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS).** R. Gutierrez, L. Schreibman, A. Stahmer, R. Koegel and L. Koegel. UCSD Autism Research Program, 9500 Gilman Dr MC 0109, La Jolla, Ca 92093-0109.

P1B.2.10 **LANGUAGE, READING AND SPELLING SKILLS IN CHILDREN WITH DEVELOPMENTAL DISABILITIES.** D. Jacobs and A. Richdale. RMIT University, Division of Psychology, School of Health Sciences, RMIT University, PO Box 71, Bundoora, Victoria, 3083, Australia.

P1B.2.11 **LANGUAGE PROFILES OF OPTIMAL OUTCOME CHILDREN WITH AUTISM.** E. Kelley and D. Fein. University of Connecticut, Dept. of Psychology/ 406 Babbidge Rd., Unit 1020/ Storrs, CT, 06269-1020.

P1B.2.12 **PRAGMATICS, LANGUAGE AND AUTISTIC SPECTRUM DISORDERS: EVIDENCE FROM CHILDREN OF NORMAL NONVERBAL INTELLIGENCE, WITH AND WITHOUT ASD.** T. Loucas, G. Baird, T. Charman, A. Pickles, E. Simonoff, S. Chandler and E. Rowley. School of Applied Health Sciences, De Montfort University, School of Applied Health Sciences, De Montfort University, The Gateway, Leicester, LE1 9BH, United Kingdom.

P1B.2.13 **LANGUAGE ABILITY IN YOUNG CHILDREN WITH AUTISM AND TYPICAL DEVELOPMENT: THE ROLE OF GESTURES.** A. Mastergeorge, G. Young, M. Lombardo, J. West, S. Ozonoff and S. Rogers. University of California, Davis/M.I.N.D. Institute, 2825 50th Street, Sacramento, CA. 95817.

P1B.2.14 **ACHIEVING SPEECH PRODUCTION IN A NON-VERBAL ADOLESCENT WITH AUTISM.** J. O'Grady, O. Pullara, J. Thorne, J. Juska, L. Bejoian and B. Gordon. Johns Hopkins School of Medicine, 386 Dartmouth Street, Wyckoff, New Jersey 07481.

P1B.2.15 **RELATIONSHIP BETWEEN LANGUAGE SKILLS AND ADOLESCENT BEHAVIOR IN AUTSIM SPECTRUM DISORDERS.** A. Sullivan, D. Anderson, S. Risi, S. Heinz, K. Gotham and C. Lord. University of Michigan Autism and Communication Disorders Center, 1111 East Catherine Street, Ann Arbor, MI 48109.

P1B.2.16 **INNER SPEECH DEFICITS IN AUTISM.** A. Whitehouse, M. Maybery and K. Durkin. School of Psychology, University of Western Australia, University of Western Australia, 35 Stirling Highway, Crawley, 6009, Western Australia.

P1B.2.17 **LINKAGE OF AUTISTIC SPECTRUM DISORDER: EVIDENCE OF A NON-VERBAL COMMUNICATION LOCUS ON 8Q24.** G. Chen, N. Kono, D. Geschwind and R. Cantor. UCLA, 10535 Wilshire Blvd. #806, Los Angeles, CA 90024.

P1B.2.18 **SENSORY INTEGRATION OF VISUAL AND AUDITORY INPUT IN HIGH FUNCTIONING CHILDREN WITH AUTISM (HFA).** J. McLaughlin, G. Iarocci, J. Yager, A. Rombough, S. Grant, D. Weeks and R. Chua. Simon Fraser University, Autism and Developmental Disorders Lab, 8888 University Dr., Department of Psychology, Simon Fraser University, Burnaby, BC V5A 1S6.

P1B.2.19 **INDICATION OF AUGMENTATIVE COMMUNICATION: PSYCHOMETRIC PROPERTIES AND CLINICAL RELEVANCE OF THE COMFOR.** I. Noens, I. van Berckelaer-Onnes, R. Verpoorten and G. van Duijn. Leiden University, Centre for the Study of Developmental Disorders, Leiden University, Centre for the Study of Developmental Disorders, P.O. Box 9555, 2300 RB Leiden, The Netherlands.

P1B.2.20 **THE DEVELOPMENT OF AN OBSERVATION MEASURE FOR THE SOCIAL COMMUNICATION OF CHILDREN WITH AUTISM IN THE CLASSROOM.** G. Pasco, K. Gordon, P. Howlin and T. Charman. St. George's Hospital Medical School, Room 6.69, Hunter Wing, Cranmer Terrace, Tooting, LONDON, United Kingdom, SW17 0RE.

## Thursday, May 5, 2005

P1B.2.21 **EFFECTS OF SELF-INITIATION TRAINING FOR PREVERBAL CHILDREN WITH AUTISM.** M. Rocha and L. Schreibman. University of California, San Diego, 0109 Department of Psychology, 9500 Gilman Drive, La Jolla, CA 92122-0109.

P1B.2.22 **ADAPTING TWO-PART MODEL/RIVAL TRAINING TO A GROUP SETTING.** D. Shermam and I. Pepperberg. New-Found Therapies, Inc., 850 Munras ave Suite 1, Monterey, Ca 93940.

P1B.2.23 **IMITATION IN ASD: EFFECTS OF NOVELTY AND FAMILIARITY OF ACTIONS AND OBJECTS.** I. Smith and C. Patterson. Dalhousie University, Psychologial Services, IWK Health Centre, PO Box 9700, Halifax NS B3K 6R8, Canada.

## Friday, May 6, 2005

Slide Session 1

### *Basic Science & Population Approaches*

S1.1 **PREVALENCE AND CORRELATES OF TREATMENT USE AMONG A COMMUNITY SAMPLE OF INDIVIDUALS WITH AUTISM.** D. Mandell, M. Novak, C. Zubritsky and S. Levy. University of Pennsylvania School of Medicine, Center for Mental Health Policy and Services Research, 3535 Market Street, 3rd Floor, Philadelphia, PA 19104.

S1.2 **THE INFLUENCE OF ENVIRONMENTAL FACTORS ON CRITICAL PERIOD PLASTICITY IN RATS AUDITORY CORTEX.** T. Kenet, I. Pessah and M. Merzenich. University of California, San Francisco, Keck Center for Integrative Neurosciences, University of California San Francisco, 513 Parnassus, HSE 808, box 0732, San Francisco, CA 94143.

S1.3 **ABNORMAL REPETITIVE BEHAVIOR AND ASSOCIATED DEFICITS IN BASAL GANGLIA MEDIATED LEARNING AND MEMORY.** M. Lewis, C. Turner, H. Mikes, L. Lee and Y. Tanimura. University of Florida, Department of Psychiatry, Box 100256, McKnight Brain Institute, 100 S. Newel Dr., University of Florida, Gainesville, FL 32610.

S1.4 **SEXUALLY DIMORPHIC RESPONSE OF THE DEVELOPING RAT CNS TO POLYCHLORINATED BIPHENYLS (PCBS): CEREBELLAR CELL APOPTOSIS, STRUCTURE, AND MOTOR BEHAVIOR IN MALE AND FEMALE RATS.** E. Sajdel-Sulkowska and K. Nguon. Dept. Psychiatry, Brigham and Women's Hospital and Harvard Medical School, 221 Longwood Ave., Boston, MA 02115, USA.

S1.5 **MATERNAL PSYCHIATRIC HISTORY, ANTIDEPRESSANT USE DURING PREGNANCY, AND CHILDHOOD AUTISM.** L. Croen, C. Yoshida, R. Odouli and J. Grether. Kaiser Permanente Division of Research, 2000 Broadway, Oakland, California, 94612.

S1.6 **TRENDS IN THE ASSIGNMENT OF SPECIAL EDUCATION CODES FOR AUTISM IN BRITISH COLUMBIA: IMPLICATIONS FOR AUTISM PREVALENCE ESTIMATES.** H. Ouellette-Kuntz, H. Coo, J. Lloyd, L. Kasmara, J. Holden and S. Lewis. Departments of Community Health & Epidemiology and Psychiatry, Queen's University; and the Autism Spectrum Disorders - Canadian-American Research Consortium, 191 Portsmouth Avenue, Kingston, Ontario, CANADA, K7M 8A6.

S1.7 **AUTISM SPECTRUM DISORDERS IN RELATION TO DISTRIBUTION OF HAZARDOUS AIR POLLUTANTS.** G. Windham, L. Zhang, R. Gunier, L. Croen and J. Grether. CA Department of Health Services, 1515 Clay St., Suite 1700, Oakland, CA 94612.

S1.8 **IS AN INCREASE IN AUTISM PREVALENCE DUE TO DIAGNOSTIC SUBSTITUTION?.** M. Yale Kaiser, C. Lazarus and K. Scott. University of Miami, Dept. of Psychology, FHF Building, Rm 354, PO Box 248185, Coral Gables, FL 33124.

S1.9 **IMMUNOPHENOTYPING AND PROTEOMIC AND METABOLOMIC PROFILING OF CHILDREN WITH AUTISM.** D. Amaral, B. Corbett, A. Kantor, C. Becker, V. Kakkanaiah, J. Deng, S. Bacalman and H. Schulman. David G. Amaral, Ph.D., The M.I.N.D. Institute, 2825 50th Street, Sacramento CA 95817.

S1.10 **DO AUTISTIC CHILDREN HAVE ENHANCED ANTIBODIES TO CENTRAL NERVOUS SYSTEM PROTEINS OR MEASLES VIRUS?.** R. Fujinami, T. Sweeten, H. Coon, J. Miller, N. Burgess and W. McMahon. University of Utah, Department of Neurology, 30 N 1900 E, 3R330 SOM, Salt Lake City, Utah 84132-2305.

Slide Session 2

### *Brain Structure & Structural Neuroimaging*

S2.1 **TOTAL BRAIN VOLUME IN PATIENTS WITH ASPERGER SYNDROME DOES NOT CHANGE WITH AGE.** B. Hallahan, G. McAlonan, F. O'Brien, E. Daly, S. Curran and D. Murphy. Institute of Psychiatry, Box P050 / Brain Maturation, Institute of Psychiatry, De Crespigny Park, Denmark Hill, London SE5 8AF, U.K.

S2.2 **UPDATE ON A LONGITUDINAL MRI STUDY OF YOUNG CHILDREN WITH AUTISM.** H. Hazlett, M. Poe, R. Smith, G. Gerig and J. Piven. University of North Carolina, CB# 3367, Autism Research Program, Neurodevelopmental Disorders Research Center, University of North Carolina, Chapel Hill, NC 27599.

S2.3 **HEAD CIRCUMFERENCE OF SIBLINGS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS: BIRTH THROUGH THE THIRD YEAR OF LIFE.** L. Lee, C. Newschaffer, A. Zimmerman, M. Johnson and R. Landa. Center for Autism & Developmental Disabilities Epidemiology, Bloomberg School of Public Health, Johns Hopkins University, 615 N. Wolfe Street, Room E6032, Baltimore, MD 21205 .

S2.4 **PATHOLOGICAL BRAIN GROWTH IN AUTISM LEADS TO INCREASED, THEN REDUCED INTERHEMISPHERIC CONNECTIVITY.** J. Lewis and E. Courchesne. Dept. of Cognitive Science 0515, UC San Diego, 9500 Gilman Drive, La Jolla, CA 92093.

S2.5 **BASAL GANGLIA ABNORMALITIES IN CHILDREN AND ADULTS WITH AN AUTISM SPECTRUM DISORDER. A STUDY IN TWO DIFFERENT AGE GROUPS AND CULTURES.** G. McAlonan, E. Loth, S. Chua, E. Daly, S. Curran, V. Cheung, C. Cheung, G. Lam, K. Tai, L. Yip and D. Murphy. University of Hong Kong, Department of Psychiatry, Pokfulam, Hong Kong, SAR, China.

S2.6 **AMYGDALA AND HIPPOCAMPUS ENLARGEMENT IN YOUNG CHILDREN WITH AUTISM.** M. Mosconi, H. Cody, M. Poe, S. Joshi, S. Peterson and J. Piven. University of North Carolina at Chapel Hill, Neurodevelopmental Disorders Research Center CB #3367, Chapel Hill, NC 27599-3367.

S2.7 **AN IN VIVO 1H MAGNETIC RESONANCE SPECTROSCOPY STUDY OF LIMBIC AND PARIETAL REGIONS IN AUTISM.** L. Page, A. Simmons, E. Daly, E. Loth, S. Curran, B. Hallahan, F. Toal, Q. Deeley, G. McAlonan and D. Murphy. Institute of Psychiatry, King's College London, Division of Psychological Medicine, De Crespigny Park, London SE5 8AF, U.K.

S2.8 **BRAIN MORPHOLOGY IN AUTISM SPECTRUM DISORDERS: AN MRI STUDY.** R. Schultz, L. Win, A. Jackowski, A. Klin, L. Staib, X. Papademetris, T. Babitz, E. Carter, C. Klaiman, A. Fieler and F. Volkmar. Yale University Child Study Center, 230 South Frontage Rd, New Haven, CT 06520-7900.

S2.9 **NO DIFFERENCE IN THE NUMBER OF NEURONS IN THE AMYGDALA IN POSTMORTEM CASES OF AUTISM: A STEREOLOGICAL STUDY.** C. Schumann and D. Amaral. UC Davis M.I.N.D. Institute, 2805 50th Street, Room 1413, Sacramento CA 95817.

S2.10 **CONVERGENT EVIDENCE FOR WHITE MATTER DIFFERENCES IN CHILDREN WITH AUTISM STUDIED USING DIFFUSION TENSOR IMAGING (DTI) AND VOXEL-BASED MORPHOMETRY (VBM).** J. VanMeter, L. Girton, M. Kalbfleisch, A. Hailu, A. Wolfe, E. Mease, J. Mbwana, S. Warburton, P. Daniolos, W. Gallaird and T. Zeffiro. Center for Functional and Molecular Imaging, Georgetown University Medical Center, 3900 Reservoir Road, NW, Preclinical Sciences Building, LM 14, Washington, D.C. 20057-1488.

## Slide Session 3 *Emotions & Behavior*

S3.1 **THE REPETITIVE BEHAVIOR SCALE-R: ASSOCIATONS WITH AGE, ADAPTIVE LEVEL, AND IRRITABILITY.** S. Donnelly, C. Wolpert, H. Cope, R. Abramson, H. Wright, A. Hall, S. Ravan, J. Gilbert, M. Pericak-Vance, R. Gabriels and M. Cuccaro. Duke University Medical Center, Center for Human Genetics, Box 3445, Duke University Medical Center, Durham, NC 27710.

S3.2 **ANXIETY SYMPTOMS IN CHILDREN AND ADOLESCENTS WITH AUTISM.** K. Loveland, D. Pearson and S. Reddoch. University of Texas Health Science Center, Houston, Center for Human Development Research, Department of Psychiatry and Behavioral Sciences, University of Texas Medical School, U.T.-M.S.I, 1300 Moursund Street, Houston, Texas 77030 USA.

S3.3 **EVALUATION OF DIFFERENCES IN SLEEP BETWEEN CHILDREN WITH AUTISM AND CHILDREN WITH TYPICAL DEVELOPMENT USING THE CHILD'S SLEEP HABITS QUESTIONNAIRE.** T. Mandler, A. Herndon, S. Hepburn and A. Reynolds. University of Colorado Health Sciences Center, The Children's Hospital, Child Development Unit, 1056 East 19th Avenue, B140, Denver, CO 80218.

S3.4 **A COMPARISON OF SLEEP PATTERNS AND SLEEP PROBLEMS IN AUTISM, ASPERGER'S DISORDER, ADHD, AND TYPICALLY DEVELOPING CHILDREN.** A. Richdale, M. Polimeni and A. Francis. RMIT University, Division of Psychology, School of Health Sciences, RMIT University, PO Box 71, Bundoora, Victoria, 3083, Australia.

S3.5 **AUTISM IN VISUALLY IMPAIRED INDIVIDUALS.** N. Mukaddes, A. Kilincaslan, G. Sozen, T. Sevketoglu and S. Tuncer. Istanbul Medical Faculty, Istanbul University, Istanbul Tip Fakultesi, PTT si PK:53 Capa Istanbul 34272 Turkey.

S3.6 **FURTHER EXPLORATIONS OF THE EMPATHISING - SYSTEMISING MODEL OF AUTISM SPECTRUM CONDITIONS.** J. Lawson and S. Baron-Cohen. University of Cambridge, Autism Research Centre, Department of Psychiatry, Douglas House, Cambridge, UK, CB2 .

S3.7 **PATTERNS OF VISUAL ATTENTION AND FACE RECOGNITION IN AUTISM.** J. McPartland, G. Dawson, S. Webb and B. Keehn. Yale Child Study Center, 230 South Frontage Road, Box 207900, New Haven, CT 06520.

S3.8 **PERCEPTION OF EMOTION THROUGH FACIAL EXPRESSION AND TONE OF VOICE IN AUTISM SPECTRUM DISORDERS: AN FMRI STUDY.** D. Robins, E. Hunyadi and R. Schultz. Georgia State University, Diana L. Robins, Department of Psychology, PO Box 5010, Atlanta, GA 30302-5010.

S3.9 **ATTENTIONAL PATTERNS OF FAMILIAR FACE PROCESSING IN INDIVIDUALS WITH AUTISM.** L. Sterling, G. Dawson, H. Panagiotides and S. Webb. University of Washington, Box 357920 CHDD, University of Washington, Seattle, WA 98195.

S3.10 **ARE INDIVIDUALS WITH AUTISM SPECTRUM DISORDERS "EXPERTS" AT FACE PROCESSING AND IF NOT, WHY NOT?.** S. Wallace, M. Coleman and A. Bailey. Oxford University, Department of Psychiatry, OX3 7JX.

## Slide Session 4 *Early Detection/Diagnosis*

S4.1 **AUTISM SPECTRUM DISORDER IN THE SECOND YEAR: STABILITY AND CHANGE IN SYNDROME EXPRESSION.** K. Chawarska, A. Klin, R. Paul and F. Volkmar. Yale University School of Medicine, Yale Child Study Center, 40 Temple, Suite 7I, New Haven, CT 06510.

S4.2 **THE AUTISM DIAGNOSTIC OBSERVATION SCHEDULE (ADOS): REVISED ALGORITHMS FOR IMPROVED DIAGNOSTIC VALIDITY.** K. Gotham, S. Risi and C. Lord. University of Michigan, UMACC, 1111 E. Catherine, Ann Arbor, MI, 48109.

S4.3 **USE OF THE STAT AS AN AUTISM SCREEN FOR CHILDREN UNDER 24 MONTHS.** L. Henderson and W. Stone. Vanderbilt University Children's Hospital, Center for Child Development/TRIAD, Vanderbilt Children's Hospital, 415 MCS, 2100 Pierce Avenue, Nashville, TN 37232-3573.

S4.4 **FUNCTIONAL CONSEQUENCE OF COMMON GLYOXALASE I SNP IN AUTISM.** M. Junaid, B. Madhabi, D. Kowal and P. Pullarkat. New York State Institute for Basic Research in Developmental Disabilities, 1050 Forest Hill Road, Staten Island, NY 10314.

S4.5 **USING THE M-CHAT TO DETECT AUTISM SPECTRUM DISORDERS IN YOUNG SIBLINGS OF ASD CHILDREN.** J. Pandey, K. Toth, S. Sutera, J. Kleinman, P. Dixon, L. Wilson, H. Boorstein, E. Esser, M. Barton, S. Hodgson, T. Dumont-Mathieu, J. Green, G. Marshia, G. Dawson and D. Fein. University of Connecticut, 406 Babbidge Road, U-1020, Storrs, CT 06269-1020.

S4.6 **THE FIRST YEAR INVENTORY (FYI): A QUESTIONNAIRE TO SCREEN FOR AUTISM RISK IN 12-MONTH OLDS.** L. Watson, G. Baranek, E. Crais, J. Reznick, J. Dykstra, S. Reavis, and R. Benton. University of North Carolina at Chapel Hill, Div. of Speech & Hearing Sciences, CB# 7190, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC 27599-7190.

S4.7 **RELATIONSHIP AMONG RED FLAGS FOR AUTISM SPECTRUM DISORDERS IN THE SECOND YEAR OF LIFE AND LATER SYMPTOMS.** N. Watt, A. Wetherby and J. Woods. Florida State University, Department of Communication Disorders, Florida State University, 32306-7814.

S4.8 **SOCIAL COMMUNICATION SKILLS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS, DEVELOPMENTAL DELAY, AND TYPICAL DEVELOPMENT IN THE SECOND YEAR OF LIFE.** A. Wetherby, S. Shumway, N. Watt and L. Morgan. Florida State University, Department of Communication Disorders, Florida State University, Tallahassee, FL 32306-7814.

S4.9 **EARLY LANGUAGE IMPAIRMENTS IN HIGH-RISK INFANTS SUBSEQUENTLY DIAGNOSED WITH AUTISM.** L. Zwaigenbaum, S. Bryson, J. Brian, W. Roberts, P. Szatmari, B. MacKinnon and S. Mitchell. Department of Paediatrics, McMaster University, Children's Hospital, Chedoke Site, 565 Sanatorium Road, Hamilton, Ontario, Canada, L8N 3Z5.

S4.10 **SCREENING FOR DEVELOPMENTAL DELAY AND AUTISM SPECTRUM DISORDERS IN GENERAL PEDIATRIC PRACTICE.** S. dosReis, C. Weiner, L. Johnson, N. Lee and C. Newschaffer. Johns Hopkins University, Division of Child and Adolescent Psychiatry, 600 N. Wolfe Street, CMSC 346, Baltimore, MD 21287.

## Friday, May 6, 2005

Slide Session 5 ***Genetics***

S5.1 **PHENOTYPIC CHARACTERISTICS OF AUTISTIC REGRESSION IN AN INTERNATIONAL MULTIPLEX SAMPLE.** A. Bailey, J. Parr, G. Baird, A. Le Couteur, M. Rutter and IMGSAC. Department of Psychiatry, University of Oxford, Section of Child and Adolescent Psychiatry, The Parh Hospital, Old Road, Headington, Oxford. OX3 7LQ UK.

S5.2 **LOCALIZATION OF AN AUTISM GENE ON CHROMOSOME 17Q.** R. Cantor, J. Duvall, N. Kono, J. Stone, A. Alvarez-Retuerto, S. Nelson and D. Geschwind. Department of Human Genetics, UCLA School of Medicine, 695 Charles E. Young Dr. South, Los Angeles, CA 90095-7088.

S5.3 **FAMILIALITY OF QUANTITATIVE AUTISTIC TRAITS IS EQUIVALENT FOR SEVERE AND SUB THRESHOLD LEVELS OF SYMPTOMATOLOGY.** J. Constantino, A. Abbacchi and R. Todd. Washington University School of Medicine, Department of Psychiatry, Campus Box 8134, 660 South Euclid Avenue, St. Louis, Missouri 63110.

S5.4 **GENETICS, ENVIRONMENT, NUTRITION EXPLORING AUTISM IN CHILDREN: THE GENE-A STUDY.** E. Fombonne, R. Zakharyan, P. Assouad, M. Fischel, E. Golan and E. Dewailly. Department of Psychiatry, Montreal Children's Hospital, 4018 Ste-Catherine West, Montreal, Quebec, H3Z 1P2, CANADA.

S5.5 **THE ICELANDIC AUTISM STUDY - A GENEALOGICAL APPROACH TO THE GENETICS OF AUTISM INCLUDING THE BROADER AUTISM PHENOTYPE.** R. Fossdal, P. Magnusson, E. Saemundsen, G. Bjornsdottir, S. Steinberg, J. Thorhallsdottir, B. Unnarsdottir, C. López-Correa, S. Matthiasdottir, H. Stefansson, B. Lauth, S. Hreidarsson, O. Gudmundsson, J. Gulcher, K. Kristjansson, T. Thorgeirsson and K. Stefansson. deCODE Genetics, Inc., Sturlugata 8, IS 101 Reykjavik, Iceland .

S5.6 **A GENOMEWIDE LINKAGE SCAN USING THE SOCIAL RESPONSIVENESS SCALE (SRS) AS A QUANTITATIVE TRAIT FOR AUTISM.** D. Geschwind, J. Duvall, R. Cantor, AGRE Consortium, R. Todd and J. Constantino. UCLA, UCLA DEPARTMENT OF NEUROLOGY, 710 WESTWOOD PLAZA, ROOM 145, LOS ANGELES, CA 90095-1769.

S5.7 **GABRB3 EXPRESSION DEFECTS IN AUTISM CEREBRAL SAMPLES.** A. Hogart, R. Samaco and J. LaSalle. U.C. Davis School of Medicine, Microbiology and Immunology, Rowe Program in Human Genetics, U.C. Davis School of Medicine, Davis, CA 95616.

S5.8 **EPIGENETIC OVERLAP IN AUTISM-SPECTRUM NEURODEVELOPMENTAL DISORDERS: MECP2 DEFICIENCY CAUSES REDUCED EXPRESSION OF UBE3A AND GABRB3.** J. LaSalle, S. Rodney and S. Rodney. U.C. Davis School of Medicine, Medical Microbiology and Immunology, U.C. Davis School of Medicine, Davis, CA 95616.

S5.9 **EVIDENCE FOR AUTISM LOCI IN THE CHROMOSOME 2Q24-Q33 REGION, IN ADDITION TO AGC1.** N. Ramoz, J. Reichert, C. Smith, T. Corwin, J. Silverman and J. Buxbaum. Laboratory of Molecular Neuropsychiatry, Department of Psychiatry, Mount Sinai School of Medicine, Mount Sinai School of Medicine, One Gustave L Levy Place, Box#1668, New York, NY, 10029, USA.

S5.10 **GENETIC TESTING FOR AUTISM: CURRENT STATE OF CLINICAL PRACTICE IN THE SOUTHEASTERN UNITED STATES.** C. Wolpert, S. Donnelly, H. Cope, M. McDonald, R. Abramson, H. Wright, J. Gilbert, M. Cuccaro and M. Pericak-Vance. Duke University Medical Center, Duke Center for Human Genetics, 595 LaSalle Street, Duke University Medical Center, Durham, NC 27710.

Slide Session 6 ***Intervention & Education***

S6.1 **WHERE ARE THEY NOW?: ADULT FUNCTIONING IN AUTISM SPECTRUM DISORDERS.** D. Ellison, C. Clark and B. Langford. Child and Parent Resource Institute and The University of Western Ontario, 600 Sanitorium Rd., London, Ontario, N6H 3W7, Canada.

S6.2 **TEACHING CHILDREN WITH ASPERGER SYNDROME TO RECOGNIZE EMOTIONS USING INTERACTIVE MULTIMEDIA.** O. Golan and S. Baron-Cohen. Autism Research Centre, Departments of Experimental Psychology and Psychiatry, Cambridge University, Autism Research Centre, Douglas House, 18b Trumpington Road, Cambridge, CB2 2AH, U.K.

S6.3 **GROWTH IN JOINT ATTENTION AND SYMBOLIC PLAY.** C. Kasari. UCLA, 3132 Moore Hall, Los Angeles, CA 90095.

S6.4 **INVESTIGATING CHANGE IN SOCIAL COMMUNICATION FOLLOWING EARLY INTERVENTION FOR CHILDREN WITH AUTISM.** D. Keen, S. Rodger, M. Braithwaite and K. Doussin. University of Queensland, School of Education, Brisbane Queensland, Australia 4072.

S6.5 **LANGUAGE AND SOCIAL CHANGE IN TODDLERS WITH ASD: EARLY INTERVENTION.** R. Landa, K. Holman, M. Sullivan and J. Cleary. Kennedy Krieger Institute, Center for Autism and Related Disorders, 3901 Greenspring Avenue, Baltimore, MD 21211.

S6.6 **A COGNITIVE BEHAVIORAL INTERVENTION FOR HIGH FUNCTIONING CHILDREN WITH AUTISM SPECTRUM DISORDERS AND PROBLEM BEHAVIORS.** M. Solomon, M. Ono and B. Goodlin-Jones. U. C. Davis Health System, Department of Psychiatry, MIND Institute, 2825 50th Street, Sacramento, CA 95817.

S6.7 **PHARMACEUTICAL TREATMENTS IN CHILDREN WITH AUTISM AND ADHD: A REVIEW.** T. Wisniewski, M. Brimacombe and X. Ming. University of Medicine and Dentistry of New Jersey / Department of Preventive Medicine and Community Health, UMDNJ, Department of Preventive Medicine and Community Health, 185 South Orange Ave. MSB F506, Newark, NJ 07103.

S6.8 **A STUDY OF THE EFFECT OF EARLY INTERVENTION ON THE USE OF VERBAL AND NON-VERBAL COMMUNICATION IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** K. Wittemeyer, B. Rogé, G. Magerotte and J. Fremolle-Kruck. CERPP, CERPP, Maison de la Recherche, Université de Toulouse Le Mirail, 5 all. Antonio Machado, 31058 Toulouse Cedex, France.

S6.9 **VARIABLES AFFECTING OUTCOME IN YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDER AFTER ONE YEAR OF INTENSIVE BEHAVIOR INTERVENTION.** D. Zachor and E. Ben Itzchak. Assaf Harofeh Medical Center, Tel Aviv University, 12 Hatizmoret St., Kiryat Ono 55556, Israel.

S6.10 **SOCIAL SKILLS DEVELOPMENT IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: DEVELOPMENT OF A MODEL CURRICULUM.** K. Koenic, S. Williams, A. Merz, K. Scalzo, K. Kramer, E. Schilling and L. Scahill. Yale University, Yale Child Study Center, P.O. Box 207900, New Haven, CT 06520-7900.

## Poster Session 2A: Topic 1

### *Cognition & Neuropsychology*

P2A.1.1 **EXPLORATIONS OF MUSIC AND LANGUAGE PROCESSING OF INDIVIDUALS WITH AUTISM.** R. Accordino, D. Bishop and P. Heaton. University of Oxford, Oxford Study of Children's Communication Impairments, Department of Experimental Psychology, University of Oxford, South Parks Road, Oxford, OX1 3UD, United Kingdom.

P2A.1.2 **BODY POSTURE: WHAT INDIVIDUALS WITH AUTISM SPECTRUM DISORDER MIGHT BE MISSING.** P. Beall, C. Reed, L. Kopelioff, S. Hepburn and D. Pulham. University of Denver, 1358 Ben Nevis Ave, Broomfield, CO 80020.

P2A.1.3 **INTERMODAL PERCEPTION IN CHILDREN WITH AUTISM.** J. Bebko, K. Wells, J. Demark and J. Weiss. York University & ASD-CARC, Department of Psychology, York University, 4700 Keele Street, Toronto, ONtario, Canada M3J 1P3.

P2A.1.4 **AUTISM SPECTRUM CONDITIONS AS AN EXTREME SYSTEMIZING COGNITIVE STYLE.** J. Billington and S. Baron-Cohen. Autism Research Centre, Departments of Experimental Psychology and Psychiatry, University of Cambridge., Douglas House, 18b Trumpington Road, Cambridge, CB3 9DF.

P2A.1.5 **HEAD CIRCUMFERENCE AND COGNITIVE/BEHAVIORAL FUNCTIONING IN CHILDREN WITH AUTISM FROM THE AGRE DATABASE.** D. Black, J. Miyamoto and S. Spence. UCLA Center for Autism Research and Treatment, UCLA Neuropsychiatric Institute, Los Angeles, CA, 90095.

P2A.1.6 **OCULOMOTOR CORRELATES OF VISUAL SEARCH IN ADOLESCENTS WITH HIGH-FUNCTIONING AUTISM.** L. Brenner, A. Ramos, S. Knust, K. Turner, S. Marshall and R. Müller. San Diego State University, 6363 Alvarado Court, Suite 250, San Diego, CA, 92120.

P2A.1.7 **SUPERIOR PERFORMANCE OF AUTISTICS ON RPM AND PPVT RELATIVE TO WESCHLER SCALES PROVIDES EVIDENCE FOR THE NATURE OF AUTISTIC INTELLIGENCE.** M. Dawson, L. Mottron, P. Jelenic and I. Soulières. Pervasive developmental disorders specialized clinic, University of Montréal, Hôpital Rivière-des-Prairies, 7070 Boulevard Perras, Montréal, QC, Canada H1E 1A4.

P2A.1.8 **OBJECT CATEGORIZATION IN INDIVIDUALS WITH AUTISM.** H. Gastgeb, M. Strauss and N. Minshew. University of Pittsburgh, Department of Psychology, University of Pittsburgh, 210 S. Bouquet St, Pittsburgh, PA 15260.

P2A.1.9 **PARENT REPORTED DIFFICULTY WITH SHIFTING PREDICTS EMOTIONAL DIFFICULTY IN SCHOOL FOR CHILDREN WITH ASPERGER'S DISORDER.** M. Gibbs, A. Nye, L. Gilotty, P. Lee, G. Wallace, D. Black and L. Kenworthy. Children's National Medical Center, 14801 Physicians Lane, Suite 173, Rockville, MD 20850.

P2A.1.10 **THE USE OF ORGANIZATIONAL AND REHEARSAL STRATEGY TRAINING TO IMPROVE RECALL AND CLUSTERING PERFORMANCE OF CHILDREN WITH AUTISM SPECTRUM DISORDERS.** G. Goldstein and J. Bebko. York University & CIHR/NAAR STIHR Inter-Institute Autism Spectrum Disorders Training Program (PI: JJAH), Behavioural Sciences Building, 4700 Keele Street, Toronto, Ontario, M3J 1P3.

P2A.1.11 **SHIFTING OF ATTENTION IN HIGH-FUNCTIONING AUTISM.** G. Goldstein, D. Williams and N. Minshew. VA Pittsburgh HCS, VA Pittsburgh HCS, 7180 Highland Dr. (151R), Pittsburgh, PA 15206.

P2A.1.12 **THE EFFECT OF STRESS ON COGNITIVE FLEXIBILITY AMONG THOSE ON THE AUTISM SPECTRUM.** A. Hillier, J. Alexander, R. Smith, M. Tivarus, H. Campbell, J. Kitzmiller, S. Smyth and D. Beversdorf. The Ohio State University, 4th fl. Means Hall, 1654 Upham Drive, Columbus, OH 43210.

P2A.1.13 **THE EFFECT OF CUES ON FALSE BELIEF PERFORMANCE OF CHILDREN WITH AUTISM.** P. Holland and D. Bowler. City University, Department of Psychology, School of Social Sciences, Northampton Square, London EC1V 0HB.

P2A.1.14 **SELECTIVE ATTENTION IN HIGH-FUNCTIONING ADULTS WITH AUTISM.** K. Humphreys, N. Minshew and M. Behrmann. Carnegie Mellon University, Dept of Psychology, CMU, 5000 Forbes Avenue, Pittsburgh, PA 15213.

P2A.1.15 **EXECUTIVE FUNCTIONING AND WEAK CENTRAL COHERENCE: EXPLORING THE RELATIONSHIP BETWEEN THEORIES THAT PURPORT TO UNDERLIE COGNITIVE PROCESSING IN CHILDREN WITH AUTISM.** J. James, M. Gibbs, P. Lee, L. Gilotty, G. Wallace, D. Black and L. Kenworthy. Children's National Medical Center, Joette D. James, Ph.D., Pediatric Neuropsychology Fellow, Pediatric Neuropsychology Program, 14801 Physician's Lane, Suite 173, Rockville, MD 20850.

P2A.1.16 **NEW PERSPECTIVES ON GLOBAL-LOCAL PROCESSING IN AUTISM SPECTRUM DISORDERS.** S. Johnson, L. Blaha, I. Hernandez-Ritter, M. Fific, R. Murphy, J. Townsend and J. Stout. Indiana University, Indiana University, Department of Psychology, 1101 E. 10th Street, Bloomington, Indiana 47405-7007.

P2A.1.18 **ATYPICAL WECHSLER INTELLIGENCE SCALE PROFILES IN HIGH FUNCTIONING AUTISM.** N. Kojkowski, N. Minshew and G. Goldstein. University of Pittsburgh, NIH Center of Excellence in Autism Research at the University of Pittsburgh, 4415 Fifth Ave, Webster Hall, Suite 300, Pittsburgh, PA 15213.

P2A.1.19 **NEUROPSYCHOLOGICAL ASSESSMENT OF CASES WITH ASPERGER'S DISORDER (AD).** G. Kucukyazici, N. Mukaddes, A. Kilincaslan and A. Umut. Istanbul Medical Faculty Child Psychiatry Department, Ahmet Vefik Pasa Cad. Deniz Abdal Mah. Sair Mehmet Emin Sok. Banka Apt. A Blok No:10/3 34390 Findikzade/ Istanbul/TURKEY.

P2A.1.20 **ARE CHILDREN WITH AUTISM SUPERIOR AT THREE-DIMENSIONAL DRAWING?.** E. Sheppard, D. Ropar and P. Mitchell. School of Psychology, University of Nottingham, University Park, Nottingham, NG7 2RD, England.

P2A.1.21 **NEUROCOGNITIVE FUNCTIONING IN ADOLESCENTS WITH PDD-NOS, SUBTYPE MULTIPLE COMPLEX DEVELOPMENTAL DISORDER.** M. Simons-Sprong, H. Swaab-Barneveld, P. Schothorst and H. van Engeland. Rudolf Magnus Institute of Neuroscience, Department of Psychiatry, HP A01.468, Postbus 85500, 3508 GA Utrecht, The Netherlands.

P2A.1.22 **NUMERICAL ESTIMATION: DO INDIVIDUALS WITH AUTISM DEMONSTRATE SUPERIOR ABLITIES?.** M. Strauss, K. Turner, J. Stout and N. Minshew. University of Pittsburgh, Department of Psychology, University of Pittsburgh, 3403 Sennott Square, Pittsburgh, PA 15260.

P2A.1.23 **THE DAY OF THE WEEK WHEN YOU WERE BORN IN 0.7 SECOND: CALENDAR COMPUTATION IN AN AUTISTIC SAVANT.** M. Thioux, D. Stark, C. Klaiman and R. Schultz. Yale University Child Study Center, Yale Child Study Center, SHM I G63, P.O. Box 207900, 230 South Frontage Road, New Haven CT 06520-7900.

P2A.1.24 **HETEROGENEITY IN GLOBAL AND LOCAL VISUAL PROCESSING STYLES IN AUTISM POPULATIONS.** C. Thomas, N. Minshew, R. Kimchi and M. Behrmann. Carnegie Mellon University, Psychology Department, Baker Hall, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213.

P2A.1.25 **FREE-CHOICE CONDITION WITH HIERACHICAL STIMULI DEMONSTRATES INTACT GLOBAL PROCESSING, FASTER LOCAL RESPONSE, AND RANDOM LEVEL PREFERENCE IN PERSONS WITH AUTISM.** L. Wang and L. Mottron. Wang Lixin,Institute of Cognitive Neuroscience & Learning, Beijing Normal University; Mottron Laurent, Clinique Spécialisée des Troubles Envahissants du Développement, Hôpital Rivière-des-Prairies, Montréal, Canada.

P2A.1.26 **SENSORY INTERESTS AND IDIOSYNCRATIC REACTIONS IN AUTISM: EVIDENCE FROM AN INTERNATIONAL MULTIPLEX SAMPLE.** E. Weisblatt, J. Parr, J. Alcántara and A. Bailey. University of Cambridge UK, Developmental Psychiatry Section, Douglas House, 18b Trumpington Road, Cambridge, CB2 2AH, UK.

P2A.1.27 **IMPAIRED COGNITIVE FUNCTIONING IN THE PDD-NOS, MCDD SUBTYPE COMPARED TO PDD-NOS.** B. Lahuis, H. Swaab-Barneveld, J. Pietersen and H. Van Engeland. University Medical Center Utrecht, Heidelberglaan 100, 3584 CX Utrecht, b01.201.

P2A.1.28 **NON-VERBAL COGNITIVE AND MEMORY PROFILES OF HIGH AND LOW FUNCTIONING CHILDREN WITH AUTISM.** N. Russo, T. Flanagan, I. Blidner, D. Berringer and J. Burack. McGill University, 3700 McTavish, Montreal, QC, H3A 1Y2, Canada.

P2A.1.29 **VERBAL AND VISUAL MEMORY ASSESSMENT IN CASES WITH ASPERGER'S DISORDER (AD).** A. Kilincaslan, N. Mukaddes, G. Kucukyazici and A. Umut. Istanbul Medical Faculty Child Psychiatry Department, Deniz Abdal Mah. Koprulu Mehmet Pasa sok. No:32 D.8 Capa/ ISTANBUL, TURKEY.

## Poster Session 2B: Topic 1

***Broader Phenotype & Families***

P2B.1.1 **BEHAVIORAL AND NEURAL CORRELATES OF SOCIAL REFERENCING IN INFANTS AT RISK FOR AUTISM.** L. Cornew and L. Carver. Department of Psychology, University of California, San Diego, 9500 Gilman Drive, Mail Code 0109, La Jolla, CA 92093-0109.

P2B.1.2 **PEPTIDURIA IN AUTISM AND RELATED DISORDERS: AN EXPLORATORY STUDY.** S. Kahler and E. Cooper. Department of Pediatrics, Johns Hopkins School of Medicine, 612 Coventry Rd. Towson, MD 21286.

P2B.1.3 **NEUROPSYCHOLOGICAL PROFILES IN PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS.** L. Kopelioff, E. Winterrowd, B. Pennington, S. Hepburn, S. Gwen and R. Don. University of Colorado, Health Sciences Center, Dept. of Psychiatry, Health Sciences Center, Denver, CO.

P2B.1.4 **DESCRIPTION OF GASTROINTESTINAL SYMPTOMS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS COMPARED TO CONTROLS.** A. Reynolds, A. Herndon, T. Mandler and S. Hepburn. University of Colorado Health Sciences Center, Child Development Unit, Children's Hospital, 1056 East 19th Avenue, B-140, Denver, CO 80218.

## Friday, May 6, 2005

P2B.1.5 **GENETIC AND ENVIRONMENTAL INFLUENCES ON AUTISTIC TRAITS AMONG NON-AUTISTIC ADULTS: A TWIN STUDY.** A. Senju, Y. Kunihira, J. Ando, Y. Ono and T. Hasegawa. The University of Tokyo, Japan, Dept. of Cognitive and Behavioral Science, Univ. of Tokyo., Tokyo, 153-8902, Japan.

P2B.1.6 **PRAGMATIC LANGUAGE USE IN AUTISTIC INDIVIDUALS AND THEIR PARENTS FROM MULTI-INCIDENCE FAMILIES.** M. de Jonge, C. Kemner and H. van Engeland. UMC Utrecht, Department of Child and Adolescent Psychiatry, huispostnr. B01.201, Postbus 85500, 3508 GA Utrecht, The Netherlands.

P2B.1.7 **FAMILY HISTORY AND MOOD DISORDER IN ASPERGERS DISORDER.** A. Hall, R. Abramson, S. Ravan, H. Wright, H. Cope, M. Cuccaro, J. Gilbert and M. Pericak-Vance. University of South Carolina School of Medicine, Department of Neuropsychatry, 3555 Harden Street Ext, Suite 104-A, Columbia, SC 29203.

P2B.1.8 **FAMILIES OF YOUNG CHILDREN WITH AUTISM: EVALUATION OF DIAGNOSTIC EXPERIENCES.** C. Peterson. University of Rochester, 601 Elmwood Ave., Box 671, Rochester, NY 14642.

P2B.1.9 **AUTISM, ATTACHMENT AND PARENTING: A COMPARISON OF CHILDREN WITH AUTISTIC DISORDER, PDD-NOS, MENTAL RETARDATION OR LANGUAGE DISORDER, AND NON-CLINICAL CHILDREN.** A. Rutgers, M. Bakermans-Kranenburg, S. Willemsen-Swinkels, E. Van Daalen and M. Van Ijzendoorn. Department of Education and Child Studies, Centre for Child and Family Studies, Leiden University, Pb. 9555, 2300 RB Leiden, The Netherlands.

P2B.1.10 **DSM-IV AXIS I DISORDERS IN PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS.** E. Winterrowd, S. Hepburn, L. Kopelioff and D. Rojas. Neuromagnetic Imaging Laboratory, University of Colorado Health Sciences Center, UCHSC, Dept of Psychiatry, 4200 E. Ninth Ave. Box C268-68, Denver, CO 80262.

P2B.1.11 **THE IMPACT OF SPEECH AND FAMILY HISTORY ON MOOD SYMPTOMATOLOGY AND AUTISM.** H. Wright, A. Hall, R. Abramson, S. Ravan, H. Cope, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Department of Neuropsychiatry, 3555 Harden St. Ext, Suite 103A, Columbia, SC 29203.

P2B.1.12 **PARENTAL ATTITUDE AND SOCIAL-EMOTIONAL DEVELOPMENT IN HIGHER FUNCTIONING CHILDREN WITH AUTISM.** N. Zahka, A. Weisman, C. Burnette, C. Schwartz, A. Pradella, H. Henderson, S. Sutton and P. Mundy. University of Miami, University of Miami, Department of Psychology, 5665 Ponce de Leon Blvd, 5th Floor, Coral Gables, FL 33146.

Poster Session 2B: Topic 2

***Early Development***

P2B.2.1 **THE ORIGINS AND DEVELOPMENT OF JOINT ATTENTION IN INFANCY AND ITS CONTRIBUTION TO SOCIAL UNDERSTANDING AND SOCIAL RESPONSIVENESS IN PRESCHOOL-AGED CHILDREN WITH AUTISTIC DISORDER.** S. Clifford and C. Dissanayake. School of Psychological Science, La Trobe University, Bundoora, VIC 3083, Australia.

P2B.2.2 **INTELLECTUAL GROWTH BETWEEN INFANCY AND TODDLERHOOD IN CHILDREN WITH DEVELOPMENTAL DISORDERS.** C. Dietz, S. Willemsen-Swinkels, J. Buitelaar, E. Van Daalen and H. Van Engeland. University Medical Center, Department of Child and Adolescent Psychiatry, B01.201, Post Box 85500, 3508 GA, Utrecht, The Netherlands.

P2B.2.3 **DEVELOPMENT OF VISUAL FILTERING AMONG PERSONS WITH AUTISM.** A. Grivas, T. Flanagan, L. Pasto, N. Russo, D. Berringer and J. Burack. McGill University, McGill University, Department of Educational and Counselling Psychology, 3700 McTavish Street, Montreal, Quebec, H3A 1Y2.

P2B.2.4 **REDUCED CORTICAL THICKNESS IN BOYS WITH AUTISM OR AUTISTIC SPECTRUM DISORDER.** M. Hediger, L. England, C. Molloy, D. Warren, K. Yu, P. Manning-Courtney and J. Mills. National Institute of Child Health and Human Development, DESPR, NICHD, NIH, Bldg 6100, Rm 7B03, MSC 7510, 9000 Rockville Pike, Bethesda MD 20892-7510, and, The Kelly O'Leary Ctr for Autism Spectrum Disorders, Division of Developmental Disabilities, Cincinnati Children's Hospital Medical Center, Cincinnati OH 45215.

P2B.2.5 **FOLLOW-UP OF CHILDREN DIAGNOSED WITH PERVASIVE DEVELOPMENTAL DISORDERS; STABILITY AND CHANGE DURING THE PRESCHOOL YEARS.** S. Jonsdottir, E. Saemundsen, G. Asmundsdottir, S. Hjartardottir, B. Asgeirsdottir, H. Smaradottir, S. Sigurdardottir and J. Smari. The State Diagnostic and Counseling Center, Digranesvegur 5, 200 Kopavogur, Iceland.

P2B.2.6 **GROSS MOTOR SKILLS OF TODDLERS WITH AUTISM AND PDD.** M. Lloyd, S. Risi and C. Lord. University of Michigan, University of Michigan Autism and Communications Disorders Clinic, 1111 East Catherine St, Ann Arbor, MI, 48109-2054.

P2B.2.7 **TEMPERAMENT MATTERS: IMITATIVE ABILITIES OF YOUNG CHILDREN WITH AUTISM, FRAGILE X, AND DEVELOPMENTAL DELAY.** S. Nichols, S. Hepburn, I. Smith and S. Rogers. University of Colorado Health Sciences Center and JFK Partners, 4200 E 9th Avenue C-234, Denver, Colorado, 80262.

P2B.2.8 **FACTORS ASSOCIATED WITH AGE OF ENTRY TO EARLY INTERVENTION.** M. Novak, C. Zubritsky and D. Mandell. University of Pennsylvania/ Center for Mental Health Policy and Services Research, University of Pennsylvania, 3535 Market Street, 3rd Floor (CMHPSR), Philadelphia, PA 19104.

P2B.2.9 **AN EXPLORATION OF THE PREDICTIVE AND CONCURRENT RELATIONSHIPS BETWEEN EARLY SOCIAL COGNITIVE BEHAVIORS AND SUBSEQUENT INTELLECTUAL AND COMMUNICATION OUTCOMES: INSIGHTS FROM THE RETROSPECTIVE ANALYSES OF HOME MOVIES.** K. Poon, L. Watson and G. Baranek. University of North Carolina at Chapel Hill, Sensory Experiences Project, AHS, Chase Hall Suite 255, CB#7118, Chapel Hill, NC 27599-7118.

P2B.2.10 **HEAD CIRCUMFERENCE AT BIRTH IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** J. Richler and R. Oti. University of Michigan, U-M Autism and Communication Disorders Center, 1111 E. Catherine St., Ann Arbor, MI 48109.

P2B.2.11 **DEVELOPMENTAL MILESTONES IN HIGH FUNCTIONING AUTISM AND ASPERGER'S DISORDER.** A. Schropp, M. Gibbs, P. Lee and L. Kenworthy. Suffolk University, Department of Psychology, 41 Temple Street, Boston, MA 02114.

Poster Session 3A: Topic 1

***Cognitive Neuroscience & Functional Neuroimaging***

P3A.1.1 **EYEBLINK CONDITIONING IN AUTISM.** T. Arndt, K. Chadman, E. Peloso, D. Watson, M. Stanton and P. Rodier. University of Rochester School of Medicine and Dentistry, 601 Elmwood Ave., Box 668, Rochester, NY 14626.

P3A.1.2 **LATERALIZED CORTICAL SEROTONERGIC ABNORMALITIES IN AUTISTIC CHILDREN ARE ASSOCIATED WITH SOCIAL SUBTYPES.** M. Behen, S. Chandana, O. Muzik, C. Juhasz, H. Chugani and D. Chugani. Departments of Pediatrics, Radiology, Neurology, Children's Hospital of Michigan/Wayne State University, PET Center, 3901 Beaubien, Detroit, MI 48201.

P3A.1.3 **CHARACTERIZING ATYPICAL LOW-LEVEL VISUAL INFORMATION PROCESSING FOR PERSONS WITH HIGH-FUNCTIONING AUTISM (HFA).** A. Bertone, L. Mottron, P. Jelenic and J. Faubert. École d'optométrie, Université de Montréal, Visual Psychophysics and Perception Laboratory, CP 6128, succursale Centre-Ville, Montréal, H3C 3J7, Québec, Canada.

P3A.1.4 **ANOMALOUS N400 AND GAMMA-BAND RESPONSES TO SEMANTIC VIOLATION STIMULI IN INDIVIDUALS WITH AUTISM SPECTRUM DISORDER.** S. Braeutigam, S. Swithenby and A. Bailey. Department of Psychiatry, University Section of Child and Adolescent Psychiatry, Department of Psychiatry, University of Oxford, Oxford OX3 7LQ, UK.

P3A.1.5 **AUDIOVISUAL SPEECH INTEGRATION IN AUTISM: AN FMRI STUDY.** E. Collins, K. Pelphrey and J. Morris. University of Rochester, 50 Rockingham St. Rochester, NY 14620.

P3A.1.6 **REDUCED SENSITIVITY TO VOWEL-CONSONANT PAIR ANOMALIES IN CHILDREN WITH AUTISM: AN MEG STUDY.** E. Flagg, J. Oram Cardy, T. Roberts and W. Roberts. University of Toronto, Dept. of Medical Imaging, 150 College St., Rm. 116, Toronto, Ontario, M5S 3E2, Canada.

P3A.1.7 **CORRELATION BETWEEN CEREBRAL BLOOD FLOW DISTRIBUTION AND AUTISM CLINICAL SEVERITY.** I. Gendry Meresse, N. Chabane, N. Boddaert, L. Laurier, I. Sfaello, Y. Samson and M. Zilbovicius. INSERM-CEA, ERM0205, Service Hospitalier Frédéric Joliot, Direction des Sciences du Vivant, Département de Recherche Médicale, Commissariat à l'Energie Atomique, 4 Place du Général Leclerc, 91406 Orsay, France.

P3A.1.8 **MEG AND BEHAVIORAL MEASURES OF SPEECH PERCEPTION.** N. Gage, A. Isenberg, P. Fillmore and M. Spence. University of California, Irvine, 3151 Social Sciences Plaza A, Mail code 5100, Irvine, CA 92697-5100.

P3A.1.9 **NEURAL SYSTEMS FOR COGNITIVE CONTROL IN CHILDREN WITH AUTISM STUDIED USING FUNCTIONAL MAGNETIC RESONANCE IMAGING (FMRI).** L. Kalbfleisch, J. VanMeter, L. Girton, A. Hailu, E. Mease, A. Wolfe, S. Warburton, P. Daniolos, W. Gaillard and T. Zeffiro. Center for Functional and Molecular Imaging, Georgetown University Medical Center, CFMI, GUMC, 3900 Reservoir Road, NW, Preclinical Sciences Building LM 14, Washington, D.C. 20057.

P3A.1.10 **ATTRIBUTION OF MENTAL STATES IN HIGH FUNCTIONING AUTISM: EVIDENCE FOR CORTICAL UNDERCONNECTIVITY.** R. Kana, T. Keller, D. Williams, N. Minshew and M. Just. Center for Cognitive Brain Imaging, Department of Psychology, Carnegie Mellon University, Baker Hall 327G, Carnegie Mellon University, Pittsburgh, PA 15213-3890.

P3A.1.11 **CAN YOU SEE WHAT IS NOT THERE? LOW-LEVEL AUDIO-VISUAL INTEGRATION IN PERVASIVE DEVELOPMENTAL DISORDER.** C. Kemner. Rudolf Magnus Institute of Neuroscience, Department of Child and Adolescent Psychiatry, University Medical Center, Heidelberglaan 100, HP. B01.324, 3584 CX Utrecht.

P3A.1.12 **BRAIN ACTIVATION TO FACE STIMULI IN A WORKING MEMORY TASK IN HIGH FUNCTIONING AUTISM.** H. Koshino, R. Kana, N. Minshew and M. Just. Department of Psychology, California State University San Bernardino, Department of Psychology, JB-226, California State University San Bernardino, 5500 University Parkway, San Bernardino, CA 92407.

P3A.1.13 **GUSTATORY FUNCTION AND FOOD PREFERENCES IN HIGH-FUNCTIONING AUTISM.** E. Kuschner, L. Bennetto and L. Silverman. University of Rochester, Clinical & Social Sciences in Psychology, RC 270266, Rochester, NY 14627.

P3A.1.14 **NEURAL CORRELATES OF FACE AND GAZE PROCESSING IN CHILDREN WITH AUTISM.** A. Kylliainen, S. Braeutigam, J. Hietanen, S. Swithenby and A. Bailey. Department of Psychology, Department of Psychology/Finn-Medi1, FIN-33014 University of Tampere, Finland.

P3A.1.15 **GETTING A GRIP ON MOVEMENT SKILLS IN AUTISTIC SPECTRUM DISORDER.** L. Livingstone, J. Williams, S. Ross and M. Mon-Williams. University of Aberdeen, Department of child health, Royal Aberdeen Childrens Hospital, Foresterhill, ABERDEEN, AB25 2ZG.

P3A.1.16 **CHARACTERISTICS OF INSOMNIA IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** B. Malow, L. Henderson, S. McGrew and W. Stone. Vanderbilt University, 2100 Pierce Avenue, Room 352, Nashville, Tennessee 37212.

P3A.1.17 **TYPICAL BRAIN ACTIVATION FOR VOICES IN HIGH FUNCTIONING AUTISTIC INDIVIDUALS; A PRELIMINARY STUDY.** I. Pelletier, P. Belin, H. Gervais, B. Jemel, L. Mottron and M. Zilbovicius. CERNEC, University of Montreal, Département de Psychologie, CERNEC, University of Montreal, C.P. 6128, succursale Centre-ville, Montréal, QC, Canada H3C 3J7.

P3A.1.18 **MAGNETOENCEPHALOGRAPHIC STUDIES OF LANGUAGE IMPAIRMENT IN AUTISM SPECTRUM DISORDER: MISMATCH DETECTION AND RAPID TEMPORAL PROCESSING.** T. Roberts, J. Oram Cardy, E. Flagg and W. Roberts. University of Toronto, Dept. of Medical Imaging, 150 College St. #113, Toronto, ON, M5S 3E2, Canada.

P3A.1.19 **PHYSIOLOGICAL VARIATIONS IN SELF-MONITORING AND AFECTIVE PRESENTATION IN HIGHER FUNCTIONING CHILDREN WITH AUTISM.** C. Schwartz, H. Henderson, C. Burnette, N. Zahka, S. Sutton, A. Pradella and P. Mundy. University of Miami, 5665 Ponce de Leon Blvd, Flipse Building 5th floor, Coral Gables, Florida 33146.

## Friday, May 6, 2005

P3A.1.20 **IMPLICIT LANGUAGE LEARNING IN CHILDREN WITH AUTISM: AN FMRI STUDY OF WORD SEGMENTATION.** A. Scott, K. Stamm, S. Lee and M. Dapretto. University of California, Los Angeles, Ahamanson-Lovelace Brain Mapping Center, 660 Charles E. Young Drive South, Los Angeles, CA 90095.

P3A.1.21 **OVERLAP BETWEEN THE NEURAL SUBSTRATE FOR JOINT ATTENTION, AND WHITE AND GREY MATTER VOLUME DIFFERENCES IN AUTISTIC SPECTRUM DISORDER.** J. Williams, G. Waiter, O. Perra, A. Whiten and D. Perrett. University of Aberdeen, Department of Child Health, University of Aberdeen Medical School, Royal Aberdeen Children's Hospital, Westburn Rd., Aberdeen, AB25 2ZD, Scotland, United Kingdom.

P3A.1.22 **FUNCTIONAL MRI STUDY OF SENSORIMOTOR DEFICITS IN AUTISM.** Y. Takarae, N. Minshew, B. Luna and J. Sweeney. Center for Cognitive Medicine, Univ of Illinois at Chicago, Department of Psychiatry (MC913), 912 S. Wood St., Suite 235, Chicago, IL 60612-7327.

P3A.1.23 **UNDERSTANDING IRONY: NEURAL CORRELATES OF INTERPRETING COMMUNICATIVE INTENT IN CHILDREN WITH AUTISM.** A. Wang, S. Lee, M. Sigman and M. Dapretto. UCLA, Los Angeles, CA 90024, 760 Westwood Plaza, UCLA-NPI, rm. 68-237, Los Angeles, CA 90024.

P3A.1.24 **A FUNCTIONAL MRI STUDY OF MENTAL ROTATION IN AUTISM.** D. Williams, H. Koshino, R. Kana, N. Minshew and M. Just. Department of Psychiatry, University of Pittsburgh, School of Medicine, Webster Hall Suite 300, 3811 O'Hara Street, Pittsburgh, PA 15213.

### Poster Session 3A: Topic 2

***Intervention & Education***

P3A.2.1 **VALUES OF KAPPA AS LOW AS .34 CAN INDICATE 90% CODER ACCURACY.** N. Bainbridge, C. Taylor and P. Yoder. Vanderbilt University, Department of Special Education, Box 328, Peabody College, Nashville, TN 37203.

P3A.2.2 **STABILITY OF VOCAL REPERTOIRE IN TWO OLDER NON-VERBAL CHILDREN WITH AUTISM.** M. Boner, E. Andersson and B. Gordon. Loyola College in Maryland, Loyola Graduate Center, 2034 Greenspring Drive, Timonium, MD 21093.

P3A.2.3 **EFFECTS OF AN INDIVIDUAL WORK SYSTEM ON THE INDEPENDENT ACADEMIC WORK SKILLS IN CHILDREN WITH AUTISM.** K. Hume, R. Loftin and S. Odom. Indiana University, 812 S. Gatewood, Bloomington, IN, 47403.

P3A.2.4 **SELF-MANAGEMENT OF SOCIAL INITIATIONS: THE RELATIONSHIP BETWEEN SOCIAL INTERACTION AND STEREOTYPIC BEHAVIOR.** R. Loftin. Indiana University, Bloomington, School of Education, 201 N. Rose, Bloomington, Indiana 47405.

P3A.2.5 **THE ROLE OF TECHNOLOGY IN DEVELOPING LITERACY FOR ADULTS WITH AUTISM SPECTRUM DISORDERS.** M. Louis, L. Markowicz, C. Martin, K. Steiner, J. Holden and ASD-CARC. Centre for Neuroscience Studies, Queen's University, Autism Spectrum Disorders Research Program, Ongwanada Resource Centre, 191 Portsmouth Avenue, Kingston, ON, Canada, K7M 8A6.

P3A.2.6 **PREDICTORS OF QUALITY OF LIFE IN ADULTS WITH AUTISM SPECTRUM DISORDER.** J. Renty, H. Roeyers and M. Meirsschaut. Ghent University, Ghent University, Department of Experimental Clinical and Health Psychology, Research Group Developmental disorders, Henri Dunantlaan 2, 9000 Gent, Belgium.

P3A.2.7 **PLASTICITY OF THE NEURAL MECHANISMS UNDERLYING FACE PROCESSING IN CHILDREN WITH ASD: BEHAVIORAL IMPROVEMENTS FOLLOWING PERCEPTUAL TRAINING WITH FACES.** J. Tanaka, C. Klaiman, K. Koenig and R. Schultz. University of Victoria, Department of Psychology, PO Box 3050 STN CSC, Victoria, British Columbia V8W 3P5, Canada.

Poster Session 3B: Topic 1

***Early Detection/Diagnosis***

P3B.1.1 **EARLY PREDICTORS OF COGNITIVE FUNCTIONING IN 4-YEAR-OLDS WITH AUTISM SPECTRUM DISORDERS.** H. Boorstein, E. Esser, P. Dixon, J. Kleinman, J. Pandey, L. Wilson, M. Barton, T. Dumont-Mathieu, J. Green, S. Hodgson, G. Marshia and D. Fein. Univ. of Connecticut, Psychology Dept., 406 Babbidge Road-Unit 1020, Storrs, CT 06069.

P3B.1.2 **DIFFERENTIAL EFFECTS OF PLATELET ACTIVATING FACTOR ON THE LYMPHOBLASTS OF AUTISM AND NORMAL SUBJECTS.** V. Chauhan, A. Chauhan, A. Sheikh, T. Brown and E. Park. NYS Institute for Basic Research in Developmental Disabilities, Head, Cellular Neurochemistry Laboratory, 1050 Forest Hill Road, Staten Island, New York 10314.

P3B.1.3 **PRESENCE OF DSM-IV CRITERIA IN TODDLERS WITH ASD.** P. Dixon, J. Pandey, J. Kleinman, E. Esser, L. Wilson, H. Boorstein, M. Barton, S. Hodgson, J. Green, T. Dumont-Mathieu, G. Marshia, F. Volkmar, A. Klin, K. Chawarska and D. Fein. University of Connecticut, 406 Babbidge Road, U-1020 Storrs, CT 06269.

P3B.1.4 **CHARACTERISTICS OF TODDLERS WITH AUTISTIC SPECTRUM DISORDERS SCREENED FROM HIGH RISK AND LOW RISK SETTINGS.** T. Dumont-Mathieu, J. Kleinman and D. Fein. University of Connecticut, 114 Woodland Street, MS 11308, Hartford, CT 06105.

P3B.1.5 **PREDICTORS OF DIAGNOSIS IN YOUNG CHILDREN WITH AUTISTIC SYMPTOMS.** E. Esser, H. Boorstein, P. Dixon, J. Kleinman, J. Pandey, L. Wilson, M. Barton, T. Dumont-Mathieu, J. Green, S. Hodgson, G. Marshia and D. Fein. University of Connecticut, Department of Clinical Psychology, 406 Babbidge Rd., U-1020, Storrs, CT 06269-1020.

P3B.1.6 **THE AUTISM-SPECTRUM DIAGNOSTIC PROCESS: WHEN ARE PARENTS SATISFIED?.** R. Goin, V. Mackintosh and B. Myers. Virginia Institute for Psychiatric and Behavioral Genetics, P.O. Box 980126, Richmond, VA 23298-0126.

P3B.1.7 **COMPARISON OF TEMPERAMENT DATA OF AFFECTED AND UNAFFECTED INFANT SIBLINGS AT-RISK FOR AN AUTISM SPECTRUM DISORDER.** K. Holman and R. Landa. Kennedy Krieger Institute/Johns Hopkins, 3901 Greenspring Avenue, Baltimore, Maryland 21211.

P3B.1.8 **RESPONSE TO NAME IN 12-MONTH-OLD SIBLINGS OF CHILDREN WITH AUTISM OR TYPICAL DEVELOPMENT.** A. Nadig, S. Ozonoff, G. Young, S. Macari, S. Rogers, M. Sigman and A. Rozga. UC Davis M.I.N.D. Institute, Aparna Nadig, Ph. D., M.I.N.D. Institute, Office 1262, UC Davis Medical Center, 2825 50th Street, Sacramento, CA 95817.

P3B.1.9 **COMPARING SCQ AND PDDST SCORES IN A 3-5 YEAR OLD SPECIAL EDUCATION POPULATION.** C. Newschaffer, L. Lee, A. David and N. Lee. Center for Autism and Developmental Disabilities Epidemiology, Johns Hopkins Bloomberg School of Public Health, 615 N Wolfe Street Room E6030, Baltimore, MD 21205.

P3B.1.10 **DIFFERENTIATING LANGUAGE IMPAIRMENT AND AUTISM SPECTRUM DISORDER USING THE SOCIAL COMMUNICATION QUESTIONNAIRE (SCQ).** C. Norbury. University of Oxford, Dept. of Experimental Psychology, South Parks Road, Oxford, OX1 3UD, United Kingdom.

P3B.1.12 **THE USE OF AUTISM DISCRIMINATOR BEHAVIORS TO DIFFERENTIATE CHILDREN WITH AND WITHOUT AN AUTISM SPECTRUM DISORDER (ASD).** C. Rice, J. Baio, L. Wiggins, G. McGee, M. Morrier and C. Lord. Centers for Disease Control and Prevention, 1600 Clifton Road, MS E-86, Atlanta, Georgia 30333.

P3B.1.13 **EFFECT OF LANGUAGE DEMANDS ON THE DIAGNOSTIC EFFECTIVENESS OF THE AUTISM DIAGNOSTIC OBSERVATION SCHEDULE: THE IMPACT OF MODULE CHOICE.** S. Risi, B. Klein-Tasman, C. Corsello and C. Lord. University of Michigan Autism and Communication Disorders Center, 11 E Catherine St, Ann Arbor, MI 48109-2054.

P3B.1.14 **TEST RETEST RELIABILITY OF A SCREENING CHECKLIST FOR AUTISM SPECTRUM DISORDERS IN YOUNG CHILDREN.** S. Schjolberg. Inistitute of Psychology at University of Oslo, R.BUP, Postbox 23 Tåsen, N-0802 Oslo, Norway.

## Friday, May 6, 2005

P3B.1.15 **INCREASED SERUM CATHEPSIN D LEVELS IN AUTISM.** A. Sheikh, V. Chauhan, A. Chauhan, I. Cohen, T. Brown and M. Malik. NYS Institute for Basic Research in Developmental Disabilities, Department of Neurochemistry, 1050 Forest Hill Road, Staten Island, New York 10314.

P3B.1.16 **UPDATE ON THE MODIFIED CHECKLIST FOR AUTISM IN TODDLERS.** L. Wilson, P. Dixon, J. Kleinman, J. Pandey, H. Boorstein, E. Esser, M. Rosenthal, S. Sutera, A. Verbalis, D. Robins, M. Barton, T. Dumont-Mathieu, J. Green, S. Hodgson, G. Marshia and D. Fein. University of Connecticut, Department of Psychology, 406 Babbidge Road Unit 1020, Storrs, CT 06269-1020.

P3B.1.17 **PARENTAL RECOGNITION OF AUTISM SYMPTOMS AND SUBSEQUENT INTERACTIONS WITH THE HEALTHCARE SYSTEM.** C. Zubritsky, M. Novak and D. Mandell. University of Pennsylvania, Center for Mental Health Policy and Services Research, 3535 Market Street, 3rd Floor, Philadelphia, PA 19104.

P3B.1.18 **A COMPARISON OF THE ADI-R AND THE SCQ.** C. Corsello, C. Lord, V. Hus and S. Qiu. The University of Michigan Autism and Communication Disorders Center, 1111 East Catherine Street, Suite 18, Ann Arbor, Michigan 48109-2054.

P3B.1.19 **RELIABILITYOF THE DIAGNOSIS AUTISTIC SPECTRUM DISORDERS IN A POPULATION-BASED SAMPLE OF VERY YOUNG CHILDREN.** E. Van Daalen, C. Dietz, S. Willemsen-Swinkels, J. Buitelaar and H. van Engeland. University Medical Centre Utrecht, Dept of Child and Adolescent Psychiatry and Rudolf Magnus Institute for Neurosciences, P.O. Box 85500, 3508 GA Utrecht, The Netherlands.

P3B.1.20 **USING THE ADI-R AND ADOS TO DIAGNOSE ASD AND AUTISM: DISCREPANCIES IN INSTRUMENT DIAGNOSIS.** S. Chandler, G. Baird, T. Charman, E. Simonoff, A. Pickles, T. Loucas and E. Rowley. King's College London, Newcomen Centre, Guy's Hospital, St Thomas Street, London, SE1 9RT.

Poster Session 3B: Topic 2

***Intervention & Education***

P3B.2.1 **NUTRITIONAL STATUS OF CHILDREN WITH ASD:FATTY ACID DEFICIENCY AND HYPERACTIVITY OF RBC PHOSPHOLIPASE A-2.** T. Audhya. Vitamin Diagnostics, Inc., Route 35 @ Industrial Drive, Cliffwood Beach, NJ 07735.

P3B.2.3 **A GROUP RANDOMISED CONTROL TRIAL TO INVESTIGATE THE EFFECTIVENESS OF THE PICTURE EXCHANGE COMMUNICATION SYSTEM FOR CHILDREN WITH AUTISM.** K. Gordon, G. Pasco, T. Charman and P. Howlin. St. George's Hospital Medical School, Department of Community Health Science, 6th Floor, Hunter Wing, Tooting, London, SW17 0RE.

P3B.2.4 **EARLY INTENSIVE STIMULATION FOR YOUNG AUTISTIC CHILDREN.** C. Mantoulan, B. Rogé, G. Magerotte and J. Fremolle-Kruck. CERPP, CERPP, Maison de la Recherche, Université de Toulouse Le Mirail, 5 allées Antonio Machado, 31058 Toulouse Cedex - FRANCE.

P3B.2.5 **AUTISM THERAPIST TRAINING EFFECTIVENESS IMPROVING KNOWLEDGE & SKILLS.** A. Morgan, B. D'Entremont and M. Paul. Amanda Morgan, University of New Brunswick, Department of Psychology, Fredericton, New Brunswick, Canada, E3B 6E4.

P3B.2.6 **THE EFFECTS OF AN INTERDISCIPLINARY TREATMENT PROGRAM ON THE DEVELOPMENT OF YOUNG CHILDREN WITH AUTISM.** S. Freeman, T. Paparella, K. Stickles and A. Blazejko. UCLA, Child Psychiatry, NPI, Room 78-222, 760 Westwood Plaza, LA, CA 90024.

P3B.2.7 **TREATMENTS FOR SLEEP PROBLEMS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: PREVALENCE OF USE AND OUTCOME.** M. Polimeni. RMIT University, Melinda Polimeni, Division of Psychology, PO Box 71 Bundoora, Victoria, Australia, 3083.

P3B.2.8 **IMPROVING SOCIAL SKILLS OF CHILDREN WITH AUTISM THROUGH PARENT ENGAGEMENT.** L. Ruble, K. Andrea, R. Abby and G. Trish. University of Louisville, Department of Pediatrics, 571 S. Floyd St., Suite 100, Louisville, KY 40202.

P3B.2.9 **VARIATION IN JOINT ACTION ROUTINES: EFFECTS ON SOCIAL COMMUNICATION SKILLS OF TODDLERS WITH ASD.** S. Shumway, N. Watt and A. Wetherby. Florida State University, Florida State University, Department of Communication Disorders, Regional Rehabilitation Center, Tallahassee, FL 32306.

P3B.2.10 **EARLY INTENSIVE BEHAVIORAL INTERVENTION: REPLICATION OF THE UCLA MODEL IN A COMMUNITY AGENCY.** T. Smith, H. Cohen and M. Amerine-Dickens. University of Rochester Medical Center, Strong Center for Developmental Disabilities, University of Rochester Medical Center, 601 Elmwood Avenue, Box 671, Rochester, NY 14642.

P3B.2.11 **EARLY INTERVENTION SERVICES AND EVIDENCE-BASED PRACTICE.** A. Stahmer. Children's Hospital and Health Center, 3020 Children's Way, MC 5033, San Diego, CA 92123.

P3B.2.12 **TEACHER IMPLEMENTATION OF PIVOTAL RESPONSE TRAINING (PRT).** J. Suhrheinrich and L. Schreibman. Autism Research Program of Universiy of California, San Diego, Department of Psychology, La Jolla, California, 92093-0109.

## Saturday, May 7, 2005

Slide Session 7

### *Broader Phenotype & Families*

S7.1 **EMOTION PROCESSING IS ALTERED IN AUTISM FAMILIES: BEHAVIORAL AND ERP EVIDENCE.** G. Dawson, S. Faja and S. Webb. University of Washington, Box 357920, Seattle, WA.

S7.2 **PERFORMANCE OF YOUNG CHILDREN WITH WILLIAMS SYNDROME ON THE AUTISM DIAGNOSTIC OBSERVATION SCHEDULE.** B. Klein-Tasman, S. Risi, C. Lord and K. Phillips. University of Wisconsin, Milwaukee, Department of Psychology, PO Box 413, Milwaukee, WI 53201.

S7.3 **SOCIAL-COGNITION AND THE BROADER AUTISM PHENOTYPE.** M. Losh and J. Piven. University of North Carolina, Chapel Hill, Neurodevelopmental Disorders Research Center CB#3367, Chapel Hill, NC 27599-3367.

S7.4 **DEVELOPMENT OF A SELF REPORT SCREENING MEASURE OF AUTISTIC TRAITS IN ADULTS.** P. Magnusson, E. Saemundsen, S. Steinberg, G. Bjornsdottir, R. Fossdal, B. Lauth, S. Hreidarsson, O. Gudmundsson, J. Smari, M. Frigge, K. Stefansson, T. Thorgeirsson and K. Kristjansson. 1) Department of Child and Adolescent Psychiatry, Landspitali University Hospital; 2) deCODE Genetics Inc., Dalbraut 12, 105 Reykjavik, Iceland.

S7.5 **CHARACTERISTICS OF THE BROADER PHENOTYPE IN SIBLINGS AND PARENTS OF AFFECTED RELATIVE PAIRS WITH PDD.** J. Parr, S. Wallace, A. Le Couteur, M. de Jonge, M. Rutter, A. Bailey and IMGSAC. Department of Child and Adolescent Psychiatry, University of Oxford, UK, OX3 7LQ.

S7.6 **THE BROADER AUTISM PHENOTYPE IN FIRST-DEGREE RELATIVES: LINKS BETWEEN COGNITION AND BEHAVIOUR.** E. Pellicano, L. Heavey, S. Wallace, A. Bailey and M. Rutter. University of Oxford, Section of Child and Adolescent Psychiatry, Park Hospital for Children, Old Road, Headington, Oxford OX3 7LQ UK.

S7.7 **THE OCCURRENCE OF MACROCEPHALY IN AUTISTIC AND NON-AUTISTIC INDIVIDUALS FROM A LARGE FAMILIAL IDIOPATHIC AUTISM SAMPLE (AGRE).** S. Spence, D. Black, J. Miyamoto and D. Geschwind. UCLA Center for Austism Research and Treatment, UCLA Autism Evaluation Clinic, 300 Medical Plaza, Rm 1247, Box 956967, Los Angeles, CA 90095-6967.

S7.8 **MATERNAL RECURRENT MOOD DISORDERS AND HIGH-FUNCTIONING AUTISM.** I. Cohen and J. Tsiouris. NYS Institute for Basic Research in DD, Dept. of Psychology, 1050 Forest Hill Rd, Staten Island, NY 10314.

S7.9 **FEELINGS OF GUILT AMONG PARENTS OF CHILDREN WITH AN AUTISM SPECTRUM DISORDER.** J. Kuhn and A. Carter. University of Massachusetts Boston, Department of Psychology, 100 Morrissey Boulevard, Boston, MA 02125.

S7.10 **SERVICE USE BY FAMILIES WITH YOUNG CHILDREN: THE MIX OF SCHOOL AND OUTSIDE SERVICES.** K. Thomas, J. Morrissey and C. McLaurin. Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, 725 Airport Road, CB#7590, Chapel Hill, NC 27514.

Slide Session 8

### *Cognition & Neuropsychology*

S8.1 **A FAILURE OF CUE BASED PERCEPTION IN ASPERGER'S SYNDROME.** Y. Bonneh, Y. Adini, R. Yoran-Hegesh and D. Sagi. The Weizmann Institute of Science, Rehovot 76100, Israel.

S8.2 **MEASURING CENTRAL COHERENCE ACROSS DOMAINS: NAVON SIMILARITY-JUDGMENT IS RELATED TO HOMOGRAPH READING.** R. Booth and F. Happé . Social, Genetic, and Developmental Psychiatry Centre, Institute of Psychiatry, King's College London, SGDP Centre, Institute of Psychiatry, Box number PO80, London SE5 8AF, United Kingdom.

S8.3 **FREE RECALL LEARNING IN ASPERGER'S SYNDROME: ADDITIONAL EVIDENCE FOR IMPAIRED RELATIONAL ENCODING.** D. Bowler, J. Gardiner and S. Gaigg. City University, Department of Psychology, London EC1V 0HB, UK.

S8.4 **CONCEPT FORMATION AND CONCEPT IDENTIFICATION IN HIGH FUNCTIONING CHILDREN WITH AUTISM SPECTRUM DISORDERS.** J. Brown, M. Solomon, N. Bauminger and S. Rogers. UC Davis M.I.N.D. Institute, 2825 50th St., Sacramento, CA 95817.

S8.5 **MINDREADING IN NATURALISTIC CONTEXTS: PREFERRED DECODING OF LANGUAGE, NOT FACES, IN ASPERGER SYNDROME.** I. Dziobek, S. Fleck, K. Rogers, J. Hassenstab, E. Kalbe, J. Kessler, O. Wolf and A. Convit. New York University School of Medicine, Center for Brain Health, 550 First Avenue, Millhauser Laboratories, 4th Floor, New York, NY 10016.

S8.6 **USING SENTENCE COMPLETION TO ASSESS CENTRAL COHERENCE IN AUTISM SPECTRUM DISORDERS, TYPICAL DEVELOPMENT AND ADHD.** F. Happé and R. Booth. SGDP, Institute of Psychiatry, King's College, Box Number P080, De Crespigny Park, Denmark Hill, London SE5 8AF.

S8.7 **DECISION MAKING IN CHILDREN WITH HIGH FUNCTIONING AUTISM.** K. Isaacson, E. Crone and M. Solomon. U.C. Davis M.I.N.D. Institute, 2825 50th Street, Sacramento, CA, 95817.

S8.8 **MEMORY FOR RELEVANT VERSUS IRRELEVANT ASPECTS OF THE ENVIRONMENT: PRELIMINARY EVIDENCE FOR REDUCED TOP-DOWN MODULATION IN AUTISM.** E. Loth and F. Happé. Institute of Psychiatry, King's College London, Institute of Psychiatry, De Crespigny Park, Denmark Hill, London SE5 8AF, U.K.

S8.9 **DIRECTED FORGETTING TASKS REVEAL IMPAIRED MEMORY IN ADULTS WITH ASPERGERS SYNDROME FOR TO-BE-LEARNED, BUT NOT TO-BE FORGOTTEN WORDS.** B. Smith, J. Gardiner and D. Bowler. University of Sussex, Psychology Department, School of Life Sciences, University of Sussex, Brighton, BN1 9QH, ENGLAND.

S8.10 **CATEGORY LEARNING IN HIGH-FUNCTIONING INDIVIDUALS WITH AUTISM.** I. Soulières, S. Larochelle, G. Giguère and L. Mottron. Isabelle Soulières, Clinique spécialisée de l'autisme, Hôpital Rivière-des-Prairies, 7070 Boul. Perras, Montréal (Québec), H1E 6W8, Canada.

## Slide Session 9

***Cognitive Neuroscience & Functional Neuroimaging***

S9.1 **COMPARING AND CONTRASTING NEUROPSYCHOLOGICAL FUNCTIONING IN CHILDREN WITH ADHD AND AUTISM.** B. Corbett and L. Constantine. UC Davis, The M.I.N.D. Institute, 2825 50th Street, Sacramento, CA 95817.

S9.2 **GAZE-FIXATION AND BRAIN ACTIVATION IN UNAFFECTED SIBLINGS OF INDIVIDUALS WITH AUTISM DURING A FACIAL IDENTIFICATION TASK.** K. Dalton, B. Nacewicz, E. McAuliff, M. Nersesian, A. Alexander and R. Davidson. University of Wisconsin, Madison, Waisman Laboratory for Brain Imaging and Behavior - T127, 1500 HIghland Avenue, Madison, WI. 53706.

S9.3 **NEURAL CORRELATES OF FACIAL AFFECT IMITATION IN CHILDREN WITH AUTISM.** M. Davies, M. Iacoboni, J. Pfeifer, S. Bookheimer, M. Sigman and M. Dapretto. UCLA Department of Psychology, UCLA Neuropsychiatric Institute, 760 Westwood Plaza, Rm 67-464, Los Angeles, CA 90024-17592.

S9.4 **IMPLICIT PROCESSING OF FACIAL EMOTION IN ADULTS WITH ASPERGER SYNDROME, AND THE ROLE OF SEROTONIN: AN EVENT-RELATED FMRI STUDY.** Q. Deeley, B. Hallahan, E. Daly, M. Brammer, E. Loth, S. Curran, M. Phillips, S. Surgladze and D. Murphy. Institute of Psychiatry, PO Box 50, Department of Psychological Medicine, Institute of Psychiatry, DeCrespigny Park, London SE5 8AF, UK.

S9.5 **A DISTRIBUTED NEURAL SYSTEM FOR THE PERCEPTION, EXECUTION, AND IMITATION OF SOCIAL AND INSTRUMENTAL GESTURE IN AUTISM.** N. Isenberg, K. Montgomery, I. Neuberger and J. Haxby. Princeton University, Department of Psychology, Green Hall, Princeton, NJ 08944.

S9.6 **ATYPICAL FUNCTIONAL LATERALIZATION OF LANGUAGE IN AUTISM SPECTRUM DISORDERS.** N. Kleinhans, D. Cohen and E. Courchesne. SDSU/UCSD Joint Doctoral Program in Clinical Psychology, Center for Autism Research, 8110 La Jolla Shores Dr. Suite 200, La Jolla, CA 92037.

S9.7 **NEUROPSYCHOLOGIC FUNCTIONING IN CHILDREN WITH AUTISM.** N. Minshew, G. Goldstein and D. Williams. University of Pittsburgh, Webster Hall - Suite 300, 3811 O'Hara Street, Pittsburgh, PA 15213.

S9.8 **CORTICAL 5-HT2A RECEPTOR BINDING AND SOCIAL COMMUNICATION IN ADULTS WITH ASPERGER SYNDROME; AN IN VIVO SPET STUDY.** D. Murphy, N. Schmitz, F. Toal, B. Hallahan, E. Loth, E. Daly, S. Curran, K. Erlandsson, P. Ell and M. Travis. Institute of Psychiatry, King's College London, Department of Psychological Medicine, Institute of Psychiatry, De Crespigny Park, London SE5 8AF.

S9.9 **AMYGDALA ACTIVITY DURING IMITATION IN AUTISM.** G. Waiter, J. Williams, A. Murray, A. Gilchrist, A. Whiten and D. Perrett. University of Aberdeen, Department of Radiology, Lilian Sutton Building, Foresterhill, Aberdeen, AB25 2ZD, UK.

S9.10 **AN FMRI STUDY OF SENSORIMOTOR INTEGRATION IN CHILDREN WITH AUTISM.** T. Zeffiro, S. Warburton, J. VanMeter, L. Girton, A. Hailu, P. Daniolos and W. Gaillard. Center for Functional and Molecular Imaging, Georgetown University, Bldg D, Suite 150, 4000 Reservoir Rd., NW, Washington, DC 20007.

## Slide Session 10 *Early Development*

S10.1 **DEVELOPMENTAL COURSE OF RESTRICTED AND REPETITIVE BEHAVIORS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** S. Bishop, M. Huerta, J. Richler, S. Qiu and C. Lord. University of Michigan, UMACC, 1111 East Catherine Street, Ann Arbor, MI, 48109.

S10.2 **SLEEP AND BEHAVIOR IN YOUNG CHILDREN WITH AUTISM.** B. Goodlin-Jones, T. Anders, A. Wu, K. Tang and S. Burton. M.I.N.D. Institute & Dept of Psychiatry, 2825 50th Street, Sacramento, CA 95817.

S10.3 **COMPARING MOTHER AND TEACHER REPORTS OF EARLY LANGUAGE SKILLS TO AN OBSERVATIONAL MEASURE.** T. Hutman, E. Jimenez, M. Siller and M. Sigman. UCLA Department of Psychology, 1285 Franz Hall, Box 951563, Los Angeles, CA 90095-1563.

S10.4 **PREDICTING OUTCOMES OF CHILDREN REFERRED FOR AUTISM USING THE MACARTHUR COMMUNICATIVE DEVELOPMENT INVENTORY (CDI).** R. Luyster, S. Qiu, K. Lopez and C. Lord. University of Michigan Autism and Communication Disorders Center, UMACC, 1111 E. Catherine St., Ann Arbor, MI 48109-2054.

S10.5 **ATYPICAL VISUAL EXPLORATORY BEHAVIOURS FOR INANIMATE OBJECTS IN AUTISTIC TODDLERS: CHARACTERIZATION, RELIABILITY AND INTERPRETATION.** L. Mottron, S. Mineau, G. Martel, C. Saint-Charles, T. Charman and J. Faubert. Clinique Spécialisée de L'Autisme, Université de Montréal, Hopital Rivière-des-Prairies, 7070 Bvd Perras, Montréal (PQ), CANADA H1E1A4.

S10.6 **INFANTS WITH AUTISM: OBJECT-DIRECTED BEHAVIOR AT 9-12 MONTHS.** S. Macari, S. Rogers, S. Ozonoff, G. Young, B. Goodlin-Jones, S. Goldring and M. Lombardo. M.I.N.D. Institute, UC Davis Medical Center, 2825 50th St., Sacramento, CA 95817.

S10.7 **PSYCHOPHYSICAL EVIDENCE FOR ABNORMAL MAGNOCELLULAR PROCESSING IN 6-MONTH OLD INFANTS WITH AUTISM IN THEIR FAMILY.** J. McCleery, E. Allman, K. Burner, L. Carver and K. Dobkins. University of California, San Diego, UCSD Dept of Psychology, MC 0109, 9500 Gilman Drive, La Jolla, CA 92093-0109.

S10.8 **TEMPORAL COORDINATION OF JOINT ATTENTION BEHAVIOUR IN PRESCHOOLERS WITH AUTISM SPECTRUM DISORDER.** H. Roeyers and P. Warreyn. Ghent University, Ghent University, Department of Experimental Clinical and Health Psychology, Research Group Developmental disorders, Henri Dunantlaan 2, 9000 Gent, BELGIUM.

S10.9 **FACE AND OBJECT MEMORY IN TODDLERS WITH AUTISM, SIBLINGS OF CHILDREN WITH AUTISM, AND CONTROLS.** S. Webb, G. Dawson, K. Toth and M. Carlberg. University of Washington, Box 357920, CHDD, Seattle WA 98195.

S10.10 **ARE CONGENITAL ANOMALIES ASSOCIATED WITH AUTISM SPECTRUM DISORDERS?.** M. Wier, C. Yoshida, R. Odouli, J. Grether and L. Croen. Kaiser Permanente, Division of Research, Megan L. Wier, MPH, Research Scientist, Sequoia Foundation, c/o Genetic Disease Branch, California Department of Health Services, 850 Marina Bay Parkway, Room F175, Richmond, CA 94804.

## Slide Session 11

### *Verbal & Nonverbal Communication*

S11.1 **PHONOLOGICAL PROCESSING IN CHILDREN WITH AUTISM AND CHILDREN WITH SPECIFIC LANGUAGE IMPAIRMENT.** K. Condouris, R. Bemis, L. Evancie, L. McGrath, C. Connolly and H. Tager-Flusberg. Department of Anatomy and Neurobiology, Boston University School of Medicine, 715 Albany St, L814, Boston, Ma 02118-2526.

## Saturday, May 7, 2005

S11.2 **RECEPTIVE AND EXPRESSIVE PROSODY AND LANGUAGE SKILLS IN CHILDREN WITH HIGH-FUNCTIONING AUTISM.** S. Peppe, J. McCann, F. Gibbon, A. O'Hare and R. Marion. Queen Margaret University College, Edinburgh UK, Clerwood Terrace, Edinburgh EH12 8TS, Scotland, UK.

S11.3 **THE ROLE OF PRAGMATIC AND SYNTACTIC CUES IN LANGUAGE ACQUISITION IN YOUNG CHILDREN WITH AUTISM.** C. Shulman and A. Guberman. The Hebrew University of Jerusalem, School of Social Work, Mount Scopus, Jerusalem 91905 Israel.

S11.4 **DIFFICULTIES IN THE PROGRESSION OF LANGUAGE IN CHILDEN WITH AUTISM.** L. Swensen, E. Kelley, D. Fein and L. Naigles. University of Connecticut, 406 Babbidge Road Unit 1020, Storrs, CT 06269.

S11.5 **RELATIVE FREQUENCY OF DECLARATIVE AND IMPERATIVE COMMUNICATION VARIES BY STRUCTURE OF MEASUREMENT CONTEXT.** C. Taylor and P. Yoder. Vanderbilt University, Box 328; Nashville, TN 37203.

S11.6 **VARYING LANGUAGE STYLE BASED ON LISTENER NEEDS.** J. Volden, J. Magill-Evans, K. Goulden and M. Clarke. SPA, University of Alberta, 3-10 Corbett Hall, Edmonton, AB, Canada, T6G 2G4.

S11.7 **SPONTANEOUS GESTURE USE IN HIGH-FUNCTIONING AUTISM.** L. Bennetto, L. Silverman and R. Webb. University of Rochester, Clinical & Social Sciences in Psychology, RC 270266, Rochester, NY.

S11.8 **DO THE FREQUENCY, FORM AND FUNCTION OF NON-VERBAL COMMUNICATION IN TODDLERS WITH AUTISM PREDICT LANGUAGE OUTCOMES?.** T. Charman, A. Drew, E. Taylor, E. Milne and G. Baird. Institute of Child Health, University College London, Behavioural & Brain Sciences Unit, 30 Guilford Street, London, WC1N 1EH, UK.

S11.9 **REQUESTING BEHAVIORS IN CHILDREN WITH AUTISM: STABILITY AND CHANGE DURING THE PRESCHOOL YEARS.** M. Siller and M. Sigman. UCLA, NPI Rm.68-237, 760 Westwood Plaza, Los Angeles, CA 90095-8353.

S11.10 **POINTING AS DISPLAY OF INTERACTIONAL CO-PRESENCE BY CHILDREN FUNCTIONING AT THE EXTREMES OF AUTISM SPECTRUM.** O. Solomon. University of California, Los Angeles, Dept. of Anthropology, Olga Solomon, 341 Haines Hall, Box 951553, Los Angeles, CA 90095.

### Slide Session 12 — *Social Behavior & Play*

S12.1 **JEALOUSY AND EMOTIONAL EXPRESIVENESS IN LOW- AND HIGH-FUNCTIONING CHILDREN WITH AUTISM.** N. Bauminger, L. Smolkin and E. Orbach-Caspi. Bar Ilan University, School of Education, Ramat - Gan, 52900, Israel.

S12.2 **UNDERSTANDING INTENTIONS ON OBJECTS, IMITATION, AND SOCIAL ENGAGEMENT IN CHILDREN WITH AUTISM.** C. Colombi, S. Rogers and G. Young. UC Davis, M.I.N.D. Institute, 2825 50th Street, Sacramento, CA 95817.

S12.3 **IMITATION OF INTENTIONS AND ACCIDENTS IN CHILDREN WITH AUTISM.** B. D'Entremont and A. Yazbek. Psychology Department, University of New Brunswick, Bag Service 45444, Fredericton, NB, E3B 6E4 CANADA.

S12.4 **A COMPARATIVE STUDY OF PRETEND PLAY IN CHILDREN WITH HIGH FUNCTIONING AUTISM AND ASPERGER'S DISORDER.** C. Dissanayake and S. Prescott. Child Development Unit/La Trobe University, La Trobe University, Bundoora, Victoria 3083, Australia.

S12.5 **LET'S PRETEND! PRETEND PLAY AS A PREDICTOR OF SOCIAL FUNCTIONING IN CHILDREN WITH AUTISM.** M. Manning and L. Wainwright. University of Massachusetts at Boston, Psychology Department, 100 Morrissey Blvd., Boston, MA 02125.

S12.6 **A MULTI-DIMENSIONAL ASSESSMENT OF EMPATHY IN ASPERGER SYNDROME.** K. Rogers, I. Dziobek, J. Hassenstab, W. Oliver and C. Antonio. Center for Brain Health, NYU School of Medicine, 550 First Avenue, 4th Floor, MHL 400, New York, NY, 10016.

S12.7 **IMITATION OF INSTRUMENTAL VERSUS NON-INSTRUMENTAL ACTIONS IN YOUNG CHILDREN WITH AUTISM.** S. Rogers, I. Cook, G. Young and A. Giolzetti. M.I.N.D. Institute, Dept. of Psychiatry, University California Davis, 2825 50th Street, Sacramento, CA 95817.

S12.8 **VAGAL TONE AND SOCIAL BEHAVIORS IN CHILDREN WITH AUTISM.** S. Sheinkopf, A. Neal, C. Miller-Loncar and A. Johnson. Brown Medical School, Bradley Hospital, E. P. Bradley Hospital, 1011 Veterans Memorial Parkway, East Providence, RI 02915.

S12.9 **WHAT CAN WE LEARN ABOUT SOCIAL FUNCTIONING IN AUTISTIC SPECTRUM DISORDERS FROM CHILDREN WITH 47,XXY?.** H. Swaab-Barneveld, P. Cohen-Kettenis and H. van Engeland. Department of Child and Adolescent Studies, University Leiden and Department of Child and Adolescent Psychiatry, Rudolf Magnus Institute of Neuroscience, PO Box 9500, 2300 RA Leiden.

S12.10 **CULTURAL INFLUENCES ON THE BEHAVIORAL SYMPTOMS OF AUTISM IN KENYA AND THE UNITED STATES OF AMERICA.** J. Weru. University of Texas at Austin, 7103 Guadalupe Street, Austin, Texas 78752.

## Poster Session 4A: Topic 1 — *Genetics*

P4A.1.1 **EXAMINATION OF IMPRINTING AND MATERNAL EFFECTS AT CANDIDATE GENES ON CHROMOSOMES 2, 7 AND 19 IN AUTISM.** A. Ashley-Koch, J. Jaworski, E. Martin, H. Mei, D. Ma, D. Skaar, R. Rabionet, M. Menold, G. DeLong, R. Abramson, H. Wright, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Duke University Center for Human Genetics, Box 3445, DUMC 595 LaSalle Street, Durham, NC 27710.

P4A.1.2 **FREQUENCY OF FRAGILE X IN MULTIPLEX AUTISM: TESTING AGRE FAMILIES.** W. Brown, S. Nolin, C. Dobkin, G. Houck, A. Glicksman, X. Ding, L. Crawford, S. Spence and D. Geschwind. NYS Institute for Basic Research, Dept Human Genetics, 1050 Forest Hill Rd, Staten Island, NY 10304.

P4A.1.3 **POLYMORPHISMS IN THE GENE FOR ß2 ADRENERGIC RECEPTOR AND RISK FOR AUTISM IN THE AGRE COHORT.** K. Cheslack-Postava, M. Fallin, D. Avramopoulos, S. Connors, A. Zimmerman, C. Eberhart and C. Newschaffer. Center for Autism and Developmental Disabilities Epidemiology, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe St., Rm. E6035, Baltimore, MD 21211.

P4A.1.4 **DELETION OF CHROMOSOME 7Q11.21-Q11.23 AND DUPLICATION OF CHROMOSOME 15Q11.1-Q11.2 ASSOCIATED WITH WILLIAMS SYNDROME AND AUTISM.** H. Cope, C. Wolpert, S. Donnelly, N. Schanen, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Duke University Medical Center, 595 LaSalle St, Box 3445, Durham, NC 27710.

P4A.1.5 **ASSOCIATION ANALYSIS OF GABAERGIC GENES AND PHENOTYPE ANALYSIS IN AFRICAN AMERICAN AUTISM FAMILIES.** M. Cuccaro, D. Ma, E. Martin, S. Donnelly, H. Cope, C. Wolpert, R. Abramson, H. Wright, J. Hussman, J. Gilbert, P. Whitehead, G. Delong and M. Pericak-Vance. Duke University Medical Center, Center for Human Genetics, Box 3445, Durham, NC 27710.

P4A.1.6 **AN ASSOCIATION ANALYSIS OF MICROSATELLITE MARKERS ACROSS THE PRADER WILLI/ANGELMAN CRITICAL REGION ON CHROMOSOME 15 (Q11-13) AND AUTISM SPECTRUM DISORDER.** S. Curran, W. Roberts, S. Thomas, M. Veltman, J. Brown, E. Medda, A. Pickles, P. Sham, J. Powell and P. Bolton. Sarah R Curran, P050 Department of Psychological Medicine, Institute of Psychiatry, De Crespigny Park, London SE 5 8AF.

P4A.1.7 **ASSOCIATION ANALYSIS OF 657 SNPS IN A CANDIDATE AUTISM GENE: CNTNAP2.** J. Duvall, A. Lu, J. Stone, N. Kono, S. Nelson, M. Alarcón, R. Cantor and D. Geschwind. UCLA Department of Neurology, 710 Westwood Plaza, Room 145, Los Angeles, CA 90095-1769.

P4A.1.8 **A STUDY OF THE IMPACT OF OBSTETRIC FACTORS ON AUTISM IN A UK MULTIPLEX SAMPLE.** K. Francis, J. Parr, T. Robinson, S. Palferman, A. Le Couteur, J. Green, A. Bailey and IMGSAC. Department of Child and Adolescent Psychiatry, University of Oxford, University Section of Child and Adolescent Psychiatry, Park Hospital for Children, Old Road, Headington, Oxford, OX3 7LQ, UK.

P4A.1.9 **AUTISM AND ENVIRONMENTAL GENOMICS.** M. Herbert, J. Russo, M. Blaxill, S. Kahler, D. Ziegler and E. Hatchwell. Mass Gen Hosp/Harvard Med School, MGH-East, CMA, 149 13th St, Room 6012, Charlestown, MA 02129.

## Saturday, May 7, 2005

P4A.1.10 **THE DRD2 GENE AS A CANDIDATE LOCUS FOR AUTISM SPECTRUM DISORDERS.** J. Hettinger, X. Liu, J. Holden and ASD-CARC. Department of Physiology, Queen's University, Autism Research Program, Ongwanada Resource Centre, 191 Portsmouth Avenue, Kingston, ON, Canada, K7M 8A6.

P4A.1.11 **AUTISTIC REGRESSION IN AFFECTED SIBLING PAIRS.** E. Jimenez, P. Szatmari, A. Dupuis and W. Roberts. The Hospital for Sick Children, 555 University Ave., Toronto, Ontario, Canada, M5G 1X8.

P4A.1.12 **CHARTING THE PROGRESS OF AUTISM RESEARCH: THE IMPACT OF THE AUTISM GENETIC RESOURCE EXCHANGE ON AUTISM GENETICS.** C. Lajonchere and AGRE Consortium. Cure Autism Now, AGRE Program Director, 5455 Wilshire Blvd, Suite 715, Los Angeles, CA 90036.

P4A.1.13 **IDENTIFICATION OF SIGNIFICANT ASSOCIATION AND GENE-GENE INTERACTION ON GABAA RECEPTOR (GABAR) SUBUNIT GENES IN AUTISM.** D. Ma, P. Whitehead, M. Menold, E. Martin, A. Ashley-Koch, H. Mei, R. Chung, G. DeLong, R. Abramson, H. Wright, M. Cuccaro, J. Hussman, J. Gilbert and M. Pericak-Vance. Center for Human Genetics, Duke University Medical Center, 595 LaSalle Street, DUMC, BOX 3445, Durham, NC 27710.

P4A.1.14 **CHROMOSOMAL REARRANGEMENTS IN AUTISM SPECTRUM DISORDERS.** P. Malenfant, L. Waintraub, X. Liu, J. Holden and ASD-CARC. Department of Physiology, Queen's University, Autism Research Program, Ongwanada Resource Centre, 191 Portsmouth Avenue, Kingston, ON, Canada, K7M 8A6.

P4A.1.15 **MDR-PHENOMICS: A NOVEL APPROACH TO UNTANGLING THE GENETICS OF AUTISM.** E. Martin, M. Cuccaro, H. Mei, P. Whitehead, G. DeLong, R. Abramson, H. Wright, J. Hussman, J. Gilbert and M. Pericak-Vance. Center for Human Genetics, Duke University Medical Center, DUMC Box 3445, Durham, NC, 27710.

P4A.1.16 **SUPPORT FOR ENGRAILED 2 AS AN AUTISM SPECTRUM DISORDER SUSCEPTIBILITY GENE.** J. Millonig, R. Benayed, N. Gharani, V. Mancuso, G. Lazar, S. Kamdar and L. Brzustowicz. UMDNJ-Robert Wood Johnson Medical School, Center for Advanced Biotechnology and Medicine, Department of Neuroscience and Cell Biology, 679 Hoes Lane, Piscataway, NJ 08854.

P4A.1.17 **EVIDENCE FOR AN AUTISM SUSCEPTIBILITY GENE ON CHROMOSOME 21 IN A SUBSET OF FAMILIES WITH A HISTORY OF DEVELOPMENTAL REGRESSION.** C. Molloy and M. Keddache. Cincinnati Children's Hospital Medical Center, Center for Epidemiology/Biostats, 3333 Burnet Avenue ML 5041, Cincinnati, OH 45229-3039.

P4A.1.18 **NRCAM: A MAJOR SUSCEPTIBILITY GENE FOR AUTISM.** R. Pullarkat, D. Kowal, P. Pullarkat, B. Chiou and M. Junaid. NYS Institute for Basic research in Developmental Disabilities, 1050 Forest Hill Road, Staten Island, NY 10314.

P4A.1.19 **ASSOCIATION OF AUTISM TO CHROMOSOME 19.** R. Rabionet, D. Ma, I. Konidari, E. Martin, A. Ashley-Koch, G. DeLong, R. Abramson, H. Wright, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Duke University Medical Center, Center for Human Genetics, 595 LaSalle St, Box 2903, Durham, NC, 27710.

P4A.1.20 **GENETIC HETEROGENEITY IN THE TRIAD OF AUTISTIC IMPAIRMENTS AS ASSESSED AS QUANTITATIVE TRAITS.** A. Ronald, F. Happé and R. Plomin. Social Genetic and Developmental Psychiatry (SGDP) Center, Institute of Psychiatry, Box P083, Denmark Hill, London SE5 8AF, UK.

P4A.1.21 **MAPPING CHROMOSOME 15 REARRANGEMENTS BY HIGH RESOLUTION ARRAY-COMPARATIVE GENOMIC HYBRIDIZATION (CGH): IMPLICATIONS FOR GENOTYPE-PHENOTYPE CORRELATIONS IN ANGELMAN SYNDROME.** T. Sahoo, S. Peters, J. German, L. Bird, C. Bacino and A. Beaudet. Baylor College of Medicine, Molecular & Human Genetics, One Baylor Plaza, Houston, TX 77030.

P4A.1.22 **EXAMINATION FOR ASSOCIATION OF REELIN IN ASPERGER SYNDROME.** D. Skaar, J. Solomon, A. Mazurek, J. Jaworski, H. Wright, R. Abramson, J. Gilbert, M. Cuccaro and M. Pericak-Vance. Duke University Center for Human Genetics, 595 LaSalle Street, Durham, NC 27710.

P4A.1.23 **HIGH DENSITY SNP ASSOCIATION ANALYSIS OF 16.6MB COVERING AN AREA OF LINKAGE TO AUTISM ON CHOMOSOME 17.** J. Stone, B. Merriman, D. Geschwind, S. Nelson and AGRE Consortium. UCLA, Department of Human Genetics, 695 Charles Young Dr. S., Gonda Building, Room 5554, Los Angeles, CA 90095.

## Saturday, May 7, 2005

P4A.1.24 **SINGLE GENE CANDIDATE APPROACH IN AUTISM SPECTRUM DISORDER.** F. Tassone, K. Butler DeRose, S. Nowicki, R. Hagerman, R. Hansen, L. Li, P. Hagerman and F. Tassone. Department of Biochemistry and Molecular Medicine, UC Davis, and The MIND Institute, Tupper Hall, One shields Avenue, Davis, CA 95616.

P4A.1.25 **CONFIRMATION OF THE ASSOCIATION OF THE C4B NULL ALLELLE IN AUTISTIC DISORDER.** A. Torres, A. Cutler, T. Sweeten and J. Odell. Utah State University, 6895 Old Main Hill, Logan, UT 84322.

P4A.1.26 **RH AND ABO MATERNAL-FETAL INCOMPATIBILITY AND RISK OF AUTISM.** P. Zandi, A. Kalaydjian, M. Fallin, D. Avramopoulos, Y. Ho and C. Newschaffer. Johns Hopkins Bloomberg School of Public Health, Hampton House, Room 857, 624 North Broadway, Baltimore, MD 21205.

P4A.1.27 **AGE & TISSUE-SPECIFIC MISREGULATION OF IMPRINTED AUTISM-CANDIDATE GENE EXPRESSION IN THE MECP2-KNOCKOUT MOUSE.** L. Herzing, J. Lyons and A. Broz. Dept of Pediatrics,Children's Memorial Research Center, Northwestern University SOM, Children's Memorial Research Center (CMRC), 2300 Children's Plaza Box 211, Chicago, IL 60614.

P4A.1.28 **OCCURRENCE OF LANGUAGE REGRESSION AND EEG ABNORMALITIES IN CHILDREN WITH DOWN SYNDROME AND AUTISTIC SPECTRUM DISORDER.** F. Hickey and B. Patterson. Cincinnati Children's Division of Developmental Disabilities, 3333 Burnet Ave, Cincinnati, Ohio, 46229.

### Poster Session 4A: Topic 2

***Emotions & Behavior***

P4A.2.1 **EEG ASYMMETRY AND SOCIAL-EMOTIONAL BEHAVIORS IN HIGH FUNCTIONING AUTISM: A REPLICATION STUDY.** C. Burnette, N. Zahka, C. Schwartz, S. Sutton, H. Henderson, A. Pradella and P. Mundy. University of Miami, University of Miami, Flipse, Room 501, 5665 Ponce de Leon, Coral Gables, Fl 33146.

P4A.2.2 **REPETITIVE BEHAVIORS AND SENSORY PROFILES IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** R. Gabriels. University of Colorado Health Sciences Center, The Children's Hospital, 1056 East 19th Ave., B505, Denver, CO 80218.

P4A.2.3 **THE RELATIONSHIP BETWEEN STEREOTYPED MOVEMENTS AND SELF INJURIOUS BEHAVIOURS.** E. Gal, M. Dyck and A. Passmore. University of Haifa, Mount Carmel, Haifa 31905, Israel.

P4A.2.4 **A COMPARISON OF BEHAVIORAL AND EMOTIONAL FUNCTIONING IN CHILDREN WITH AUTISTIC DISORDER AND PDD-NOS.** D. Pearson, K. Loveland, D. Lachar, D. Lane, B. Handen, C. Johnson, S. Reddoch, R. Mansour and L. Cleveland. Univ. of Texas Medical School at Houston, Dept. of Psychiatry & Behavioral Sciences, 1300 Moursund, Houston, TX 77030.

P4A.2.5 **FACE PROCESSING ABILITIES IN YOUNG CHILDREN WITH AUTISM.** J. Giovannelli, M. Strauss, C. Best, L. Newell, K. Rump, K. Turner and N. Minshew. University of Pittsburgh, 210 South Bouquet Street, 3319 Sennott Square, Pittsburgh, PA 15260.

### Poster Session 4B: Topic 1

***Emotions & Behavior***

P4B.1.1 **THE USE AND UNDERSTANDING OF SELF-PRESENTATIONAL DISPLAY RULES IN CHILDREN WITH HIGH-FUNCTIONING AUTISM, CHILDREN WITH ASPERGER'S DISORDER AND TYPICALLY DEVELOPING CHILDREN.** J. Barbaro and C. Dissanayake. Child Development Unit, School of Psychological Science, La Trobe University, 31 Richardson Street, Essendon, Victoria, 3040, Australia.

P4B.1.2 **FACE KNOWLEDGE IN INDIVIDUALS WITH AUTISM: ABSTRACTING SPECIFIC INFORMATION FROM FACES.** C. Best, M. Strauss, L. Newell and N. Minshew. University of Pittsburgh, Department of Psychology, 210 South Bouquet Street, Pittsburgh, PA 15260.

P4B.1.3 **FACE PROCESSING IN CHILDREN WITH PERVASIVE DEVELOPMENTAL DISORDER (PDD): THE ROLES OF EXPERTISE AND SPATIAL FREQUENCY.** M. Boeschoten, C. Kemner, L. Kenemans and H. Engeland. Department of Child and Adolescent Psychiatry, Rudolf Magnus Institute for Neurosciences, University Medical Center Utrecht, P.O. Box 85500, 3508 GA Utrecht, The Netherlands. Room: B.01.324.

P4B.1.4 **A FMRI STUDY OF EMOTION RECOGNITION TRAINING IN AUTISM.** S. Bölte, D. Hubl, S. Feineis-Matthews, T. Dierks and F. Poustka. J.W.Goethe-University, Dept. of Child and Adolescent Psychiatry, Deutschordenstr. 50, D-60528 Frankfurt/M., GERMANY.

P4B.1.5 **FACE PROCESSING IN HIGH FUNCTIONING AUTISM: BEHAVIORAL FINDINGS.** S. Faja, S. Webb, G. Dawson, M. Bloomquist and M. Walters. University of Washington, University of Washington, Box 357920, Seattle, WA 98185.

P4B.1.6 **RESPONSIVENESS TOWARD ADULT PAIN, AND INFANT AND ANIMAL DISTRESS IN YOUNG CHILDREN WITH ASD.** K. Hudry and V. Slaughter. Early Cognitive Development Unit, School of Psychology, University of Queensland, St Lucia, QLD, Australia 4072.

P4B.1.7 **REFLEXIVE AND VOLUNTARY ORIENTING TO EYE-GAZE CUES IN YOUNG HIGH FUNCTIONING CHILDREN WITH AUTISM.** G. Iarocci, A. Rombough, J. McLaughlin, N. Jauernig and S. Grant. Simon Fraser University, Autism and Developmental Disorders Lab, 8888 University Dr, Burnaby, BC, V5A 1S6.

P4B.1.8 **AN ERP INVESTIGATION OF ATYPICAL PROCESSING OF SPATIAL FREQUENCIES IN SOCIAL AND NON-SOCIAL INFORMATION IN AUTISM SPECTRUM DISORDER.** B. Jemel, M. Boeschoten, L. Mottron, A. Hosein, H. van Engeland and C. Kemner. Riviere-des-Prairies Hospital, Research Lab. In Neurosciences, and Cognitive Electrophysiology, Montreal, H1E 1A4, Canada.

P4B.1.9 **DEVELOPING A QUANTITATIVE MEASURE OF FACE EMOTION RECOGNITION IN AUTISM.** R. Joseph, A. Verbalis, R. McNally, B. Keehn, C. Connolly and H. Tager-Flusberg. Boston University School of Medicine, 715 Albany St., L-814, Boston, MA 02118.

P4B.1.10 **AUTOMATIC PROCESSING OF EMOTIONAL FACES IN HIGH-FUNCTIONING PERVASIVE DEVELOPMENTAL DISORDERS: AN AFFECTIVE PRIMING STUDY.** Y. Kamio, J. Wolf, T. Saitoh, Y. Yamamoto and D. Fein. Kyushu University, Dept. of Psychology, 6-19-1 Hakozaki, Higashi-ku, Fukuoka, Japan.

P4B.1.11 **EMOTION PERCEPTION IN ASPERGER'S SYNDROME AND HIGH-FUNCTIONING AUTISM: THE IMPORTANCE OF DIAGNOSTIC CRITERIA AND CUE INTENSITY.** C. Mazefsky. Brown University/Virginia Commonwealth University, Clinical Psychology Training Consortium, Brown University, Box G-BH, Providence, RI 02912.

P4B.1.12 **AFFECTIVE DYSREGULATION AND REPETITIVE BEHAVIORS IN AUTISM.** R. McNally, B. Keehn, C. Connolly, K. Dominick and R. Joseph. Boston University School of Medicine, Lab of Developmental Cognitive Neuroscience, 715 Albany St L-814, Boston, MA 02118.

P4B.1.13 **THE NEUROPHYSIOLOGICAL CORRELATES OF FACE PROCESSING IN ADULTS AND CHILDREN WITH ASPERGER'S SYNDROME.** K. O'Connor, J. Hamm and I. Kirk. Research Centre for Cognitive Neuroscience, Department of Psychology, University of Auckland, Auckland, New Zealand, Private Bag 92019.

P4B.1.14 **RECOGNIZING SUBTLE EXPRESSIONS OF EMOTION: INDIVIDUALS WITH AUTISM AND THE EMOTION RECOGNITION.** K. Rump, M. Strauss, J. Giovannelli, K. Turner and N. Minshew. University of Pittsburgh, Department of Psychology, 210 South Bouquet St, Pittsburgh, PA 15260.

P4B.1.15 **FAMILIAR AND UNFAMILIAR FACE RECOGNITION IN CHILDREN WITH AUTISTIC SPECTRUM DISORDERS.** R. Wilson, M. Blades and O. Pascalis. University of Sheffield, Department of Psychology, Western Bank, S10 2TP.

P4B.1.16 **SCREENING FOR AUTISTIC SYMPTOMS IN CHILDREN WITH ADHD.** A. Di Martino, A. Krain, M. Dijkstra, S. Rathor, K. Bannon and F. Castellanos. NYU Child Study Center, Institute for Pediatric Neuroscience, NYU School of Medicine, 215 Lexington Ave Room 1420, New York, NY 10016.

P4B.1.17 **THE FUNCTIONAL ANALYSIS: EXAMINING THE ATTENTION COMPONENT OF A TANGIBLE CONDITION.** S. Ferraioli and K. Potoczak. University of Rochester, University of Rochester SCDD, 601 Elmwood Avenue, Box 671.

P4B.1.18 **RESPONSE TO THE SSRI CITALOPRAM FOR CHILDREN WITH AUTISM SPECTRUM DISORDER.** S. Gallagher, K. Lekagul and W. Roberts. Hospital for Sick Children, University of Toronto, 555 University Avenue, Toronto, M5G 1X8, Canada.

P4B.1.19 **THE INFLUENCE OF ATTENTION PROBLEMS ON AUTISTIC BEHAVIOR DOMAINS.** F. Poustka, M. Holtmann and S. Bölte. Child & Adolescent Dept. Goethe University, Deutschordenstr. 50, D-60528, Frankfurt am Main, Germany

P4B.1.20 **MODIFIED FUNCTIONAL ANALYSIS FOR YOUNG CHILDREN WITH AUTISM.** J. Zarcone, R. Reese and E. Shumate. University of Kansas Medical Center, Department of Psychiatry, MSN 4015, 3901 Rainbow Blvd., Kansas City, KS 66160.

P4B.1.21 **SENSORY SYMPTOMS IN AUTISM.** S. Hyman, C. Stodgell, L. Bennetto, D. Morris and C. Aman. University of Rochester School of Medicine and Dentistry, Strong Memorial Hospital, Box 671, 601 Elmwood Ave, Rochester, NY 14642.

P4B.1.22 **FACIAL EMG AND AFFECT PROCESSING IN AUTISM.** M. Magnee, J. Stekelenburg, B. Gelder, H. Engeland and C. Kemner. Rudolf Magnus Institute of Neuroscience, Department of Child and Adolescent Psychiatry, B01.324, University Medical Center Utrecht, Heidelberglaan 100, 3584 CX Utrecht, The Netherlands.

## Poster Session 4B: Topic 2

***Social Behavior & Play***

P4B.2.1 **EFFECTS OF TEACHER ENGAGEMENT ON THE SOCIAL BEHAVIORS OF STUDENTS WITH AUTISM.** B. Boyd, M. Conroy and T. Nakeo. University of Flordia, University of Florida, Department of Special Education, G-315 Norman Hall, PO Box 117050, Gainesville, FL 32611.

P4B.2.2 **CAN YOUNG CHILDREN WITH AUTISM USE GESTURES AND OBJECTS AS SYMBOL?.** C. Chiang, C. Lee and C. Wu. Department of Psychology, National Chung Cheng University, Department of Psychology, National Chung Cheng Universiy, Chia-Yi, Taiwan.

P4B.2.3 **EARLY PREDICTORS OF SOCIAL BEHAVIOR OF CHILDREN WITH AUTISM AT SCHOOL.** A. Dijamco, L. Travis and M. Sigman. University of California, Los Angeles, UCLA, Neuropsychiatric Institute, 760 Westwood Plaza, Room 67-464, Los Angeles, CA 90024-9972.

P4B.2.4 **A COMPARISON OF SOCIAL AND PLAY SKILLS IN CHILDREN WITH INVERTED DUPLICATION OF CHROMOSOME 15 AND CHILDREN WITH AUTISM.** J. Earhart, J. Mussey, M. Sigman and C. Schanen. UCLA, 740 Westwood Plaza Rm. 68-237, Los Angeles, CA 90024.

P4B.2.5 **CHILDREN WITH AUTISM IMITATE HANDSHAPE, BUT NOT HAND DIRECTION.** Y. Kunihira, A. Senju, T. Hasegawa and Y. Tojo. Dept. of Cognitive and Behavioral Science, Univ. of Tokyo, Hasegawa Laboratory, Department of Cognitive and Behavioral Science, Graduate School of Arts and Sciences, The University of Tokyo, Komaba, 3-8-1, Komaba, Meguro-ku, Tokyo, 153-8902, Japan.

P4B.2.6 **SOCIAL AND SPATIAL MEMORY IN AUTISM SPECTRUM DISORDERS AND THEIR RELATION TO EVERYDAY BEHAVIOR.** I. Levy, G. Wallace, D. Black, L. Gilotty, M. Gibbs, P. Lee and L. Kenworthy. Center for Autism Spectrum Disorders, Children's National Medical Center, Washington, DC 20010.

P4B.2.7 **JOINT ATTENTION OVER TIME IN YOUNG INFANTS WITH AUTISM.** F. Naber, S. Willemsen-Swinkels, J. Buitelaar, E. Van Daalen, M. Bakermans-Kranenburg, M. Van Ijzendoorn and H. Engeland. Dept. of Child and Family Studies, Leiden University, Department of Education and Child Studies, Centre for Child and Family Studies, Pb. 9555, 2300 RB Leiden, Leiden University, The Netherlands.

P4B.2.8 **DO THE MEANS JUSTIFY THE ENDS? A NEW LOOK AT IMITATION IN AUTISM.** M. Nielsen and K. Hudry. Early Cognitive Development Unit, School of Psychology, University of Queensland, St Lucia, QLD, 4072, Australia.

Poster Session 1A: Topic 1

## *Basic Science & Population Approaches*

P1A.1.1 **NEW EVIDENCE OF MERCURY TOXICITY IN AUTISM.** J. Adams and J. Romdalvik. Arizona State University.

Objective: Evaluate the level of mercury in baby hair and baby teeth of children with autism vs. controls.

Design/Methods: Baby Hair: The level of mercury and other elements in the baby hair of children with autism (n=80) and controls (n=30) was measured. The children were born between 1988-1999, and the hair was collected at age 12-24 months. A parental questionnaire was used to assess risk factors for mercury toxicity. Baby Teeth: The level of mercury, lead, and zinc was measured in the baby teeth of children with autism (n=25) compared to controls (n=25). The children were born between 1988-1999.

Results/Discussion: Baby Hair: Children with autism had much lower levels of mercury in their baby hair (57% lower) than the controls. Children with autism also had much higher usage of oral antibiotics (which greatly inhibit excretion of mercury at ages 0-6 months, 7-12 months, and 13-24 months. Other factors (seafood consumption, dental amalgams) were not significantly different. Baby Teeth: Children with autism had 3x as much mercury in their baby teeth compared to controls, but no significant difference in the level of lead or zinc.

Conclusions: Children with autism had low levels of mercury in their baby hair compared to controls, consistent with a previous study by Holmes et al. This is probably due to a reduced ability to excrete mercury, which is probably partly due to excessive use of oral antibiotics. Children with autism also had unusually high levels of mercury in their baby teeth, which is a good marker for cumulative exposure to mercury during the first few years of life.

P1A.1.2 **BEHAVIORAL DEVELOPMENT OF THE EN2-/- MOUSE: RELEVANCE TO AUTISTIC DISORDER.** M. Cheh, J. Millonig, S. Kamdar, X. Ming, L. Roselli and G. Wagner. Neuroscience Dept. Rutgers University.

Autism is a developmental disorder characterized by abnormalities in a variety of behavioral domains. Polymorphisms have been identified in the ENGRAILED 2 (EN2) gene that are significantly associated with autism under both narrow and broad diagnostic criteria (Gharani et al., 2004). EN2 is a homeobox transcription factor involved in cerebellar patterning; it is particularly relevant because En2-/- mice display cerebellar abnormalities similar to those observed in most autistic autopsy samples.

Objective: To determine whether En2-/- mice display neurobehavioral abnormalities relevant to autistic disorder.

Methods: Mice were tested beginning on postnatal day 5 through day 60 in a developmental battery consisting of surface righting, mid-air righting, negative geotaxis, hanging wire, visible-platform water maze, hidden-platform water maze, motor activity and rotorod.

Results: En2-/- mice displayed no overt signs of ataxia and showed typical development of surface righting and negative geotaxis; however, these mice displayed a subtle deficit in mid-air righting and were significantly delayed in the development of hanging wire-grip strength. Their performance on the rotorod was also severely impaired. En2-/- mice exhibited significant hyperactivity when tested in early postnatal development, and were significantly impaired in their ability to escape in the visible-platform water maze. These mice also exhibited significant cognitive deficits, which included an impaired acquisition of the hidden-platform water maze and an impaired performance when tested for memory retention of the hidden-platform location.

Conclusions: These data suggest that alterations in the human EN2 gene may be responsible for some of the aberrant behavior observed in autism.

Acknowledgements: NS43981, ES05022, EPAR829391, NJ Governor's Council on Autism, Johnson & Johnson, Busch Biomedical Research Grant

P1A.1.3 **GABRB3 GENE DISRUPTION IN MICE: A POTENTIAL MODEL OF AUTISM.** T. DeLorey, E. Hashemi, P. Sahbaie and G. Homanics. Molecular Research Institute.

Autistic individuals exhibit abnormal social behavior and to a lesser extent, changes in exploratory

behavior. A growing body of evidence has implicated chromosomal region 15q11-13 in Autism. A potential candidate gene within this region is the GABRB3 gene, which encodes the ²3 subunit of the GABAA receptor. Disruption of the gabrb3 gene in mice results in a variety of behavioral changes. Objective: Social and exploratory behavior will be assessed in gabrb3 gene disrupted mice. Methods: Gabrb3 gene disrupted mice were assessed for exploratory and social behaviors in an “open field” chamber. Results: Exploratory behavior was significantly altered in the gabrb3 gene disrupted mice, compared to controls, in regards to rearing behavior and the time to make first contact with a novel object placed in the open field. However, the number of contacts made with the novel object did not differ significantly between genotypes. Gabrb3 gene disrupted mice tended to perform poorly in the social interaction test, relative to controls, however, the results did not conclusively verify a social impairment.

Conclusion: These results suggest that disrupting the gabrb3 gene leads to altered exploratory behaviors and a potential impairment in social interactions. A more robust set of social interaction tests is currently being conducted in order to substantiate altered social behavior. The above results suggest that gabrb3 gene disrupted mice may prove useful in examining the sequence of developmental events leading to the behavioral outcomes observed in autism.

Research funded by NIMH RO1 MH065393-01.

P1A.1.4 **THE DEVELOPMENT OF MONKEY MODELS FOR THE STUDY OF AUTISM.** L. Martin, P. Ashwood, J. Van de Water and D. Amaral. The M.I.N.D. Institute and Dept. of Psychiatry UC Davis.

Objective: We employed two different techniques to develop nonhuman primate models of autism.

Design/Methods: For the first strategy, we induced phenylketonuria (PKU) in rhesus monkeys using an approach that has previously caused social and cognitive deficits in monkeys (Chamove, 1984); PKU is an accepted cause of autism. We caused hyperphenylalaninemia in fetal monkeys by feeding a high phenylalanine diet to pregnant monkeys. These "PKU" monkeys provide a potentially reliable model in which the behavioral phenotype and neuropathology of autism can be explored. For the second strategy, purified IgG antibodies from mothers of multiple children with autism were administered to pregnant rhesus monkeys during a six-week fetal period. Following birth, both the hyperphenylalaninemic and antibody-exposed monkeys were tested for neurological, physiological, and behavioral impairments through a battery of tests aimed at identifying autistic-like traits.

Results: We present here our initial results from the preweaning period (first 6 months) of testing. Results from our neonatal assessments demonstrated that "PKU" monkeys have abnormal muscle tonus and motor ability compared to controls, while antibody-exposed monkeys demonstrated less struggling with examiners during testing compared to controls. We tested social behaviors through observations of dyadic and group interactions and anxiety through separation of the mother from infants, and obtained auditory brainstem responses at 1 and 4 months of age. The results of these early studies will be reported.

Conclusion: Early results indicate some abnormalities in both PKU and antibody-exposed monkeys, however, validation of these monkey models awaits further results.

Acknowledgements: These studies were funded by a grant from the NIEHS/EPA (P01 ES11269) and by the M.I.N.D. Institute. The authors would like to thank AGRE for allowing us to purchase the serum samples for use in the monkey model.

P1A.1.5 **BEHAVIORAL TESTS TO EVALUATE DEVELOPMENTAL DISORDERS USING EXPERIMENTAL MONKEYS.** T. Negishi, K. Kawasaki, A. Nakagami, T. Koyama, Y. Kuroda and Y. Yoshikawa. Department of Chemistry and Biological Science, Faculty of Science and Engineering, Aoyama Gakuin University.

Objectives: In autism researches, animal models are essential to understand the mechanism of autism, and behavioral phenotypes are used as an endpoint. On the other hand, monkeys have the highest phylogenical similarities, including behaviors, to human among experimental animals. Here, we will demonstrate three behavioral tests using experimental monkeys.

Methods: We conducted three behavioral tests. Four-step finger maze learning test can evaluate an

ability to learn the role of the maze and to concentrate this task. Eye contact test, an original method, can measure the degree of hostility to human observer and the recognition of human's eye. Encounter test, in which two subjects' interactive behaviors were recorded, can estimate sociability of subjects.

Results: These three behavioral tests were easy and each test was completed within a half of month, which would support more efficient and high throughput study compared to the traditional behavioral tests using monkeys. The four-step finger maze learning test and the eye-contact test seemed to successfully quantify subject's learning ability and hostility to a human observer, respectively. The encounter test also quantified subject's sociability and revealed the developmental changes in social behaviors.

Conclusion: In order to extrapolate the results in animal autism models to human, these behavioral tests using monkeys are powerful and comprehensive tools for autism researches. We are now trying to establish an experimental autism model in monkeys and evaluate abnormal behavioral development of this model by these tests.

P1A.1.6 **ENGRAILED2, AN AUTISM ASSOCIATED GENE, REGULATES NEUROGENESIS DURING BRAIN DEVELOPMENT.** I. Rossman, E. Pasorek, J. Millonig and E. DiCicco-Bloom. UMDNJ-Robert Wood Johnson Medical School/Dept Neuroscience and Cell Biology.

Autism, a complex brain disorder associated with behavioral, intellectual, and language deficits, may result from abnormal genetic regulation during development. Unexpectedly, the cerebellum is one of the most consistent sites of abnormality in the autistic brain. Normal cerebellar development depends on the mammalian patterning gene, Engrailed2 (En2). Alterations in En2's complex spatiotemporal expression yields cerebellar hypoplasia with deficient Purkinje and granule cells, changes similar to autism neuropathology. Recently, Gharani et al. (2004) found that autistic individuals inherited specific polymorphisms in human EN2 more frequently than non-autistic siblings ($p<0.0001$), a finding replicated in two additional datasets (Benayed et al. 2004), suggesting that EN2 is an autism susceptibility locus.

Objective: To define En2 functions during neurogenesis.

Methods: A mouse En2 cDNA was cloned into an EGFP expression vector and the En2 and empty control vectors were transfected into rat E14.5 cortical precursors, an En2-naïve population. At 24h post-transfection, GFP+ cells were assessed morphologically as neural precursors or differentiated neurons, and immunocytochemically for markers of transfection (GFP and En2) and neuronal differentiation (betaIII-tubulin).

Results: En2 protein immunoreactivity was detected only in En2-transfected, GFP+ cells, but not controls. En2 misexpression elicited reduced neurogenesis, including decreased neurite-bearing cells and neuron-specific betaIII-tubulin, with a corresponding increase in precursor numbers.

Conclusions: These data suggest En2 represses neuronal differentiation when misexpressed in neural precursors, consistent with a model of dysregulated human EN2 expression underlying abnormal neurodevelopment in autism. Ongoing studies are defining responses of cerebellar granule precursors from En2 knockout and wildtype mice in response to developmentally relevant signaling molecules.

P1A.1.7 **THE ARUBA TREATED PREVALENCE STUDY OF AUTISM SPECTRUM DISORDERS.** I. Balkom van, M. Bresnahan, M. Vogtlander and H. Hoek. Child & Adolescent Psychiatry Clinic.

Background: Reports of increases in the prevalence of autism spectrum disorders have focused research attention on the epidemiology of ASDs. Nonetheless, little is known about the prevalence of ASDs in many regions of the world, and no information is available on the epidemiology of ASDs in the Dutch Caribbean. This study reports on the prevalence of ASDs in Aruba, an island 17 miles off the coast of Venezuela. Aruba is uniquely suited for this purpose with a well-established health care system, a centralized child psychiatry clinic, and population registry providing the means to identify disabled children, and enumerate the population in a geographically defined area.

Aim: To determine treated prevalence rates for ASDs among children born in Aruba from 1990-1999.

Method: Charts of all patients treated at the Child &

Adolescent Psychiatry Clinic of Aruba between 5/97 and 1/04 were systematically screened and records of potential cases of ASD abstracted. Study diagnoses were assigned based on DSM-IV classification. Numbers of births per year were obtained from the Aruba Population Registry.

Results: A total of 813 children born in Aruba from 1990-1999 were identified in clinic records; of these 69 children fulfilled study criteria for ASDs. The treated prevalence of ASD in Aruba is 5.3 (95% CI 4.2 - 6.7) and for AD 1.9 (95% CI 1.2-2.8) per 1000.

Conclusion: Treated prevalence rates in Aruba are comparable to those reported in recent prevalence studies in the UK and US, countries with similar income level and health profiles.

Funding: None.

P1A.1.8 **A STUDY OF BEHAVIORS ASSOCIATED WITH FEVER IN CHILDREN WITH AUTISM/PDD.** L. Curran, S. Crawford, C. Newschaffer and A. Zimmerman. Kennedy Krieger Institute and Johns Hopkins Bloomberg School of Public Health.

Clinician and parent reports suggest that communication, attention and social interaction in children with Autism/PDD may improve with fever.

Objective: To investigate behaviors during and after febrile episodes.

Methods: Behaviors of 30 children with Autism/PDD, ages 2-17 years, were evaluated using the Aberrant Behavior Checklist (ABC) at three time points: 1) During fever (body temperature >100.4°F); 2) When the fever was gone and the child was feeling better; and 3) Once the child was fever-free for seven days.

Upon receipt of fever data, one age-, sex- and verbal skills-matched subject was selected for each fever case from the list of ASD/PDD children who had not yet submitted data and were fever-free at the time. For each of these participants, a parent completed the ABC on three sequential days spaced according to the reported schedule of the febrile child.

Results: Comparisons of mean ABC scores (two way repeated measures ANOVA) showed behavior improvements during fevers on the subscales of Irritability (p=0.016), Stereotypy (p=0.006), Hyperactivity (p=0.001), and Inappropriate Speech (p=0.003). Per expectation, ABC Lethargy subscale scores were worse during fevers (p=0.002). We attempted to assess how factors associated with underlying attendant illnesses (e.g. symptoms) and parent expectations of behavior changes may have influenced the findings.

Conclusions: Fever may positively affect brain function through an underlying mechanism important to this group of disorders, possibly involving immunological and neuroendocrinological mechanisms. Further research is needed to define clinical aspects of fever in autism, as well as cellular mechanisms that may suggest new approaches to treatment.

Supported by Cure Autism Now.

P1A.1.9 **SLEEP PATTERNS AND DEVELOPMENT AMONG CHILDREN WITH AUTISM.** P. Krakowiak, R. Hansen, L. Croen and I. Hertz-Picciotto. University of California, Davis.

Objective: To characterize sleep patterns among children with autism and examine associations between these patterns and development.

Methods: A population-based sample of 136 children with autism (confirmed with ADI-R and ADOS-G), aged 2 to 5 years, was recruited from selected Regional Centers in California. Eighty of 105 (76%) children with autism had complete sleep histories reported by parents using a 39-item questionnaire. A principal factors analysis was performed to identify subgroups of sleep patterns. All children were also assessed to determine cognitive and adaptive development using Mullen Scales of Early Learning and Vineland Adaptive Behavior Scales, respectively. Logistic regression analyses adjusted for age and gender were performed to determine whether sleep patterns were associated with development. Typical cognitive and adaptive developments were defined as Early Learning Composite >70 and Adaptive Behavior Composite e70, respectively.

Results: Seven sleep pattern clusters were identified: screaming at night, motor activity (body), low sleep, resistance, odd places/times, high sleep, and motor activity (head). Children with low sleep showed greater developmental delay. For each standard deviation increase on the low sleep score, the odds of delayed cognitive development increased 3.6-fold (odds ratio [OR] 3.64; 95% confidence interval [CI] 1.16, 22.50). The same increment in the low sleep score was associated with a 3.5-fold higher odds the child had delayed adaptive development (OR 3.53;

95% CI 1.20, 16.03).

Conclusion: This study identified 7 subcategories of sleep patterns in young children with autism. Children with typical cognitive and adaptive development were more likely to get a full night's sleep.

P1A.1.10 **A COMPARISON OF HEALTHCARE UTILIZATION AND COSTS OF CHILDREN WITH AND WITHOUT AUTISM SPECTRUM DISORDERS IN A LARGE HMO.** D. Najjar, P. Bernal and L. Croen. Kaiser Permanente Division of Research.

Objective: To compare healthcare utilization and costs of children with autism spectrum disorders (ASD) and children without ASD in the same health maintenance organization (HMO).

Methods: All 2-18 year old children with continuous enrollment in the Kaiser Permanente (KP) Medical Care Program in northern California between July 1, 2003 and June 30, 2004 were identified. KP is a large, integrated group-model health plan with over 3.1 members. Healthcare utilization and costs for children with ASD (n=3,052) and a random sample of children without ASD (n=30,527) were compared using electronically captured administrative data.

Results: Annual utilization and cost of health services was higher for children with ASD. Children with ASD had a higher annual mean number of total clinic (5.6 vs. 2.8), pediatric (2.3 vs 1.6) and psychiatric (2.2 vs. 0.3) outpatient visits. A higher percentage of children with ASD experienced inpatient (3% vs. 1%) and outpatient (5% vs. 2%) hospitalizations. The mean total cost per member was 3-fold higher among children with ASD ($2,671) compared to children without ASD ($881). With the exception of emergency room visits ($66 vs. $51), mean annual member costs for hospitalizations ($544 vs. $205), clinic visits ($1337 vs. $529), and prescription medications ($724 vs. $96) were more than double for children with ASD compared to children without ASD. Medication costs represented 27% of total costs for children with ASD compared to 11% for children without ASD.

Conclusion: The utilization and costs of healthcare are substantially higher for children with ASD compared to children without ASD.

P1A.1.11 **PHENOTYPIC FEATURES OF PERVASIVE DEVELOPMENTAL DISORDER (PDD) FOLLOWING EXPOSURE TO POLYVALENT MEASLES CONTAINING VACCINE DATA FROM A UK LITIGATION COHORT.** C. Stott. Univesrity of Sunderland.

Objectives: Few studies have provided clinical and developmental data on children for whom sudden onset of developmental regression has been attributed to exposure to polyvalent measles containing vaccine (pMCV). This paper describes phenotypic presentation in a sample of children from the UK MMR-Autism litigation.

Methods: A set of hypotheses claimed by Fombonne and Chakrabarti (2001) to be central to the validity' of the phenotype of developmental regression and gastro-intestinal pathology following pMCV exposure was examined in a cohort of children in whom a high proportion with the putative phenotype would be expected. Parents of 94 children involved in the aforementioned litigation were interviewed using a specifically designed telephone interview. Additional analysis examined associations between vaccine-brand, positive biological detection of measles virus genome and variation in phenotypic presentation.

Results: A relatively high number of children in the sample met ICD-10 criteria for childhood disintegrative disorder. Age at onset was a significant predictor of age at first pMCV1. The sample was characterised by a high proportion of regressive presentations with a characteristic symptom and severity profile, and by an association between histologically confirmed/symptomatic GI pathology and developmental regression. The data also indicate an association between vaccine-brand, measles virus genome detection and phenotypic presentation.

Conclusions: Each of the Fombonne and Chakrabarti (2001) hypotheses was either directly supported or strongly indicated. It is possible that previous failure to support these hypotheses derives from a lack of power in experimental design and a related failure to address the appropriate hypotheses in relevant groups of children.

P1A.1.12 **BIRTH DATE DISTRIBUTION AND AUTISM SPECTRUM DISORDERS.** A. Zimmerman, L. Lee, B. Lee, R. Shah and C. Newschaffer. Kennedy Krieger Institute.

Objective: To determine if the birth date distribution for individuals with autism spectrum disorders (ASDs) differs from that for the general population. This information might suggest a relationship between infectious or environmental exposures and ASDs.

Methods: Two ASD case groups were studied: 630 single-birth cases ascertained at one medical center and 161 cases from multiple births ascertained by AGRE. All cases were born between 1983 and 2002. Expected birth date distributions came from Maryland vital statistics for 1983-2002. The Rayleigh test was carried out to examine distribution uniformity of birth date by gender and ASD subtype, and regression analysis was used to estimate the ratio of AD births observed in a given month to those expected based on the Maryland population standard, adjusting for birth cohort effect (5-year groups).

Results: Birth dates of multiple-birth autism cases were non uniformly distributed throughout the calendar year ($p<.05$). The observed number of births in March was 4.3 times greater than expected (95% confidence interval (CI): 1.23, 15.2) for female singleton ASD cases after controlling for birth cohort effect. On the other hand, the observed number of December births was 87% less than expected (95%CI: 0% to 98%) for male multibirth cases.

Conclusions: Birth date distributions that differ from population expectation suggest a role for prenatal infections or other environmental exposures. The fact that these patterns appear to differ by gender and singleton vs. multiple-birth pregnancy may also be etiologically significant. Possible contributions of parental autoimmune and psychiatric disorders will be discussed.

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## Poster Session 1A: Topic 2

### *Brain Structure & Structural Neuroimaging*

P1A.2.1 **SEROTONIN RECEPTORS IN THE AUTISTIC BRAIN.** E. Antzoulatos, T. Gibbs, J. Pugh, M. Bauman, T. Kemper and G. Blatt. Boston University School of Medicine.

Neuropathological and neuroimaging studies have implicated involvement of the limbic system in autism, including the anterior cingulate cortex (area 24), a region that is involved in high order integrative behaviors. Abnormalities in serotonin (5HT) in autism have been implicated in both genetic and pharmacological studies.

Objective: The purpose of this investigation was to examine the key types of 5HT receptors in area 24 of the autistic brain.

Methods: The density and anatomical distribution of 5HT2a and 5HT1a receptor subtypes (5HTR2a, 5HTR1a) and the 5HT uptake site (5HTU) were studied using receptor autoradiography techniques in 7 adult autistic and 10 age-matched control brains. Quantitative image analysis using Inquiry was performed and a 2-way nested ANOVA or t-test was used.

Results: Densitometric analysis yielded statistically significant decreases in the density of 5HTR2a and 5HTR1a but no significant differences in the density of the 5HTU site.

Conclusion: These studies demonstrate involvement of 5HT in area 24 of the adult autistic brain and the need to further characterize the 5HT receptor populations in other areas of the brain. Further, they support the need to consider 5HTR2a and 5HTR1a as candidate genes in autism.

Tissue was provided by the Harvard Brain Tissue Resource Center, and the Autism Tissue Program, via the University of Miami and Maryland Brain Banks.

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P1A.2.2 **RIGHTWARD VOLUME ASYMMETRY IN MENTALIZING NETWORKS IN AUTISTIC CEREBRAL CORTEX.** J. Bentwich, H. Benveniste, D. Ziegler, M. Maletic-Savatic, P. Filipek, D. Kennedy, N. Makris, V. Caviness S and M. Herbert. Cody Autism Center.

Difficulty in understanding other people's mental states (theory of mind, ToM), a core cognitive feature of autism spectrum conditions, involves a network of brain regions including temporoparietal junction, temporal pole, orbitofrontal, anterior paracingulate, medial prefrontal, medial frontal, medial temporal and frontotemporal areas. While electrophysiological and cognitive findings increasingly suggest right hemisphere dysfunction in autism, volumetric asymmetry in the ToM network has not been studied. We therefore hypothesized abnormal rightward volume asymmetries in ToM regions.

Methods: A whole brain MRI morphometric survey in 16 high-functioning autistic boys and 15 control boys 6-11 years old was performed yielding 48 cortical parcellation units (PU) per hemisphere, for which Symmetry Indices [SI = 2(L-R)/(L+R)*100] were calculated and tested for significant asymmetry using one-sample Student's t tests. Thirteen PU were then identified that corresponded to cortical regions associated with mentalizing or ToM.

Results: Seven of the 13 PU associated with ToM showed significant rightward asymmetry in the autism group, but only two were significantly rightwardly asymmetric in controls (Chi Square = 6.0, p = 0.049).

Conclusions: Rightward asymmetry in ToM areas appears to be increased in autism compared with controls. Further investigation is merited into etiology and neural systems as well as into the impact of cognitive or other therapeutic intervention (such as transcranial magnetic stimulation) on functional and structural asymmetry in autism.

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P1A.2.3 **INVESTIGATION OF STRUCTURAL CONNECTIVITY IN AUTISM USING DIFFUSION TENSOR IMAGING AND PROBABILISTIC TRACTOGRAPHY: METHODOLOGY.** S. Carrington, N. Voets, A. Bailey and P. Matthews. Child and Adolescent Psychiatry, University of Oxford.

Although the behavioral profile of autism is now relatively well characterized, the underlying neurobiology is still poorly understood. Post-mortem developmental cortical abnormalities have been identified and there is some evidence of aberrant functional and structural connectivity. Recently, diffusion tensor imaging (DTI) revealed morphological abnormalities indicative of reduced integrity in several white matter regions in individuals with autism compared with controls (Barnea-Goraly et al., 2004). It has been postulated that these cortical and connectivity abnormalities may be responsible for autistic developmental psychopathology.

Objective: To present a methodology for the investigation of structural connectivity in autism in the context of its application to patients with unilateral temporal lobe epilepsy (TLE).

Methods: The development of a probabilistic tractography algorithm (Behrens et al., 2002) has revealed the potential to infer anatomical connectivity of grey matter non-invasively in the human brain (Behrens et al., 2003). We will use this algorithm to investigate the probability of connection between the thalamus and the temporal lobe in TLE patients compared with healthy controls. Between-group differences may reflect the integrity of the white matter connecting these regions or abnormalities within the regions themselves. Furthermore, we will compare the integrity of different tracts within individuals in order to determine the specificity of white matter abnormalities.

Results: The findings from a pilot study of 5 patients with unilateral TLE and 5 age-matched controls will be presented.

Conclusion: These results will be used to validate the use of these methods for the investigation of structural connectivity in individuals with ASD.

McDonnell Centre for Cognitive Neuroscience, University of Oxford.

P1A.2.4 **DIFFUSION TENSOR IMAGING SUGGESTS EARLY MATURATION OF GLOBAL WHITE MATTER AND CORPUS CALLOSUM IN YOUNG CHILDREN WITH AUTISM.** C. Cascio, M. Jomier, M. Poe, H. Hazlett, R. Smith, G. Gerig and J. Piven. University of North Carolina.

Converging lines of evidence suggest that autism is associated with early brain overgrowth. Diffusion tensor imaging (DTI), a rapidly developing methodology by which white matter structural integrity is estimated, can be used in young children to investigate white matter development in autism.

Objective: Use DTI to measure global white matter and corpus callosum diffusion properties in children with and without a diagnosis of autism at ages 2 through 4 years.

Methods: DTI images were obtained from thirty-five children (20 with autism and 15 without) between the ages of 2 and 4 years. After artifact correction, fractional anisotropy (FA) and apparent diffusion coefficient (ADC) maps were generated and coregistered with segmentation maps from anatomical images, allowing assessment of FA and ADC properties in global white matter, individual lobes, and corpus callosum.

Results: For global white matter and corpus callosum, controls showed the expected increase in FA between age 2 and 4 years, reflecting increased organization of white matter with age. The FA values for the autism group at age 2 were similar to those of controls at age 4. Unlike controls, FA in the autism group did not increase between 2 and 4 years.

Conclusions: These preliminary data suggest that the typical course of white matter development may be altered in autism. It is striking that the white matter integrity for 2-year-old children with autism was similar to that of 4 year-old controls. The nature of this alteration is consistent with the theory of acceleration of early brain development in autism.

Research supported by NIMH grant MH61696 (PI: Joseph Piven, MD); NIH MRDDRC Grant 5 P30 HD03110 (PI: Joseph Piven, MD)

P1A.2.5 **BEHAVIORAL TRAINING OF YOUNG CHILDREN FOR MRI.** J. Chappell, H. Hazlett and J. Piven. University of North Carolina at Chapel Hill.

Behavioral techniques have been shown to be effective in training older children to remain motionless for an MRI scan. Thus far, reports of these methods have focused on children ages seven or older.

Objective: Assess the viability of using a protocol consisting of behavioral modification techniques to train four and five-year-olds to remain motionless for a brain MRI scan.

Methods: Five children (four typically developing, one diagnosed with PDD), ranging in age from 51 months to 63 months, were trained to remain motionless for a 25 minute MRI brain scan. Structured techniques were used in the children's homes and in a mock' scanner environment. The behavioral training protocol employed includes shaping, respondent extinction, positive reinforcement, exclusionary timeout, and stimulus generalization. Once a child successfully completed a mock scan, he/she received a scan using a 1.5 Tesla MRI scanner.

Results: 100% of the children successfully completed a 25 minute simulated scan in the mock scanner. 80% successfully completed an actual MRI scan, with three children needing only one visit and one child needing two. The only child without a successful scan withdrew from the study before the actual MRI scan could be scheduled.

Conclusions: Behavioral techniques can be used successfully to train typically developing four and five-year-olds to remain still for an MRI scan. These techniques open the door to more research using MRI technology with young children, and the possibility of employing them with high functioning children with autism spectrum disorders.

Research supported by NIMH grant MH61696 (PI: Joseph Piven, MD); NIH MRDDRC Grant 5 P30 HD03110 (PI: Joseph Piven, MD)

P1A.2.6 **AFFECTIVE INSTABILITY IN AUTISM.** J. Day, G. Voelbel, J. Hamstra, D. Nguyen, S. Chiu, M. Bates, M. Iman and R. Henden. M.I.N.D. Institute.

Objective: A subset of children with autism spectrum disorder (ASD) present with rapid fluctuation in mood and emotional dysregulation resemble affective instability (AI) common in bipolar disorder (BD). Whether AI in BD and ASD are similar phenomena is unknown. To characterize AI, semi-

structured interviews, questionnaires, rating scales, and structural magnetic resonance imaging (MRI) were used to assess children with ASD and BD.

Methods: Children between 8 and 13 years (9.92 + 2.0), males and females, who met DSM-IV criteria for ASD (n=43), BD (n=36), and ASD+BD (n=21) received assessments including: the Kidde-Schedule for Affective Disorders and Schizophrenia (K-SADS) modified to include DSM-IV criteria for ASD, the Child Behavior Checklist (CBCL), and the Conner's parent rating scale. Volumetric results (0.90-0.95 interrater reliability) were assessed by analysis of variance (ANOVA).

Results: Eleven assessment test items of affective symptoms, including “flight of ideas”, “temper tantrums”, “aggressive behavior”, and “emotional lability” showed ASD+BD to be more similar to BD compared to ASD separately. Children with symptoms of affective instability on KSADS, Conner's and CBCL items were defined in the AI category. Children with AI showed a decrease in hippocampus volume with increased flight of ideas ($F=9.56$, $p<0.05$) before and after controlling for total brain volume (TBV). AI also showed a decrease in amygdala volume with increased aggressive behavior ($F=4.75$, $p<0.05$) and emotional lability ($F=6.26$, $p<0.05$), although, no significant main effect remained after controlling for TBV.

Conclusions: Certain behavioral characteristics and structural brain changes may be associated with AI in children with ASD.

P1A.2.7 **FRONTAL-SUBCORTICAL CIRCUITRY IN AUTISM.** K. Dominick, K. Lindgren, N. Shaffer, A. Silver, D. Kim and H. Tager-Flusberg. Lab of Developmental Cognitive Neuroscience, Boston University School of Medicine.

The frontostriatal system has been implicated in repetitive behaviors in a wide array of neurodegenerative and neurodevelopmental disorders, including Parkinson's disease, Tourette's syndrome, OCD and autism.

Objective: To examine the relationship between frontal-subcortical neural circuits and restricted repetitive behaviors in children with autism using fractional anisotropy (FA) calculated from diffusion tensor imaging (DTI).

Design/Methods: Participants were children and adolescents with autism spectrum disorder (ASD; n = 5) and a control group of children without ASD (NC; n = 4) matched for age and IQ. The Repetitive Behavior Scale - Revised was used to characterize restricted repetitive behaviors in these children (Bodfish, Symons & Lewis, 1999). DTI images were obtained using Phillips 3T scanner (b-value=1000 sec/mm2; 16 gradient directions; matrix, 128x128; FOV 230x230 mm2) and then co-registered with high resolution 3D T1 anatomical images. Regions of Interest included the dorsolateral frontal cortex and caudate nucleus.

Results: The average FA value of fibers connecting the dorsolateral frontal cortex and caudate nucleus was decreased in children with ASD however this difference was not significant (ASD Left Hemisphere M=0.349, s.d.= 0.026 Right Hemisphere M=0.3156, s.d.= 0.0699; NC Left Hemisphere M=0.382, s.d.= 0.108 Right Hemisphere M= 0.345919, s.d.=0.0848). In children with ASD (n=4) there was an inverse relationship between the FA of fibers in both hemispheres and the lifetime presence of repetitive behaviors, however this relationship was only significant in the left hemisphere (Left Hemisphere r=-.99, p<.001; Right Hemisphere r=-.4, p=.3).

Conclusions: These preliminary results offer evidence of a relationship between the structural integrity of frontal-subcortical circuitry and ritualistic-repetitive behaviors that are seen in ASD. Additional data and analyses will offer further insight into the role that these white matter connections play in the presence of repetitive behaviors in ASD.

This research was funded by NIDCD (U19 DC 03610; Helen Tager-Flusberg, PI) and was conducted as part of the NICHD/NIDCD Collaborative Programs of Excellence in Autism.

P1A.2.8 **BRAIN VOLUME IN PARENTS FROM MULTIPLEX AUTISM FAMILIES.** J. Goldberg. McMaster University.

Twin and family studies suggest that genetic factors play a significant role in the susceptibility of autism spectrum disorders (ASD). However, despite strong heritability, linkage and association studies of ASD have yielded few replicable results. It has been argued that this is attributable to the genetic complexity of ASD

(Dawson, 2002;Szatmari, 1999) and it is suggested that instead of treating ASD as a group od categorical disorders, we should view it as a set of quantitative traits or endophenotypes.

Brain size has been proposed as a potential endophenotype of ASD (Courchesne, 2004). Studies have previously reported that the overall size of the brain is increased in ASD (Aylward, 2004); however more recent studies have shown that the overall size of the brain in subjects younger than twelve is larger and those of adult subjects significantly smaller than expected. The brain size of parents - who carry the genes for ASD - is unknown.

Objective: To compare the brain size of parents of ASD probands with a group of age and sex matched controls.

Sample: The sample consists of 18 parents and eighteen age and sex matched controls.

Method: Parents and controls underwent magnetic resonance imaging at the McMaster University Medical Centre (MUMC), Hamilton, ON. Canada. All studies were performed on a 1.5T system (GE Medical systems, Inc, Milwaukee). Images were transferred to a Toshiba 5200 Satellite Work Station and assessed further using ANALYZE (Mayo Clinic, Rochester, MN).

Results: Brain volumes of parents and controls will be compared and presented.

Supported by the National Alliance for Autism Research (NAAR).

P1A.2.9 **REGIONAL DIFFERENCES IN THE CORTICAL THICKNESS OF THE MIRROR NEURON NETWORK IN AUTISM SPECTRUM DISORDER.** N. Hadjikhani, R. Joseph, J. Syder, G. Harris and H. Tager-Flusberg. Martinos Center for Biomedical Imaging, MGH, Harvard Medical School.

Autism spectrum disorder (ASD) is associated with impaired social-emotive functioning. However, no neural substrate has been shown so far to underlie these complex behavioral impairments.

Objective: Assess the integrity of the cortical areas involved in processes of empathy, using a well-validated technique based on anatomical measures.

Design/methods: We measured the cortical thickness of 14 high-functioning male ASD adults and 14 age- and IQ-matched controls using an automated technique that generated cross-subject statistics in an anatomically-based coordinate system. The reliability and accuracy of this method has been assessed by within-subject test-retest studies, by comparison of cross-subject regional thickness measures with published values, as well as with histological and manual measurements.

Results: We found local decreases of gray matter specifically in the inferior frontal gyrus, the inferior parietal lobule and the superior temporal sulcus in ASD subjects. These areas belong to the mirror neurons system hypothesized to be at the basis of empathic behavior. We also found areas of cortical thinning in the "face area" of motor and sensory cortex that may be related to abnormalities in facial expression recognition in ASD.

Conclusions: Our findings suggest that the social and emotional deficits in ASD may have an underlying basis in the mirror neuron system.

P1A.2.10 **INCREASED DENSITY OF PARVALBUMIN LABELED HIPPOCAMPAL INTERNEURONS IN AUTISM.** Y. Lawrence, T. Kemper, M. Bauman and G. Blatt. Boston University School of Medicine.

Neuropathological studies of autistic brains have demonstrated increased neuronal packing density in the pyramidal layers of the CA and subicular subfields of the hippocampus (Bauman and Kemper, 1985). It is not known whether the GABAergic interneuronal subset of these neurons are similarly affected.

Objective: This study was conducted to quantitatively analyze the parvalbumin-positive subpopulation of GABAergic interneurons in the dentate gyrus, CA, prosubicular and subicular subfields in autistic and control cases.

Design/Methods: Five adult male autistic and five age-matched control brains were analyzed for this study. Serial sections through the body of the hippocampal were incubated with mouse polyclonal antibodies against parvalbumin (PV),(Swant, Bellinoza, Switzerland; 1:750) and visualized with an avidin biotin immuno peroxidase enchancement system 3'3-diaminobenzidine peroxidase protocol. Stereological probes were conducted via Stereoinvestigator.

Results: An overall statistically significant increased

cell packing density of PV-positive interneurons was found in the autistic brains (ANOVA, p< 0.048). Although all sampled hippocampal subfields demonstrated an increased packing density in the autistic brains, only the CA1 (t-test, p< 0.008) and CA3 (t-test, p< 0.048) subfields reached significance.

Conclusion: Increased neuronal packing density of PV interneurons appears to be a shared feature with the total neuronal population of these hippocampal fields, suggesting that both are responding to the same unknown pathological process. Current studies are investigating the neuronal density of other GABAergic subpopulations.

Tissue was provided by the Harvard Brain Tissue Resource Center, the Autism Tissue Program via the M.I.N.D. Institute, and the University of Miami Brain Bank. Supported by NINDS NS38975-05.

P1A.2.11 **STRUCTURAL INTEGRITY OF LANGUAGE AREA CONNECTIONS IN AUTISM.** K. Lindgren, R. Joseph, T. Knaus, K. Dominick, N. Shaffer, A. Silver, D. Kim and H. Tager-Flusberg. Lab of Developmental Cognitive Neuroscience, Boston University School of Medicine.

Objective: To investigate differences in white matter connectivity between language regions in autistic and typically developing children using fractional anisotropy (FA) calculated from diffusion tensor imaging (DTI).

Design/Methods: Participants included 5 children with ADI- and ADOS-confirmed diagnoses of autism and 4 age- and IQ-matched controls aged 9-18 years. DTI scans were acquired using conventional parameters (b-value=1000 sec/mm2; 16 gradient directions; matrix, 128 x 128; FOV 230x230 mm2) on a 3.0T magnet and were coregistered with high-resolution three-dimensional T1-weighted images. ROIs were identified a priori on anatomical images (Broca's area = left pars opercularis and pars triangularis, Wernicke's area = left posterior superior temporal gyrus). Fiber tracking between these areas was performed with a minimum FA of 0.1. Verbal and nonverbal IQ scores were compared to the obtained FA values.

Results: The FA of fibers connecting Broca's and Wernicke's areas was lower (t(7)=1.43, p < 0.10) in the autism group than in the control group. There was also a relationship between FA and VIQ (r = 0.58) but not NVIQ (r = -0.14) in the autism group.

Conclusions: These preliminary findings suggest that white matter connecting language areas is structurally more intact in typically developing children than in autistic children. In addition, the association between VIQ and FA in the autistic group suggests a relationship between linguistic ability and white matter connectivity between frontal and posterior language regions. Additional data and analyses will provide more insight into the significance of these findings for language impairments in autism.

This research was funded by the National Alliance for Autism Research, the Nancy Laurie Marks Family Foundation, and NIDCD (U19 DC 03610; Helen Tager-Flusberg, PI) and was conducted as part of the NICHD/NIDCD Collaborative Programs of Excellence in Autism.

P1A.2.12 **STRUCTURAL MAGNETIC RESONANCE IMAGING OF THE MIDSAGITTAL VERMIS IN AUTISM SPECTRUM AND BIPOLAR DISORDERS.** J. Marble, J. Day, J. Hamstra, S. Chiu, G. Voelbel, M. Bates, G. Pandina and R. Hendren. UC Davis MIND Institute.

Objective: The vermis of the cerebellum has been implicated in several diagnoses with sensory involvement including autism. The cerebellar area of the midsagittal vermis and its three distinct lobules: anterior (vA) [lobules I-V], superior-posterior (vSP) [lobules VI-VII], and inferior-posterior (vIP) [lobules XIII-X] were studied using structural magnetic resonance imaging (MRI) on children between 7 and 13 years, both males and females, with autism spectrum disorder (ASD) [n =38], bipolar disorder (BD) [n=17], and age-matched controls (n=18).

Design/Methods: Cerebellar vermis area and lobules were manually traced using methods developed by David Amaral's laboratory (0.98 interrater reliability), housed at UC Davis, using ANALYZE. Analysis of variance (ANOVA) examined diagnostic group differences in vermal lobes. Diagnostic groups were additionally partitioned for two exploratory analyses: 1) ASD, BD, and controls; and 2) ASD without comorbid BD (ASD-BD), ASD plus comorbid BD (ASD+BD), BD, and controls.

Results: A significant main effect was found for the midsagittal area of the vIP ($F=3.24$, $p<0.05$). ASD showed an increase in vIP, outliers included (n=1), with and without females (N=11). ASD-BD also had a significant increase in vIP ($F=3.36$, $p<0.05$) relative to ASD+BD, BD, and controls with and without outliers; however, no significant main effect remained after females were excluded. No significant main effect remained for any analysis after controlling for total brain volume (TBV).

Conclusion: Structural cerebellar differences may be implicated with ASD; however, these results are inconsistent with previous findings. Future endeavors in cerebellum and vermis research are needed to better understand vIP involvement in neurodevelopmental disorders.

P1A.2.13 **AMYGDALA VOLUME AND VISUAL FIXATION OF FAMILIAR AND UNFAMILIAR FACES IN INDIVIDUALS WITH AUTISM.** B. Nacewicz, K. Dalton, M. Long, E. McAuliff, M. Nersesian, T. Oakes, A. Alexander and R. Davidson. Waisman Laboratory for Brain Imaging and Behavior, University of Wisconsin, Madison.

Radiologic and post-mortem studies have indicated abnormalities in medial temporal lobe structures, including the amygdala, in autism. Previous work from our lab indicates a possible link between amygdala activation and gaze-fixation. The relationship between amygdala volume and autistic behavioral phenotype is currently unclear.

Objective: It is the goal of this study to relate amygdala volume differences in individuals with autism to gaze-fixation and the processing of familiar and unfamiliar faces.

Design/Method: Structural MR images were acquired from 14 male individuals with autism, aged 8-25 (8 with IQ > 70), and 14 neurotypical male controls. A subset of participants completed an fMRI component with accompanying eye-tracking measurements. Participants were presented with 40 images of objects and human faces, half familiar, half unfamiliar.

Results: On average, individuals in the autism group have smaller amygdalae than controls. In the control group but not the autism group, amygdala volume is positively correlated with age. While the time spent fixating faces is not significantly different between groups, amygdala volume correlates with face-fixation time only in the autism group. The direction is such that those individuals with small amygdalae show the least face-fixation. Amygdala volume predicts time to recognize faces, but not objects, as familiar for both groups; smaller amygdalae indicate shorter judgement time.

Conclusions: Decreased amygdala volume in individuals with autism predicts decreased fixation of faces. As amygdala volume relates similarly to task performance, the relationship to face-fixation might represent avoidance due to unpleasant arousal to social stimuli.

Funded by STAART grant U54MH066398 awarded to H. Tager-Flusberg (PI) and R.J. Davidson and a NARSAD Distinguished Investigator Award to R.J. Davidson

P1A.2.14 **CORTICAL SHAPE DIFFERENCES IN LOW FUNCTIONING AUTISM.** C. Nordahl, I. Mostafavi, D. Hanlon, C. Schumann, D. Amaral and D. VanEssen. The M.I.N.D. Institute, UC Davis.

Objective: To investigate potential abnormalities in cortical shape in low functioning autism.

Methods: We used surface-based analyses of structural MRIs to examine cortical shape characteristics in a group of low functioning autistic children, aged 7-12 (n=8) and a group of age-matched controls (n=8). Cortical surfaces and sulcal depth maps were generated using SureFit software and then flattened and registered to an averaged population atlas using Caret software. For a global analysis of general differences in cortical shape characteristics between groups, we cross-correlated the registered individual sulcal depth maps (node by node) and applied multi-dimensional scaling to the cross-correlation matrices. We also generated average sulcal depth maps for each group and created difference maps to localize between-group differences.

Results: Our results suggest that there are pronounced group differences in cortical shape in both hemispheres. Preliminary regional analyses suggest that differences occur in several regions, including left parietal and dorsal temporal cortex and right frontal cortex.

Conclusion: These preliminary findings indicate that

surface-based morphometry is a valuable approach for analyzing cortical shape abnormalities in autism. Additional analyses will include comparisons to a high functioning autism group and an Asperger syndrome group. In addition, a wider range of ages will be examined to see if these changes persist over time.

Supported by Human Brain Project grant R01 MH60974 (NIMH/NSF/NCI/NLM/NASA) and the UC Davis M.I.N.D. Institute

P1A.2.15 **CORTICAL NEURONS ARE MORE NUMEROUS IN AUTISM.** S. Palmen, P. Hof, H. Heinsen, H. Steinbusch, H. van Engeland and C. Schmitz. Rudolf Magnus Institute of Neuroscience, Department of Child and Adolescent Psychiatry, University Medical Center Utrecht.

Objective: Autism is a neurodevelopmental disorder, with an unknown underlying neuropathologic basis. Reports of increased head circumference, brain volume, and cell packing density, however, suggest increased cortical neuron number. For the first time, we set out to investigate cortical neuron number and density in autism.

Methods: Using high-precision design-based stereology, whole postmortem hemispheres of 6 autistic patients (12.3 ± 3.4 years old) and 6 age-matched controls (12.8 ± 3.8 years old) were investigated. Cortical neuron number and density as well as volume of cortical gray matter, subcortical gray matter, and cerebral white matter were measured.

Results: Autistic patients showed almost no differences in mean volumes of cortical gray matter, subcortical gray matter, white matter and whole hemisphere compared to controls ($p > 0.8$ for all measurements). In contrast, the autistic patients had significantly higher mean total neuron numbers in the cerebral cortex than the controls (19% increase, $p = 0.031$). The autistic patients had higher mean overall cortical neuron densities than the controls as well (on average 29% increase), which however did not reach significance due to interindividual variability ($p = 0.063$).

Conclusion: We demonstrated, for the first time, a significant increase in total neuron numbers in the cerebral cortex of autistic patients compared to age-matched controls. This increase was mainly due to the difference within the youngest pair, which points to an early insult. The present finding represents a crucial step towards a better understanding of the pathophysiologic mechanisms underlying the possible abnormal development of neural systems in autism.

P1A.2.16 **STEREOLOGICAL STUDY OF THE NUMBER AND SIZE OF NEURONS IN THE PRINCIPAL OLIVE IN AUTISM.** S. Thevarkunnel, M. Bauman, T. Kemper and G. Blatt. Boston University School of Medicine, Department of Anatomy and Neurobiology.

Previous studies in the autistic bran have reported a reduced number of Purkinje cells and cytoarchitectonic abnormalities in the synaptically related principle olive (PO).

Objective: To assess the total number of neurons and neuronal size in the PO of the inferior olivary complex in adult male autistic and control brains.

Design/Methods: Five autistic and five control brain stems were cut in 50µm thick serial sections with one series stained with cresyl-echt violet. Neurons were counted with a 60X oil immersion objective lens utilizing the optical fractionator probe. Cell surface size was measured with the Surfactor probe.

Results: No significant differences were found in total neuronal number or size in the autistic brains when compared to controls. The mean number of neurons in the autistic brains was 661, 000 and in controls was 691, 000 ($p=0.76$). The mean surface area of neurons in the autistic brains was 1679.2 um2 and in controls was 1644.4 um2.

Conclusion: The preservation of total number of neurons in the PO is consistent with previous qualitative assessments and supports the observation that the decreased number of Purkinje cells in the cerebellum is not associated with loss of olivary neurons. These observations suggest that if Purkinje cells are lost, that this occurs before birth. After birth the tight synaptic relationship of the PO with the Purkinje cells leads to loss of PO neurons.

Tissue was provided by the Harvard brain Tissue Resource Center and the Autism Tissue Program including the University of Maryland Brain Bank.

P1A.2.17 **QUANTITATIVE ANALYSIS OF CEREBELLAR BASKET AND STELLATE CELLS IN AUTISM.** E. Whitney, T. Kemper, M. Bauman and G. Blatt. Boston University School of Medicine.

Objective: This study was designed to quantify basket cells (BCs) and stellate cells (SCs) in the autistic cerebellum.

Design/Methods: Serial sections from the posterolateral cortex in 4 control and 6 autism brains were immunostained for parvalbumin and counted using stereological principles. Data are expressed as the number of BCs and SCs/mm3and as the number of BCs and SCs per number of Purkinje cells (PC) in the same area.

Results: There was no statistically significant difference in density of BCs or SCs between the autism and control groups with P=.26 and P=.91, respectively and no significant difference in the #BCs/PC or #SCs/PC between the autism and control groups with P=.61 and P=.76, respectively (Mann-Whitney U statistical test). When the data was recalculated for variability in molecular layer width, using the mean molecular layer width from control cases, there continued to be no statistically significant difference in BC and SC density with P=.11 and P=.26, respectively. Similarly, when data was recalculated for variability in PC number (#PCs/mm), using mean #PCs/mm from control cases, there continued to be no statistically significant difference between the two groups, with P=.35 and P=.76, respectively.

Conclusions: A normal number and density of BCs and SCs was observed in all 6 autism cases despite a reduced number of PCs in 3 cases. The preservation of BCs and SCs in the presence of reduced PC numbers suggest that PCs were generated, migrated to their proper location in the PC layer and subsequently died sometime after 32 weeks gestation. This research is supported by: NAAR, NIH NICHD (grant #:1R01HD39459-03)

P1A.2.18 **THE OLIVOCEREBELLAR PROJECTION IN AUTISM: USING THE INTERMEDIATE FILAMENT PROTEIN PERIPHERIN AS A MARKER FOR CLIMBING FIBERS.** J. Yip, R. Marcon, T. Kemper, M. Bauman and G. Blatt. Boston University School of Medicine, Department of Anatomy and Neurobiology.

Immunocytochemical staining for the intermediate protein peripherin has been used to label olivocerebellar climbing fibers, spinocerebellar and vestibulocerebellar tracts.

Objective: To immunolabel olivocerebellar climbing fiber innervation to Purkinje cells and to the dentate nucleus.

Design/Methods: Immunolabeling of peripherin was performed in the posterolateral cerebellar cortex and to the dentate nucleus in 6 adult autistic and 6 age-matched control brains. The avitin-biotin complex (ABC) method was utilized with diaminbenzidine (DAB) as a chromogen. Camera lucida drawings of the density and distribution as well as density measurements in the white matter near the dentate nucleus were performed.

Results: Olivocerebellar climbing fibers innervation of Purkinje cells in the autistic brain is similar to that found in controls. Both show an extensive branching pattern around the primary dendrites as well as to neighboring Purkinje cells. Peripherin-positive fibers near the dentate nucleus appear in more dense bundles in controls and are highly organized. In most autistic brains, however, the fibers are disorganized and appear less dense. Peripherin-positive fibers innervate dentate neurons in both autistics and controls.

Conclusion: This method presents a unique approach to understanding the target innervation of olivocerebellar climbing fibers in autism. Disarray in peripherin-positive innervation to the deep nuclei may contribute to altered olivocerebllar function in autism. Further analysis is ongoing and will be presented.

Tisuue was obtained from the Harvard Brain Tissue Resource Center and the Autism Tissue Program. Supported by grant NIH NICHD # HD39459-03.

## Poster Session 1B: Topic 1

### *Basic Science, Psychopharmacology & Population Approaches*

P1B.1.1 **LEVELS OF CLUSTERIN AND ±-1-MICROGLOBULIN IN PLASMA OF AUTISTIC CHILDREN.** H. Aposhian, A. van Tilburg, R. Zakharyan, M. Thomas, U. Chowdhury and P. Haynes. The University of Arizona.

Objective: To identify protein biomarkers in plasma of autistic children both for more accurate diagnosis of autism and to aid in deciphering the etiology of this disorder.

Design/Methods: Differential In-Gel Electrophoresis (DIGE) has been used to examine plasma proteins of autistic children. The major advantage of DIGE is that multiple samples, each labeled with a different fluorescent dye, can be run simultaneously on the same two-dimensional protein gel to provide accurate protein quantitation between samples. The differentially expressed protein spots are excised and identified using nanoLC-MS/MS in conjunction with protein database searching. We have analyzed blood and urine from autistic children, including twins, triplets, and quadruplets, as well as control non-autistic children.

Results: The DIGE results showed a 40-fold increase in a clusterin isozyme and a 26-fold increase in an ±-1-microglobulin isozyme of an autistic twin when compared to that of their non-autistic twin. In another set of twins, both autistic, there was only a 3.3-fold increase of clusterin and a 3.2-fold increase in ±-1 microglobulin in one twin compared to the other. Studies of other autistic children indicate clusterin and ±-1-microglobulin levels were high. As yet, no protein has been found that has a plasma concentration lower in the autistic twin compared to the non-autistic one. Metal analysis by ICP-MS of the urines of autistic children is also being performed.

Conclusion: Study of plasma proteins of autistic and non-autistic children is showing differences.

Supported in part by Defeat Autism Now Foundation.

P1B.1.2 **ALTERED CYTOKINE PROFILE IN CHILDREN WITH AUTISTIC SPECTRUM DISORDER (ASD): EVIDENCE FOR IMMUNE DYSREGULATION.**
P. Ashwood, C. Kwong, J. Schauer, M. Cress and J. Van De Water. Paul Ashwood.

There is increasing evidence of immunological abnormalities in children with ASD. Evidence has been shown for both increased autoimmunity and deficits in the immune response. To better define the immune status of children with ASD, we examined the cytokine profiles of patients and age matched typically developing controls following mitogen and recall antigen stimulation. PBMC were isolated and cultured for 48 hours in the presence of media alone, PHA, LPS, and vaccine antigens from tetanus and MMR. Luminex analysis of cytokines and chemokines was performed on the supernatants of 26 ASD children and 23 controls. All patients were up to date for their vaccinations. In contrast to previous studies, baseline cytokine levels were similar in ASD children and typically developing controls. Following stimulation with PHA, patients with ASD had significantly lower IL-2, IL-6, IL-10 and IL-12p40 ($p<0.02$) than typically developing controls. Moreover, there were increased IL-13 and GM-CSF levels in the ASD group. Stimulation with tetanus resulted in lower IFNgamma, IL-1beta, IL-10, TNFalpha and GM-CSF ($p<0.03$) in ASD children compared with controls. In contrast, for LPS, both IL-10 and IL-12 and the chemokines MIP-1alpha and MIP-1beta were significantly lower in ASD children ($p=0.03$). There were no differences between the groups following stimulation with MMR. In conclusion, following stimulation, cytokine responses in ASD children were significantly altered compared with age matched controls and may be indicative of an immune dysregulation in these children.

P1B.1.3 **THE ASSOCIATION OF HLA-A2 WITH AUTISTIC DISORDER IN CAUCASIAN SUBJECTS.**
T. Sweeten, A. Cutler, J. Odell and A. Torres. Utah State University.

Using case-control studies our laboratory has consistently found an association between certain human leukocyte antigen (HLA) genes on chromosome 6p and autistic disorder (autism), yet numerous genome-wide screens using sib-pair linkage analysis fail to substantiate involvement of this genomic region. However, the history of immunogenetic researcher has shown that sib-pair designs are ineffective at detecting HLA involvement in various diseases (i.e. thyroid disease) where significant HLA associations have been established by other methods.

Objective: To determine the frequency of HLA-A and -B alleles in autistic subjects compared to controls. Molecules from these class I genes are involved in presenting antigens to T cells.

Design/Methods: DNA was obtained from 111 Caucasian autistic subjects who meet DSM-IV criteria

for autism as confirmed by the ADOS and ADI. Subjects were obtained from Utah, Portland and the Autism Genetic Resource Exchange (AGRE). HLA class I genetic typing was done by polymerase chain reaction-site specific primer methodology. Class I allelic frequencies from a group of 265 Caucasian subjects who participated in the National Marrow Donor Program were used as controls.

Results: After correction for multiple comparisons the frequency of HLA-A2 alleles was increased in autistic subjects compared to controls (p = .0057). No group differences were found for HLA-B alleles. The HLA A2-B44 haplotype tended to be increased in autistic probands (p = 0.089).

Conclusion: These findings are consistent with a previous preliminary study suggesting an association between HLA-A2, or a nearby gene in linkage disequilibrium with HLA-A2, and autism.

This work was supported by NICHD Grant P01 HD35476 and PHS Research Grant M01-RR00064.

P1B.1.4 **FREE PLASMA SEROTONIN IN AUTISM.** S. Connors, K. Matteson, G. Sega, C. Lozzio and A. Zimmerman. Kennedy Krieger Institute.

Serotonin is necessary for normal fetal brain development. Maternal free plasma serotonin (FP5HT) crosses the placenta and is detected in fetal (rat) brain (Koren 1966). Low FP5HT in mothers may contribute to abnormal brain development in autism: administration of 5HT inhibitors to pregnant rats results in offspring with abnormal behaviors, brain morphology and 5HT receptor numbers (Butkevich 2003).

Levels of FP5HT in autistic adults are low compared to controls (Spivak 2004), and correlate between patients with autism and first-degree relatives (Cook 1988). No studies have included controls for relatives.

Objective: Measure and compare FP5HT in children with autism and relatives; compare FP5HT in autism mothers to control mothers.

Design/Methods: Plasma serotonin levels were measured by HPLC: Zorbax SB-C18 column, and fluorescence detection of eluted peaks. We analyzed FP5HT in 17 autistic children, their mothers, fathers and siblings. Levels in the autism mothers were compared to mothers of typically developing children. We also measured FP5HT in a larger group of children with autism (N = 58), and compared them to children with ADHD and Developmental Delay (DD).

Results: FP5HT levels correlated between autism mothers and their children, and differed between autistic children and their fathers (p = 0.028), and siblings (p= 0.063). FP5HT levels in autism mothers were lower than mothers of normal children (p = 0.002). There was no difference between FP5HT in children with autism compared to children with ADHD or DD.

Conclusion: Low maternal free plasma serotonin may be a risk factor for the development of autism.

Supported by East Tennessee Chapter, Autism Society of America

P1B.1.5 **AGE OF MENARCHE IN WOMEN WITH AUTISM SPECTRUM CONDITIONS.** R. Knickmeyer, R. Hoekstra, S. Wheelwright and S. Baron-Cohen. The Autism Research Centre.

At the cognitive level, autism may be an extreme form of the male brain. Typical males score lower on empathy measures and higher on systemizing measures. Individuals on the autistic spectrum show empathy impairments alongside hyper-systemizing. Such sex differences are associated with levels of fetal testosterone (FT), suggesting that elevated FT may be a risk factor for autism. The present study examines the pattern of puberty in females with autism spectrum conditions (ASCs). If higher FT delays puberty in typical females, and if FT is elevated in individuals with ASCs, then puberty is predicted to be significantly delayed in females with an ASC.

Objectives: To determine whether the age at menarche is different in females with autism spectrum conditions (ASCs) compared to non-clinical controls. Methods: 38 women with ASCs and 38 age-matched control women were asked when they had their first period.

Results: The mean age at menarche was later in the women with ASCs compared to controls (13.3 vs. 12.6 years).

Conclusions: Onset of menarche is delayed in women with ASCs. This is compatible with the hypothesis that exposure of the brain to high FT increases the risk of ASCs, but could also reflect differences in nutritional status, medication, and other variables relevant to pubertal development in women

with ASCs. Further research into the pattern of pubertal development in ASCs could be important for understanding the biological basis of the condition and would provide valuable information for parents and those who work with pre-pubertal and pubertal children with ASCs.

## Poster Session 1B: Topic 2

### *Verbal & Nonverbal Communication*

P1B.2.1 **PARENT PERCEPTION OF MOOD RELATED MOVEMENT AS A FUNCTION OF OVERALL LEVEL OF SPEECH.** R. Abramson, A. Hall, S. Ravan, H. Cope, J. Gilbert, M. Cuccaro, H. Wright and M. Pericak-Vance. Department of Neuropsychiatry.

Repetitive behaviors and stereotypies in children with Autistic Disorder (AD) may be influenced by mood. There are few reports of level of speech on parent report of irritability, stereotypy and hyperactivity.

Objective: To assess the relationship between level of speech, parent report of irritability, stereotypy and hyperactivity on the Aberrant Behavior Checklist (ABC), and Autism Diagnostic Interview-Revised (ADI-R) Factor 1 Repetitive Motor and Stereotyped Behavior (RMSB) (Cuccaro, 2003).

Methods: Participants (n=81) were drawn from the Duke/USC molecular study of AD. Diagnoses were confirmed by the ADI-R and medical records. The ABC was completed for each individual. Using Discriminant Function Analysis with level of speech (question 19, ADI-R) as the grouping variable, the irritability, stereotypy, and hyperactivity subscale scores from the ABC were combined to create a new factor of "mood related movement" F-MRM. On this factor, the variables loaded in the following manner, Irritability = 0.697, Stereotypy = -0.270, and Hyperactivity = 0.58.

Results: Discriminant scores for F-MRM for children with useful speech (n=61) were significantly higher (t=3.042, df=79, p=0.003) than for children with no useful speech (n=20). Pearson Correlation was negative(r= -0.237, p=0.033, n=81) for F-MRM and RMSB, and absent for ADI Factor 2 Insistence on Sameness.

Conclusions: Useful speech may influence parent report of irritability, stereotypy and hyperactivity as captured by F-MRM. As F-MRM increases, RMSB decreases. Overall level of speech may be an important factor in parent perception of mood related movement.

P1B.2.2 **CONTEXT AND READING IN INDIVIDUALS WITH AUTISM: AN MEG STUDY.** B. Ahtam, A. Bailey, S. Swithenby and S. Braeutigam. Oxford University, University Section of Child and Adolescent Psychiatry.

Individuals with autism often show weak central coherence and experimental studies have shown that affected individuals tend not to use sentence context spontaneously to guide the pronunciation of words that have several meanings.

Objective: To use magnetoencephalography (MEG) to examine the neural basis of abnormalities in sentence context effects in individuals with an ASD.

Design/Methods: Whole-head MEG was used to study the neural responses in 6 adults with autism and 11 normally developing adults. Participants read sentences ending in a homograph. Each sentence biased the less common meaning of the homograph, which was followed by a probe word. The probe word either related to the meaning of the sentence (subordinate) or the most common meaning of the homograph (dominant). The words in each sentence were presented sequentially (200 ms word display, 500 ms separation). The probe followed the sentence's final homograph either immediately (200 ms) or after a delay of 700 ms. All participants in this study gave written informed consent before the experiment (Helsinki Declaration).

Results: MEG revealed a specific N400-like evoked component in individuals with autism between 390 and 450 ms after the onset of delayed probe words. This component was larger in amplitude for subordinate probes compared to dominant probes over right superior temporal and parietal regions. No such effect was found in control subjects.

Conclusions: This indicates abnormalities in the persistence over time of the meaning of words in individuals with autism. These abnormalities may affect the processing of words in the context of a sentence.

Funding: MRC, Welton Foundation

P1B.2.3 **IMPORTANCE OF CONTEXTUAL CUES FOR SPEECH-IN-NOISE PROCESSING IN AUTISM.** J. Alcántara, E. Weisblatt, C. Clarke, M. McLaughlin, N. Minakaran and B. Moore. University of Cambridge.

Individuals with autism have poorer-than-normal speech-in-noise perception abilities as measured on a standardised sentence speech test (Alcántara et al., 2004).

Objective: To determine whether the previously measured speech-in-noise deficit is due to a reduced ability to make use of contextual cues available in running speech to disambiguate difficult-to-hear speech.

Method: Speech reception thresholds (SRTs), defined as the signal-to-noise ratio required for 50% of speech to be correctly identified, were measured for a group of autistic individuals and age/IQ-matched control participants, using five different types of background noises, and two types of speech stimuli: everyday sentences and vowel-consonant-vowel nonsense syllables; the latter being devoid of contextual cues. All testing was conducted in a non-reverberant sound-attenuating chamber.

Results: SRTs for the autistic individuals were significantly higher (i.e. poorer) than for the control participants, for all background noises, and for both the sentence and nonsense syllable tests.

Conclusions: The speech-in-noise perception deficit observed in autistic individuals is not due to a reduced ability to make use of contextual cues available in speech.

References: Alcántara, J. I., Weisblatt, E. J., Moore, B. C. J., and Bolton, P. F. (2004). "Speech-in-noise perception in high-functioning individuals with autism or Asperger's syndrome," J. Child Psychol. Psychiat. 45, 1107-1114.

P1B.2.4 **LONGITUDINAL PATTERNS OF GROWTH IN LANGUAGE ABILITIES AMONG CHILDREN WITH AUTISTIC SPECTRUM DISORDER.** D. Anderson, C. Lord and S. Heinz. University of Michigan Autism and Communication Disorders Center (UMACC).

Introduction: Though language impairment is a defining feature of Autistic Spectrum Disorders, little is known about the long-term trajectories of language development in autism, nor the heterogeneity of outcomes within ASD populations.

Objective: to longitudinally examine the rate and pattern of growth in language abilities between the ages of two and nine years for various diagnostic subgroups.

Design/Methods: Language outcome was assessed at approximately ages 2, 3, 5, and 9-years in a sample of 209 children with a clinical diagnosis of autism (n=99), PDD-NOS (n=59), or nonspectrum developmental disabilities (n=51) at age 2. Age equivalents were obtained at each wave from normed verbal ability instruments appropriate to the child's developmental level. Growth curve analyses using SAS proc mixed were conducted in order to analyze language trajectories over time.

Results: Nonverbal IQ at age 2 emerged as a strong positive predictor of language outcome. The gap between children with autism and the other two diagnostic groups widened with time as the language abilities of the latter groups improved at a higher rate. The gap was noticeably more pronounced when age 9 diagnosis and nonverbal IQ were used as predictors. However, both ASD groups improved at a steady rate through age 9, with only the nonspectrum group beginning to level off. Though underrepresented, some children with autism were among the most improved and were more likely to undergo a change in diagnosis to PDD and an increase in nonverbal IQ than the least improved children with autism.

This study was supported by grants from NIMH #MH46865 and NICHD #HD35482.

P1B.2.5 **EVIDENCE FOR INTACT SYNTACTIC REPRESENTATION DESPITE IMPAIRED SEMANTIC INTEGRATION IN CHILDREN WITH AUTISM.** K. Boser and B. Gordon. Johns Hopkins University, School of Medicine.

Children with autism (CwA) have demonstrated sentence-level semantic impairments, but evidence for syntactic deficits is controversial. This controversy continues because syntactic and semantic factors are difficult to separate. To disentangle these, we created a semantic anomaly judgment-task, varying syntactic markedness. For example, a salient non-subject topic noun in the subject position is syntactically marked and

also requires delayed semantic integration ("Rocks grew..." ). In contrast, immediate integration, when the noun follows the verb ("They grew rocks..."), is syntactically unmarked. Both immediate and delayed adjective anomalies are unmarked for topic salience ("..the hot milkshakes." vs. "The milkshakes were hot..."). In semantically impaired subjects, delayed integration is associated with worse performance than immediate, particularly with intervening words ("The hot tasty..").

Objective: To determine if syntactic markedness aids detection of semantic anomalies in CwA.

Design: We studied 7 CwA and 7 typically developing controls (TDCs), ages 11-14, using a sentence semantic anomaly judgment-task. The task was balanced for: 1) semantic anomaly (+/-); 2) grammatical type (noun/adjective); 3) semantic integration (immediate/delayed); and 4) load (1 or 3 intervening words). Subjects decided if the auditory sentence made sense.

Results: As expected, CwA performed worse than TDCs for adjective anomalies, showing an interaction between load and delay. However, CwA performed comparably to controls with delayed noun anomalies, regardless of load.

Conclusions: CwA demonstrated semantic impairments for comprehension of sentences with unmarked syntax. However, the syntactic feature of topic salience, occurring only in delayed noun anomalies, allowed subjects to use intact syntactic representations to correctly interpret meaning.

P1B.2.6 **INVESTIGATING LINGUISTIC PROCESSING IN AUTISM USING LANGUAGE-MEDIATED EYE-MOVEMENTS.** J. Brock, K. Kinsey and K. Nation. Department of Experimental Psychology, University of Oxford.

Language and communication difficulties are core features of autism. However, for practical reasons, most research on language in autism has concentrated on the minority of individuals with autism who actually have relatively good language. Consequently, we have little knowledge of the underlying causes of language difficulties in autism.

In our current project, we are using eye-tracking technology to investigate on-line language processing in autism. Research in non-autistic populations has shown that concurrent spoken language leads to automatic eye-movements to corresponding items in a visual-display. Moreover, participants are quicker to make eye-movements towards the object of a sentence when it is predicted by sentential context, but are slower if competing items in the visual display are phonologically similar. By adapting these paradigms, we aim to investigate two hypotheses: (1) that individuals with autism have difficulties in processing context during language comprehension; and (2) that language disorder in autism has a similar underlying cause to that in specific language impairment.

To date, eye-tracking studies in autism have been restricted to older and more able individuals. However, the recent development of remote eye-trackers now allows the use of eye-tracking measures to investigate language, cognition, and perception even in very young or low-functioning individuals with autism. We will discuss our solutions to various methodological challenges and present preliminary data from studies using this technology to investigate linguistic processing across the autistic spectrum.

P1B.2.7 **PROSODY AND LANGUAGE IN CHILDREN WITH AUTISM.** L. Carroll, J. McCann, S. Peppe, F. Gibbon, A. O'Hare and M. Rutherford. Queen Margaret University College.

Disordered communication is a diagnostic feature of autism. As part of this, it is widely reported that many individuals with autism present with disordered expressive prosody. However, prosody has received little attention and those studies that have addressed prosody in autism have not examined its relationship to other aspects of communication or to cognitive theories of autism.

Study Objectives: To investigate the prosody and language skills of 31 children with high-functioning autism (HFA) aged 6-13 years and a control group of 72 typically-developing children matched for verbal mental age.

Methods: All of the children completed a new procedure (PEPS-C) for assessing receptive and expressive prosody and a measure of receptive vocabulary. The children with autism completed a further battery of speech, language and non-verbal

assessments.

Results: The children with HFA performed significantly poorer on the assessment of prosody than typical children and prosody correlated highly with receptive and expressive language. The language skills of the children with HFA were variable but most had major difficulties in this area. Contrary to previous research, this difficulty was particularly severe for expressive language.

Conclusions: We will discuss the language profiles of children with HFA and the relationship between language and prosody. We will make some suggestions about why prosody might be particularly vulnerable in children with autism by discussing possible connections with theory-of-mind skills. Furthermore, we will present plans for longitudinal research with these children focusing on theory-of-mind and prosody. This project was funded by the Scottish Health Executive's Chief Scientist Office.

P1B.2.8 **ACOUSTIC AND PERCEPTUAL ANALYSIS OF PROSODY IN HIGH-FUNCTIONING AUTISM.** J. Diehl, D. Watson, J. McDonough, C. Gunlogson, E. Young and L. Bennetto. University of Rochester.

The speech of individuals with high-functioning autism (HFA) has been described as pedantic, but there is a paucity of research on prosodic characteristics in this population.

Objective: Examine prosodic characteristics in HFA by analyzing narratives using computerized acoustical pitch analysis and perceptual ratings from developmental linguists.

Design/Methods: Participants included 17 children with HFA and 17 typically-developing controls matched on age, gender, IQ, and receptive/expressive language abilities. Narratives were standardized story retellings to a naïve listener. The narratives were acousticaly analyzed using Praat. In addition, 5 developmental linguists, blind to group membership, rated characteristics of prosody (e.g., rate, intonation) for a randomized selection of 10 narratives (5 from each group, matched on the same variables as above). The raters listened to the narratives in two conditions: as recorded, and with the speech stream filtered to remove the frequencies of the first three vowel formants and the formant transitions, resulting in speech where only prosody was recognizable.

Results: A one-way ANOVA revealed that children with HFA had a significantly higher average standard deviation of f0, $F(1,32)=4.258$, $p<.05$. Additionally, raters were significantly more likely to rate narratives in the HFA group as atypical in the prosody only condition, $F(1,9)=5.39$, $p<.05$, but not in the unfiltered condition. The raters' descriptive accounts of prosody indicated that children with HFA had variable, choppy, and uneven intonation.

Conclusion: Results indicate that children with HFA exhibit atypicalities specific to prosody use that are detectable at both the acoustic and perceptual levels.

Supported by NIH PO1 HD35466.

P1B.2.9 **A COMPARISON OF GENERALIZED TREATMENT GAINS FOR PIVOTAL RESPONSE TRAINING (PRT) AND THE PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS).** R. Gutierrez, L. Schreibman, A. Stahmer, R. Koegel and L. Koegel. UCSD Autism Research Program.

Objectives: To compare generalization of communication skills in children with autism receiving either Pivotal Response Training (PRT) or The Picture Exchange Communication System (PECS).

Methods: Minimally verbal children with autism, ages 2-4 years, were randomly assigned to either a PECS or PRT condition. Both interventions target motivation to teach communication, however PRT focuses on verbal communication, and PECS involves an augmentative system. Families in each condition received 106 hours of parent education, and 182 hours of therapist-implemented intervention. Each parent/child dyad participated in a laboratory observation, conducted in an unfamiliar setting with unfamiliar toys, before treatment, after treatment and at follow-up. Videotapes of these observations were coded for social and communicative initiations, use of the communication system, complexity of communication, joint attention and disruptive behavior.

Results: Preliminary results for 10 children indicate both groups made significant progress in language and communication, which generalized to the novel setting. Children in both groups gained verbal language at similar levels and used their communication system in

the generalization setting. Parents were more likely to use PRT in the generalization setting. Children in the PECS group had higher social initiation.

Conclusions:. Both PECS and PRT are useful for increasing communication skills in young children with autism. Importantly, PECS, in most cases, was accompanied by increases in spoken language indicating that augmentative communication is not likely to inhibit language development. PRT may be more easily adapted by families. Examination of specific treatment characteristics that may affect generalization of skills are discussed.

This study is NIMH funded.

P1B.2.10 **LANGUAGE, READING AND SPELLING SKILLS IN CHILDREN WITH DEVELOPMENTAL DISABILITIES.** D. Jacobs and A. Richdale. RMIT University.

Study Objectives: To compare and contrast the language, reading and spellings skills of children diagnosed with a High-Functioning Autism Spectrum Disorder, Specific Language Impairment or Specific Reading Disability to typically developing peers.

Methods: Participants completed a range of assessments. Cognition was assessed via the Wechsler Abbreviated Scale of Intelligence. Language was examined using the Clinical Evaluation of Language Fundaments - Third Edition, the Peabody Picture Vocabulary Test - Third Edition and the Expressive Vocabulary Test. Phonological processing was tested using the Comprehensive Test of Phonological Processing and the Sutherland Phonological Awareness Test. Reading was assessed using the Woodcock Reading Mastery Test - Revised and the Neale Analysis of Reading - Third Edition. Spelling was tested via the British Spelling Test and the South Australian Spelling Test.

Results: Typically developing children performed in advance of other groups for all tasks except performance IQ. Children with SLI performed poorest on tasks assessing language. The SLI and SRD groups did not differ on reading or spelling activities. Phonological processing skill results were variable. The SLI group performed poorest on phonological memory; the SRD group poorest on rapid naming. Despite exhibiting language skill difficulties HFASD children were not different to controls on tasks assessing literacy.

Conclusions: The HFASD children did not demonstrate advanced visual memory skills. Neither language nor visual memory predicted literacy level in HFASD children.

P1B.2.11 **LANGUAGE PROFILES OF OPTIMAL OUTCOME CHILDREN WITH AUTISM.** E. Kelley and D. Fein. University of Connecticut.

A previous study examined language functioning in 14 children with a history of autism who had intensive early intervention and optimal outcomes. Although the children did well on vocabulary and syntax, they still experienced difficulties in semantics and pragmatics. The current study investigated these children after a three-year period. Nine boys and two girls (mean age 10;2) were given an extensive battery of language tasks, the ADOS, and subtests of the WISC-IV and NEPSY. Parents were interviewed with the ADI-R, the Vineland Scales, and the BASC. Results show that the children are doing quite well in previous areas of strength, maintaining their good performance in vocabulary and gaining on syntactic tasks. The children generally performed well on tests of vocabulary, syntax, abstract thinking, mental state verbs, categorical induction, and theory of mind tasks. Some of them experienced difficulty with pragmatics, social judgment, and figurative language and these were the same children who showed deficits on the Vineland, ADOS, and ADI-R. Thus we appear to have two groups of children: those who are functioning at an optimal level, and those who are doing well on vocabulary and grammar, but continue to experience difficulties in pragmatics and social functioning. This paper will discuss predictors of performance, as well as the relationship between VIQ, NVIQ, and more social aspects of language. By studying these "best-outcome" children we gain a better understanding of how language development in children with autism can be optimized.

P1B.2.12 **PRAGMATICS, LANGUAGE AND AUTISTIC SPECTRUM DISORDERS: EVIDENCE FROM CHILDREN OF NORMAL NONVERBAL INTELLIGENCE, WITH AND WITHOUT ASD.** T. Loucas, G. Baird, T. Charman, A. Pickles, E. Simonoff, S. Chandler and E. Rowley. School of Applied Health Sciences, De Montfort University.

Objective: To investigate the extent to which pragmatic impairments are independent of general intelligence and language skills.

Design/Methods: The pragmatic abilities, of 96 twelve-year-old children of normal nonverbal intelligence (PIQ>=80) were measured with parent completed Children's Communication Checklists (CCC). 47% of the children had language impairment (receptive and/or expressive language score =< 77). 57% were diagnosed as ASD (PDD=33, childhood autism=22), with diagnosis established by a combination of ADI, ADOS and expert clinical judgement. The non-ASD group consisted of children with specific developmental disorders (e.g., affecting language, literacy).

Results: Pragmatic composite scores differed by diagnosis (No ASD, PDD, autism) ($p<.001$), but not language (no impairment, impairment); these factors did not interact. Post hoc tests revealed there was no difference between the PDD and Autism groups, but both differed from the No ASD group ($p<.001$). Each of the pragmatic subscales of the CCC differed by diagnosis (all comparisons $p<.001$). Only the coherence subscale differed by language ($p<.01$).

Conclusions: In children of normal nonverbal intelligence, those with ASD showed poorer pragmatic ability than those with specific developmental difficulties. Pragmatic impairments in children with autism did not differ from those with PDD. Language impairment led to poorer discourse coherence in those with and without ASD but, in general language impairment did not impact on pragmatic skills for either group. Thus, pragmatic impairments in children with ASD appear to be independent of general intelligence and language skills.

Funding: Wellcome Trust, Department of Health, NAAR.

P1B.2.13 **LANGUAGE ABILITY IN YOUNG CHILDREN WITH AUTISM AND TYPICAL DEVELOPMENT: THE ROLE OF GESTURES.** A. Mastergeorge, G. Young, M. Lombardo, J. West, S. Ozonoff and S. Rogers. University of California, Davis/M.I.N.D. Institute.

Study Objectives: This study examines individual differences in the use of communicative gestures as predictors of language in children with autism compared to typically developing children.

Methods: Eighteen children with autism (CA=49.72 months) and 14 typically developing children (CA=31.32 months), matched on nonverbal mental age were included in the sample. Children were administered the Early Social Communication Scales (ESCS), the Mullen Scales of Early Learning, and the Vineland Adaptive Scales of Development in order to examine the relationship between social communicative gestures (e.g., pointing, showing, reaching) and expressive and receptive language ability.

Results: Multiple regression analyses revealed a significant interaction between the number of gestures exhibited during the ESCS and diagnosis as predictors of expressive language ability ($^2$=.325, $p<.05$), and receptive language ability ($^2$=.354, $p<.05$). Analyses of simple effects revealed a significant negative relationship between number of gestures and both expressive and receptive language only for the typically developing children ($r=-.667$, $p<.01$ for expressive, $r=-.599$, $p<.05$ for receptive). Conversely, for children with autism, there does not appear to be any meaningful relationship between use of gestures and receptive or expressive language outcome scores. Further analyses showed that motor skills do not mediate the relationship between gesture and language scores.

Conclusions: Compared to typically developing children, those with autism exhibit a qualitatively different relationship between early social-communicative gestures and language. These findings suggest inherent differences (or deviance) in developmental trajectories in children with autism.

Acknowledgement: This work is part of the Collaborative Programs of Excellence in Autism, supported by NICHD HD 35864-06.

P1B.2.14 **ACHIEVING SPEECH PRODUCTION IN A NON-VERBAL ADOLESCENT WITH AUTISM.** J. O'Grady, O. Pullara, J. Thorne, J. Juska, L. Bejoian and B. Gordon. Johns Hopkins School of Medicine.

There are no detailed, published reports of any individual with autism who has been essentially nonverbal at age 14 ever achieving voluntary speech production of three-word sentences (or greater). Here, we report such a case.

A.I., a nonverbal adolescent, had acquired the reliable use of nine consonants for communicative purposes and intermittent production of six vowels, between the ages of 14-16, as reported (O'Grady et al., IMFAR, 2004). Continued training was based on providing (1) a full-day, situation-rich environment, (2) reinforcement of successive approximations of targeted word or words, (3) provision of sentence frames, (4) both verbal and touch prompts, (5) constant opportunities to initiate speech, and (6) ready access to alternative methods of communication such as a Chat PC, communication books, and manual signs. Results: during a 12-month period, A.I.'s spontaneous oral repertoire increased from imitating initial consonant/consonant-vowel combinations to self-initiating 1-3 word approximations ("I want bathroom"), with flexible noun choice. Video samples will be shown.

Conclusions: The continued progress of A.I. demonstrates that speech production may be attainable in such individuals and that it may continue to improve over time. It may be possible to determine what components of the training program were most essential for allowing him to accomplish speech, so that we can apply these techniques in the training of other individuals.

Supported by the Therapeutic Cognitive Neuroscience fund.

P1B.2.15 **RELATIONSHIP BETWEEN LANGUAGE SKILLS AND ADOLESCENT BEHAVIOR IN AUTISM SPECTRUM DISORDERS.** A. Sullivan, D. Anderson, S. Risi, S. Heinz, K. Gotham and C. Lord. University of Michigan Autism and Communication Disorders Center.

While previous research has demonstrated a direct correlation between language level and behavior problems in autism, most studies have focused on relatively younger populations. The relationship between language level and behavior problems with respect to adolescent development has yet to be investigated.

Objective: To determine if a relationship exists between language skill and adolescent behavior.

Design/Methods: Information concerning language development for 131 participants was determined through direct testing and repeated administrations of the Autism Diagnostic Interview - Revised (ADI-R). These evaluations were completed while subjects were between 2 to 9 years of age. This information, collected as part of an ongoing longitudinal study focusing on the early diagnosis of autism, was compared with data regarding behavioral development in adolescence. Measures including the Aberrant Behavior Checklist - Community Version (ABC-CV) were used to assess behaviors in several domains (e.g. irritability, hyperactivity, etc.). Scores across these domains were analyzed with overall level of language at age 9.

Results: A general linear model demonstrated a significant difference in ABC-CV scores between those with and without phrase speech at age 9. Even with diagnosis taken into consideration (Autism, PDD-NOS, or non-spectrum), individuals with less language had consistently higher mean domain scores, indicating more severe behavioral problems in adolescence than individuals with less limited language.

Conclusions: More limited language is significantly related to adolescent behavioral difficulties. Additional aspects of this result will be further explored to clarify these relationships.

This research is funded through grants from NIMH (Early Diagnosis of Autism grant: MH46865) and NICHD (Neurobiology and Genetics of Autism grant: U19 HD35482).

P1B.2.16 **INNER SPEECH DEFICITS IN AUTISM.** A. Whitehouse, M. Maybery and K. Durkin. School of Psychology, University of Western Australia.

Inner speech is thought to be a component of executive functioning skills. While deficits in executive functioning in those with autism are well-known, very little research has examined their inner speech capabilities.

Study Objective: To determine whether individuals with autism have deficits in inner speech.

Design: In each of two experiments, 23 children with autism were compared with 23 typically developing children matched on verbal, non-verbal and reading ability. The first experiment used an immediate serial recall task involving 5 picture stimuli per trial. Oral recall of the picture names was required. Length of the names (1 versus 3-4 syllables) was varied between trials to examine the word-length effect - the typically superior recall for short compared to long words. There were three conditions: silent, label (participants verbalized the names), and picture+word (each name presented underneath its picture). This experiment worked under the assumption that in the silent condition, verbal memory effects will only be seen if inner speech is used to internally verbalize the labels of the pictures. The second experiment employed a task-switching paradigm, based on arithmetic, for which performance has been shown to be contingent upon inner-speech.

Results: In comparison with the performance of the control group in experiment one, the participants with autism showed a reduced word-length effect in the silent condition. In the second experiment, the imposed articulatory suppression affected the performance of the control participants but not the performance of the individuals with autism

Conclusion: Together, these experiments provide evidence for impaired use of inner speech in those with autism.

Source of funding: A scholarship from the Commonwealth Government of Australia

P1B.2.17 **LINKAGE OF AUTISTIC SPECTRUM DISORDER: EVIDENCE OF A NON-VERBAL COMMUNICATION LOCUS ON 8Q24.** G. Chen, N. Kono, D. Geschwind and R. Cantor. UCLA.

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that is marked by impairments in social interactive functioning, communication skills, and repetitive/compulsive behaviors. Evidence that the disorder is likely heritable and genetically complex has been shown by MZ twin studies, linkage studies, and latent class analysis of Autistic individuals. We hypothesized that Autistics who were more severely impaired in the behavioral domain of communication in ASD would provide most of the linkage evidence in a genetically heterogeneous set of families. A Quantitative Trait Locus (QTL) analysis of a trait that measures non-verbal communication (NVC) based on questions from the Autism Diagnostic Instrument Revised (ADI-R) revealed significant linkage to 5 chromosomal regions (1p12, 4q22, 7q35, 8q24, and 16p13) with the most significant peak on 1p12 ($p<.001$) when analyzed using 284 sibpairs concordant for ASD. An ordered subset analysis was employed to assess whether families with the most severe non-verbal communication deficits could account for most of the linkage signal across these 5 chromosomal regions when ASD was analyzed as a binary trait. Using the 175 families with the highest NVC values, a LOD score of 3.8 using linkage analysis on the ASD trait was obtained on 8q24 whereas when the families were not ordered and selected for their NVC values, a LOD score of 1.67 was seen in the whole sample. These findings provide evidence that 8q24 may harbor loci relevant to pathways involved in communication as well as deficits leading to Autism.

This work was supported by NIH grants R01 MH64547 and T32 HG02536.

P1B.2.18 **SENSORY INTEGRATION OF VISUAL AND AUDITORY INPUT IN HIGH FUNCTIONING CHILDREN WITH AUTISM (HFA).** J. McLaughlin, G. Iarocci, J. Yager, A. Rombough, S. Grant, D. Weeks and R. Chua. Simon Fraser University.

Background: Difficulties detecting intermodal correspondence of facial and vocal/linguistic affect and matching familiar faces to their respective voices have been found among children with autism. However, it is not clear from previous studies whether these children show impaired processing of social stimuli (i.e. familiar people and affect) specifically because they attend less to social stimuli or their performance reflects a more fundamental abnormality of sensory integration.

Objective: We employ the McGurk task, to specifically assess visual-auditory sensory integration among children with HFA under conditions that included either audio alone, visual alone, or audio and visual input.

Design/Methods: 18 children with HFA were MA-matched with 18 typically developing (TD)children. The HFA and TD participants were divided into 2 groups

which varied presentation order (Audio-AV-visual, Visual-AV-Audio). The stimuli for the present experiment included one syllable consonant-vowel sounds and visuals such as "ba" or "va". The participants were asked to "repeat what the speaker said". The participants answers were recorded and later scored for being audio compatible (in audio trials), vision compatible (in visual trials), or other.

Results: Preliminary findings indicate that as compared to MA-matched TD children, children with HFA are more attuned to auditory syllabic input than visual syllabic input.

Conclusions: Children with HFA may be less susceptible to the visual bias typically observed in the McGurk task and this may reflect difficulties in the ability to integrate visual and auditory input.

Funded By: HELP Human Early Learning Partnership

P1B.2.19 **INDICATION OF AUGMENTATIVE COMMUNICATION: PSYCHOMETRIC PROPERTIES AND CLINICAL RELEVANCE OF THE COMFOR.** I. Noens, I. van Berckelaer-Onnes, R. Verpoorten and G. van Duijn. Leiden University, Centre for the Study of Developmental Disorders.

The ComFor (Forerunners in Communication - Verpoorten, Noens, & Van Berckelaer-Onnes, 2004) is an instrument for the indication of augmentative communication, developed within the framework of the central coherence theory. More specifically, it measures perception and sense-making of non-transient forms of communication at the levels of presentation and representation. The target group consists primarily of individuals with autism and mental retardation without or with only limited verbal communication. The ComFor is suitable for children and adults with a developmental level between 12 and 60 months. The clinical interpretation of the ComFor is content-referenced, not norm-referenced.

Objective: To assess the reliability, validity and clinical relevance of the ComFor.

Method: The ComFor was tested on a sample of 623 individuals from the Netherlands and Flanders: a group of children and adults with autism and mental retardation (n=310); a group of children and adults with mental retardation only (n=174); and a control group of typically developing children (n=139).

Results: The data generally support the reliability and validity of the ComFor. Internal consistency, inter-rater and test-retest reliability were found to be good. Construct validity (internal structure, convergent and divergent patterns) was established in different ways. At present, the criterion-related validity is least guaranteed, since predictive data are not yet available.

Conclusions: The ComFor appears to be a promising instrument to determine which non-transient, spatial form of augmentative communication is the best fit, and at which level of perception/sense-making the means chosen can be offered.

P1B.2.20 **THE DEVELOPMENT OF AN OBSERVATION MEASURE FOR THE SOCIAL COMMUNICATION OF CHILDREN WITH AUTISM IN THE CLASSROOM.** G. Pasco, K. Gordon, P. Howlin and T. Charman. St. George's Hospital Medical School.

Objective: To develop an observation measure that provides reliable and valid measures of spontaneity, mode and function of communicative behaviours in classroom settings.

Methods: Fifteen-minute recordings were made of eighty-five four-to-ten-year-olds with autism during school-based snack time sessions, at baseline and two further follow-up points (approximately 10-12 months apart). Recordings were independently rated by two researchers, with each communicative act by the child coded according to context, communication partner, function, initiation/response and mode.

Results: Inter-rater reliability: the twelve most commonly-occurring communicative items had a mean intra-class correlation of .929 (each p-value <.001). Validity: associations between specific items from the observational measure and related items from concurrent standardised tests were assessed. Highly significant correlations were found between ratings of amount of speech/vocalisation and overall level of language on the ADOS (Spearman's rho = -.743, p<.001) and BPVS raw score (rho = .600, p<.001). There were smaller, but significant correlations between ratings of echolalia derived from this measure and from the ADOS (rho = .337 p=.002) and between spontaneous comments and non-verbal age equivalent scores on the Mullen (rho = .349, p<.001).

Conclusion: This newly derived observational measure has adequate reliability and validity to be useful as an outcome measure in intervention studies.

This study was supported by a grant from the Three Guineas Trust.

P1B.2.21 **EFFECTS OF SELF-INITIATION TRAINING FOR PREVERBAL CHILDREN WITH AUTISM.** M. Rocha and L. Schreibman. University of California, San Diego.

Children and adults with autism demonstrate delays, deficits or atypical characteristics in the frequency, type and quality of social interactions (McConnell, 2002). Studies evaluating children with autism have specifically identified marked deficits in self-initiations, that is, spontaneous social initiations towards others (Wetherby & Prutting, 1984; Koegel, 2000). During Pivotal Response Training (PRT), an intervention that targets language, play and social skills, some children are able to learn to self-initiate. However, there are other children who do not (Sherer & Schreibman, in press). The children who cannot learn self-initiations during PRT may need specific training in order to learn to self-initiate. Thus far, there is no research on specifically training self-initiations to young, nonverbal children with autism.

Objective: The present investigation was developed to systematically evaluate the implementation of self-initiation training sessions using behavior modification techniques.

Method: Three children with a diagnosis of autism have participated in this intervention. Participants were between 2-4 years of age. Each participant's behavior during a Structured Laboratory Observation (SLO) matched the behavior profile of children who did not learn to self-initiate during PRT. This study implemented a single subject multiple baseline design across subjects.

Results and Conclusion: Preliminary data suggest that preverbal children with autism who do not learn to self-initiate during PRT, can learn to appropriately self-initiate during self-initiation training. Results will be discussed in terms of treatment implications and future investigations.

Funded by the National Institute of Mental Health

P1B.2.22 **ADAPTING TWO-PART MODEL/RIVAL TRAINING TO A GROUP SETTING.** D. Shermam and I. Pepperberg. New-Found Therapies, Inc..

Objectives: Two part model/rival (M/R) training, where adult pairs interactively demonstrate targeted behaviors, effectively engenders social skills in children with autistic spectrum and other disorders (Pepperberg & Sherman, 2000, 2002); will group training using peers as models also be effective as models in the procedure? Will children acting as models learn additional skills by training others?

Subjects: Three co-ed groups (~ 6 children each, normal to above average IQ), A (K-1st grade), B (2nd - 3rd grade), C (5th-6th grade), diagnosed with autism spectrum, ADHD, and NLD, were evaluated for reading nonverbal cues, ability to connect with others using nonverbal cues, facial recognition, ability to anticipate other's actions and reactions and modify their behavior accordingly, and developing empathy. Each child received a specific set of goals based on skill level. Children were re-evaluated after 3 and 6 weeks of training to determine how well goals had been met.

Design/Methods: Adults initiate specific activities designed for each age group. At pre-designated points, adults stop the activities to begin demonstrating M/R training for all children. Then, for each activity, more-advanced children use M/R modeling to teach their less advanced peers. Because of varying skill levels in a given area, different children model each activity.

Results: Preliminary data suggest that children who act as models are effective in the M/R situation and that advanced children learn additional skills in the process of teaching. Data replicate results found in pilot studies with Grey parrots.

Conclusion: Two-part M/R training can be adapted to group settings.

P1B.2.23 **IMITATION IN ASD: EFFECTS OF NOVELTY AND FAMILIARITY OF ACTIONS AND OBJECTS.** I. Smith and C. Patterson. Dalhousie University.

Deficits in imitation of symbolic actions by children with ASD may result from a more general dyspraxia that also affects imitation of nonsymbolic actions, or from specific failure to represent the object in

imagination, to recall the appropriate action, or to inhibit familiar actions.

Study objectives: This study (in progress) examines the ability of children with ASD to imitate actions in which the novel and familiarity of both objects and actions are manipulated to evaluate these alternatives.

Methods: Preschoolers with ASD (n=14); mental-age-matched typically-developing children (TYP; n=17), and children with developmental delays (DD; n=5) imitated actions with objects in an elicited imitation paradigm. Within-subjects conditions entailed: (a) familiar object/familiar (conventional) action (b) familiar object/counter-conventional action; (c) novel object/familiar action (object substitution); novel object/novel (arbitrary) action. Control conditions included body movement imitation (i.e., without objects), and manual motor skill (pegboard). Recall of actions associated with objects was assessed following a one-week delay. Scoring was based on accuracy of imitation attempts, errors, specific categorical responses, and social behaviours.

Results: (Preliminary analyses) No significant differences were obtained between groups on body imitation scores, which were significantly correlated with motor skills for ASD only. ASD children made more reversal errors than TYP, but there was a similar trend in the small DD group. ASD self-corrected their errors less often than controls. On object tasks, ASD performance resembled that of much younger TYP children's difficulty inhibiting conventional actions. ASD and TYP also showed somewhat lower recall of actions after delay. ASD was best characterized by lack of social behaviours associated with imitation, and by qualitative differences in responding that reflect poor appreciation of the meaning of object-related actions.

Conclusions: Patterns of responding for ASD suggest some effects of mental age but also qualitative differences. Additional DD data will be critical for conclusions.

Funding: IWK Health Centre

## Slide Session 1

### *Basic Science & Population Approaches*

S1.1 **PREVALENCE AND CORRELATES OF TREATMENT USE AMONG A COMMUNITY SAMPLE OF INDIVIDUALS WITH AUTISM.** D. Mandell, M. Novak, C. Zubritsky and S. Levy. University of Pennsylvania School of Medicine.

Many treatments for ASD have been described in the scientific and popular literature, but few studies have examined the prevalence and correlates of their use.

Objective: to estimate the use of various treatments for ASD in a community sample, and examine factors associated with their use.

Methods: We surveyed 1018 caregivers of individuals with ASD in Pennsylvania. Caregivers reported on the lifetime and current use of 38 behavioral, cognitive, pharmaceutical, and other interventions. Treatments were categorized by their evidence base, hypothesized mechanism of action, and their potential harm. Binary and multinomial regressions were used to estimate the association of demographic and clinical characteristics with different types of treatment.

Results: Approximately 90% of the sample reported ever using at least one treatment. Social skills training was the most common (58%), followed by sensory integration therapy (52%) and applied behavior analysis (45%). Neuroleptics were the most common psychotropic medication (25%), followed by stimulant medication (27%) and SSRIs (19%). Potentially harmful treatments, including anti-fungal or anti-yeast agents (10%), antibiotics (8%), and chelation (4%), were used by a substantial minority. The average number of treatments ever used was 6.2 (SD = 4.7); the average number currently used was 3.6 (SD = 3.3).

Conclusions: A myriad of treatments are being used by people with autism, most in combination. Clinicians should be aware of treatments for ASD and their evidence base, and be willing to discuss them with families. Research should examine the efficacy of commonly used treatments that have little evidence base.

S1.2 **THE INFLUENCE OF ENVIRONMENTAL FACTORS ON CRITICAL PERIOD PLASTICITY IN RATS AUDITORY CORTEX.** T. Kenet, I. Pessah and M. Merzenich. University of California, San Francisco.

The recent increase in the number of children diagnosed with autism suggests that non-genetic factors may be etiologically important. We hypothesize that genetic polymorphisms confer increased susceptibility to neurotoxic agents, which alter brain maturational processes in a catastrophic manner, with autism being one possible outcome.

Objective: To test whether environmental (chemical or sensory) factors, may affect the development of auditory cortex in a manner that could be linked to autism.

Design/Methods: To test our hypothesis, we used multiunit electrophysiological recording to study the impact of PCB95 (a non-coplanar PCB), either alone or combined with sound/noise exposure, on the development of auditory cortex (A1) in rats.

Results: Early exposure to PCBs is already known to impair behavioral functioning in rodents in ways that are reminiscent of human autism. We found that the development of A1 in rats exposed to PCB95 was highly abnormal. Specifically, we observed large-scale differences in the cortical areas with A1 response characteristics, degraded and disrupted A1 tonotopic gradients, and grossly abnormal receptive field properties. In spite of these powerful cortically-expressed effects, recorded auditory brainstem responses were normal, meaning PBC95 did not cause any observable hearing loss. Furthermore, a likely marker of autism arising from inherited factors is a deficit in inhibition leading to increased cortical noise. To simulate this inherited expression of the at-risk child, we added moderate-level pulsed noise/tone to our developing rats' environment. Rats exposed to both PCBs and external pulsed noise/tone - i.e., with an inherently noisy cortex through the critical period - had amplified pathologies.

Conclusions: This study suggests that environmental factors may combine synergistically with genetic predisposition to contribute to the increased incidence of autism. The fact that severe auditory cortex abnormalities can occur without being reflected in regular hearing tests has far reaching implications. In the human model, the auditory cortex abnormalities described above would almost certainly result in a disturbance in aural language development, which is a prominent trait of autism.

This work is supported by the UC Davis M.I.N.D. Institute, and Cure Autism Now.

S1.3 **ABNORMAL REPETITIVE BEHAVIOR AND ASSOCIATED DEFICITS IN BASAL GANGLIA MEDIATED LEARNING AND MEMORY.** M. Lewis, C. Turner, H. Mikes, L. Lee and Y. Tanimura. University of Florida.

Repetitive behavior disorders in autism and related conditions have been linked to alterations in cortical-basal ganglia circuitry. One major function of the basal ganglia is the mediation of stimulus-response (S-R) or procedural learning and memory. Thus, learning and memory processes mediated by these same brain regions are likely to be impaired in individuals exhibiting high rates of repetitive behavior. We used the Morris water maze to examine procedural learning in an animal model of abnormal repetitive behavior. Deer mice that engaged in high or low rates of stereotypy were assessed for their ability to locate and swim to a visible platform. Mice exhibiting high rates of stereotypy exhibited longer latencies to reach the visible platform. Additionally, high stereotypy animals displayed greater thigmotaxis and spent significantly less time in the quadrant in which the platform was located. No differences in swim speed or distance traveled were noted between high and low stereotypy mice. These findings suggest that animals displaying high rates of stereotypy exhibit deficits in a S-R learning task presumably due to the effects of basal-ganglia alterations.

S1.4 **SEXUALLY DIMORPHIC RESPONSE OF THE DEVELOPING RAT CNS TO POLYCHLORINATED BIPHENYLS (PCBS): CEREBELLAR CELL APOPTOSIS, STRUCTURE, AND MOTOR BEHAVIOR IN MALE AND FEMALE RATS.** E. Sajdel-Sulkowska and K. Nguon. Dept. Psychiatry, Brigham and Women's Hospital and Harvard Medical School.

Perinatal exposure to polychlorinated biphenyls (PCBs) affects cerebellar structure and motor behavior differently in male and female rat neonates, suggesting

sex-specific responses to environmental perturbations during development.

Objective: To compare and contrast the mechanisms involved in cerebellar response to PCBs in male and female offspring of PCB-exposed rat dams. Specifically, to compare proteins involved in cell apoptosis; increased apoptosis could contribute to the smaller cerebellar size observed in PCB-exposed rat neonates.

Design/Methods: Cell apoptosis was measured in terms of expression of cerebellar apoptosis-related proteins. Proteins were analyzed by western blot analysis of cerebellar homogenates prepared from postnatal day (P) 6, P12, and P21 male and female offspring of rat dams exposed to PCBs from gestational day (G) 8 to P12. The effect of PCBs was also measured in vitro using glial and neuronal cultures exposed to PCBs. Cell apoptosis was expressed in terms apoptotic protein Cleaved Caspase-3, antiapoptotic protein Bcl-xL and prosurvival protein Akt.

Results: PCB exposure resulted in increased cerebellar proapoptotic protein Cleaved Caspase-3; there was a different rate of increase in male versus female neonates. The increase in caspase-3 was accompanied by a decrease in antiapoptotic Bcl-xL activity; the effect differed in male and female neonates. The activity of prosurvival protein Akt was relatively unaffected.

Conclusions: Sex-specific activation of cerebellar apoptosis by PCBs may contribute to sex-specific changes in cerebellar structure and motor behavior in the developing rat neonates, suggesting that the environmental contaminants contribute to a sex-related preponderance of certain neuropsychiatric disorders.

Supported by NIEHS grant ES11946-01.

S1.5 **MATERNAL PSYCHIATRIC HISTORY, ANTIDEPRESSANT USE DURING PREGNANCY, AND CHILDHOOD AUTISM.** L. Croen, C. Yoshida, R. Odouli and J. Grether. Kaiser Permanente Division of Research.

Objective: To explore associations between maternal history of psychiatric illness, antidepressant use during pregnancy, and childhood autism spectrum disorders (ASD).

Methods: We conducted a case-control study among children born at a Kaiser Permanente Northern California (KPNC) facility during 1995-1999. Cases (n=407) were children with an ASD diagnosis (ICD-9-CM 299.0, 299.8) recorded in KPNC outpatient databases. We randomly sampled controls (n=2095) from the cohort of births without an ASD, frequency matched to cases on gender, birth year, and hospital of birth. Information on maternal psychiatric illnesses diagnosed anytime preceding delivery, maternal medication use in the year prior to delivery, and several maternal and infant characteristics was obtained from health plan and vital statistics databases and KPNC medical records.

Results: Psychiatric illnesses diagnosed anytime prior to the delivery of the study infant were more prevalent in the mothers of cases than controls (46.5% vs. 33.2%). After controlling for maternal age, race/ethnicity, education, parity, and an index of health-care seeking behavior, maternal history of depression (OR=1.9, 95% CI 1.5-2.5), anxiety (OR=1.8, 95% CI 1.4-2.4), bipolar disorder (OR=3.4, 95% CI 1.6-7.4), obsessive compulsive disorder (OR=4.3, 95% CI 1.5-12.4), and adjustment disorder (OR=2.0, 95% CI 1.5-2.7) occurred more frequently in cases than controls. Antidepressant use during pregnancy was also more common among case mothers than controls (11% vs. 7%) and associated with a marginally increased risk of ASD independent of mental health history (OR=1.7, 95% CI 0.9-3.3).

Conclusions: These data suggest that maternal psychiatric illness history and antidepressant use may be associated with ASD risk.

S1.6 **TRENDS IN THE ASSIGNMENT OF SPECIAL EDUCATION CODES FOR AUTISM IN BRITISH COLUMBIA: IMPLICATIONS FOR AUTISM PREVALENCE ESTIMATES.** H. Ouellette-Kuntz, H. Coo, J. LLoyd, L. Kasmara, J. Holden and S. Lewis. Departments of Community Health & Epidemiology and Psychiatry, Queen's University; and the Autism Spectrum Disorders - Canadian-American Research Consortium.

It is unclear to what extent observed increases in the prevalence of autism are attributable to changes in diagnostic practices.

Objectives: We characterized trends in the assignment of the special education code for autism in

British Columbia (BC) to examine the potential impact on prevalence estimates.

Methods: Through a research agreement with the BC Ministry of Education (in partnership with Edudata Canada), we obtained a dataset that allowed us to examine trends in the proportion of the BC school population aged 4 to 9 years who were assigned the special education code for autism from 1996/97-2003/04, as well as the age at which the code was first assigned and the sex ratio.

Results: A significant linear increase in prevalence was detected ($p<0.001$). However, the prevalence in 1996/97 and 1997/98 more than doubled when children who were identified with autism in later years, but who were enrolled in the BC school system on the prevalence date, were included in the numerator. When we examined four cohorts of 5-year-olds who had been assigned the special education code for autism by age 9, there was a significant linear increase across the cohorts in the percent of children who had been identified with autism by age 6 ($p=0.01$). The boy:girl ratio decreased from 6.0:1 in 1996/97 to 4.7:1 in 2003/04 ($p=0.07$).

Conclusion: Identification of previously missed cases, decreasing age at diagnosis and greater recognition of autism in females need to be taken into account when interpreting changes over time in the prevalence of autism.

Funding: CIHR Interdisciplinary Health Research Team Grant #43820

S1.7 **AUTISM SPECTRUM DISORDERS IN RELATION TO DISTRIBUTION OF HAZARDOUS AIR POLLUTANTS.** G. Windham, L. Zhang, R. Gunier, L. Croen and J. Grether. CA Department of Health Services.

Objective: To explore possible associations between autism spectrum disorders (ASD) and environmental exposures, we linked our autism surveillance system to data compiled by the USEPA on estimated hazardous air pollutant (HAPs) concentrations.

Methods: Subjects included 341 children with ASD and 659 gender-matched controls, born in 1994 in the San Francisco Bay Area. Exposure level was assigned by census tract of birth residence for 19 chemicals identified as potential neurotoxicants, developmental toxicants, and/or endocrine disruptors from the 1996 HAPs database. Concentrations of many of these were highly correlated, so it was difficult to separate results for individual chemicals. We combined the chemicals into mechanistic and structural groups, calculating a summary index score from categorical levels. ASD risk in upper quartiles of these chemical groups was calculated by conditional logistic regression, adjusting for demographic factors.

Results: The adjusted hazard ratios (HR) for the over-lapping developmental toxicant and endocrine disruptor groups were both significantly elevated by 33-35% for scores above the median. Examining mutually exclusive groups, the HRs were elevated for chlorinated solvents (HR=1.39) and for metals (HR=1.61), but not for aromatic solvents. Adjusting for these 3 groups simultaneously led to decreased risks for the solvents and increased risk for metals (HR= 1.93, 95% CI 1.27 - 2.92), with no dose response by quartiles.

Conclusions: Our findings suggest a potential association between autism and ambient metal concentrations, based on a crude exposure classification. As this is the first study of its type it requires confirmation and more refined exposure assessment in future studies.

S1.8 **IS AN INCREASE IN AUTISM PREVALENCE DUE TO DIAGNOSTIC SUBSTITUTION?.** M. Yale Kaiser, C. Lazarus and K. Scott. University of Miami.

Recently, there is a growing concern that the number of individuals with autism or autism spectrum disorders is increasing in the U.S.

Objective: To determine whether an increase in children receiving special education services for autism is explained by a decrease in children receiving services for another disability.

Design/Methods: The administrative prevalence of autism and three levels of mental retardation in fifth graders attending Florida public schools were examined over a seven year period. Fifth graders were selected in order to survey successive cohorts without overlap. The number of children receiving services for autism or mental retardation was compared and temporal changes over the time period were noted.

Results: The administrative prevalence of autism in the Florida public schools increased from 4.7 per 10,000 children to 15.7 per 10,000 children over the seven year span. This resulted in an absolute change of 11 cases per 10,000 children. Over the same time period, the administrative prevalence of mental retardation remained fairly stable with an absolute decrease of less than 2 cases per 10,000.

Conclusions: While the administrative prevalence of autism increased steadily over the time period examined, the decrease in prevalence of mental retardation was not at a comparable rate. Perhaps some of the increase in autism prevalence could be attributed to a reclassification into another disability; however, these data suggest that a diagnostic substitution hypothesis for the apparent increase in prevalence is not conclusive.

Funding for this project was provided by a contract with the Florida Department of Education.

S1.9 **IMMUNOPHENOTYPING AND PROTEOMIC AND METABOLOMIC PROFILING OF CHILDREN WITH AUTISM.** D. Amaral, B. Corbett, A. Kantor, C. Becker, V. Kakkanaiah, J. Deng, S. Bacalman and H. Schulman. David G. Amaral, Ph.D..

There is currently no biological assay that is diagnostic of autism spectrum disorders. Immunophenotyping and proteomic and metabolomic profiling can provide evidence for biological phenotypes of autism and directions for development of diagnostic markers.

Objective: The purpose of this investigation was to identify putative biological markers of autism in blood samples from autistic children using cell surface cytometry for immune cells and comprehensive mass spectroscopic (MS) analysis of proteins and low molecular weight molecules.

Design/Methods: The investigation included three cohorts of children (N=105) from 4 to 6 years of age consisting of equal groups of 35 participants matched on age and gender with high functioning autism (IQ M=79), low functioning autism (IQ M = 56) and typically developing children (IQ M = 115) with a general ratio of 4:1 males:females. The autism diagnosis was based on DSM-IV criteria and corroborated by the Autism Diagnostic Observation Schedule (ADOS) and Autism Diagnostic Interview (ADI). Comprehensive cellular phenotyping was performed with SurroScanTM cytometry using 64 3-color assays on whole blood samples for all participants. A multidimensional proteomic and metabolomic analysis was carried out using liquid chromatrography and gas chromatography coupled on-line with MS.

Results: We have observed differences in immune cell populations, including B cells and NK cells, between autistic and control children. We have also observed significant differences in the proteomic and metabolomic profiling.

Conclusions: Immunophenotyping and proteomic and metabolomic profiling are effective approaches for discovery of biomarkers of autism. A detailed description of differences will be presented.

Funding provided by the M.I.N.D. Institute

S1.10 **DO AUTISTIC CHILDREN HAVE ENHANCED ANTIBODIES TO CENTRAL NERVOUS SYSTEM PROTEINS OR MEASLES VIRUS?.** R. Fujinami, T. Sweeten, H. Coon, J. Miller, N. Burgess and W. McMahon. University of Utah.

Objectives: Various studies have suggested that immune responses against central nervous system (CNS) proteins, such as myelin basic protein (MBP) or viruses, particularly measles virus, play a role in the development of autism. We have explored the humoral component of the immune response of autistic children (n = 39) and age-gender matched control children (n = 21). Methods: An enzyme linked immunosorbent assay (ELISA) was used to measure antibody titers to CNS components as well as measles virus and diphtheria toxoid. An axolemma enriched and myelin enriched fraction, as well as purified MBP and glial fibrillary acidic protein from bovine brain, were prepared and used as antigen in the ELISA. Similarly, original measles virus (Edmonston strain) used in the ELISA was obtained from the American Type Culture Collection. Diphtheria toxoid was obtained from List Biological Laboratories. Total IgG and IgM were also quantified in plasma by ELISA using kits purchased from Bethyl Laboratories.

Results: No differences were found between the antibody titers to the various antigens. No relationship was observed between brain autoantibodies and anti-

measles virus antibodies. Interestingly, autoantibodies to MBP and GFAP tended to be lower in children with autism versus healthy control subjects. There were no significant differences between the autistic and control children in terms of age or gender.

Conclusion: Thus, we have not been able to confirm earlier reports describing autoantibodies to MBP, GFAP or measles virus.

## Slide Session 2

### *Brain Structure & Structural Neuroimaging*

S2.1 **TOTAL BRAIN VOLUME IN PATIENTS WITH ASPERGER SYNDROME DOES NOT CHANGE WITH AGE.** B. Hallahan, G. McAlonen, F. O'Brien, E. Daly, S. Curran and D. Murphy. Institute of Psychiatry.

Background: It has been proposed that people with Asperger Syndrome (AS) have differences in total brain volume, but that this may only be present during discrete periods in life. However, few studies have examined total brain volume across the lifespan.

Method: We carried out three experiments. In the first we measured total brain volume using MRI (GE Sigma 1.5 Tesla System, Institute of Psychiatry) in 21 adults with AS and 24 controls. In the second, we compared head circumference measurements in 15 teenagers with AS and 13 controls. In the third we compared biparietal diameter in utero and head circumference at birth in 7 children with AS and 9 controls.

Results: We found no significant differences in total brain volume, biparietal diameter or head circumference at any age.

Conclusion: We found no evidence to support the hypothesis that people with AS have differences in brain volume in utero, at birth, in adolescence or in adulthood.

S2.2 **UPDATE ON A LONGITUDINAL MRI STUDY OF YOUNG CHILDREN WITH AUTISM.** H. Hazlett, M. Poe, R. Smith, G. Gerig and J. Piven. University of North Carolina.

This is an update on the current findings from a longitudinal MRI study of brain volumes in 18-35 month olds with autism.

Objectives: To compare brain tissue volumes in 51 children with autism and 25 controls (14 TD children, 11 DD children without autism) between 18-35 months of age.

Method: Brain tissue volumes were obtained using semi-automated tissue segmentation software and a regional (lobe) pediatric brain atlas. Head circumference measurements from birth through age 36 months were also examined in a larger sample of 176 individuals with autism and 177 typically developing controls.

Results: Total brain volume and total tissue volume were significantly increased in the autism group compared to controls. This enlargement was present in the cerebrum, for both gray and white tissue, but not in cerebellum. Children with autism had significantly enlarged cerebral brain volumes compared to both TD and DD children. Regional volumes for the children with autism were increased for all compartments (frontal, temporal, parietal-occipital) and tissues (gray and white), except parietal-occipital gray tissue, when compared to the DD subgroup, but only enlarged in white temporal and white parietal-occipital volumes when compared to the TD children. Additionally, increased head circumference was also seen for the children with autism compared to controls.

Conclusions: Brain enlargement in autism is evident very early in development, and specific to the cerebrum. Regional differences in tissue volume and tissue type are also found. These findings are supported by increased head circumference measurements.

Research supported by NIMH grant MH61696 (PI: Joseph Piven, MD); NIH MRDDRC Grant 5 P30 HD03110 (PI: Joseph Piven, MD

S2.3 **HEAD CIRCUMFERENCE OF SIBLINGS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS: BIRTH THROUGH THE THIRD YEAR OF LIFE.** L. Lee, C. Newschaffer, A. Zimmerman, M. Johnson and R. Landa. Center for Autism & Developmental Disabilities Epidemiology, Department of Epidemiology, Bloomberg School of Public Health, Johns Hopkins University.

Objective: To investigate head circumference (HC) growth rate in siblings of children with autism spectrum disorders (ASDs) and to examine siblings' HC at birth

by their diagnoses.

Methods: Siblings of children with ASDs were divided into the following three groups based on their diagnoses: ASD (n=27), language impairment (LI) (n=11) and no impairment (NI) (n=47). HC measurements were available from birth through 38 months. Mixed modeling was performed to determine whether the growth of HC is significantly different in the three groups over time. Specifically, a model was fitted with terms for child's age, diagnosis, and an age×diagnosis interaction as independent variables and repeated measures of HC as the dependent variable. In addition, to investigate HC at birth (measured at the day of birth), data from ASD siblings (n=13) were compared to that from NI siblings (n=18). LI group was not included in the birth HC analysis because only a small number of cases have birth HC data available.

Results: The three sibling groups have very similar slopes of increase in HC with age (all approximately 4 millimeters per month), suggesting that the three groups are not significantly different in the rate of growth of HC over time. In this sample, ASD siblings had larger HC at birth than did NI siblings with p=0.03.

Conclusions: The findings do not support the hypothesis that siblings with ASDs have greater rates of HC growth than other siblings with language impairment or no impairment. However, all three groups of siblings may differ from typical children. Further analysis comparing these three groups to typical children will be discussed.

This study is supported by CDC cooperative agreement U10/CCU320408-04 and by MH59630-01

S2.4 **PATHOLOGICAL BRAIN GROWTH IN AUTISM LEADS TO INCREASED, THEN REDUCED INTERHEMISPHERIC CONNECTIVITY.** J. Lewis and E. Courchesne. Cognitive Science, UCSD.

Head circumference measures indicate that the clinical onset of autism is preceded by prenatal brain undergrowth followed by abnormally accelerated early postnatal growth resulting in an enlarged brain throughout early childhood. Findings from comparative neuroanatomy and from developmental neuroscience motivate the hypothesis that this abnormal growth trajectory will give rise to an initial increase in long-distance connectivity, and then an abnormal reduction. Interhemispheric conduction delay is proportional to brain size, and so brain undergrowth early in development will provide increased impetus to retain long-distance connections; and brain overgrowth will provide increased impetus to prune long-distance connections. Moreover, the callosum shows an anterior to posterior gradient in development, and so the initial increase should be in anterior regions, and the later reduction should be in posterior regions. This prediction was tested in three cross-sectional studies (at 21 months, at 4 years, and at 10 years) by measuring the head circumferences and the corpora callosa from the MRIs of individuals with autism spectrum disorder and from typically developing children. Relative corpus callosum size was significantly greater in the rostral body in children with autism at 21 months; there were no significant differences at 4 years; and there was a significant reduction in posterior regions at 10 years. These results provide strong support for the proffered hypothesis.

S2.5 **BASAL GANGLIA ABNORMALITIES IN CHILDREN AND ADULTS WITH AN AUTISM SPECTRUM DISORDER. A STUDY IN TWO DIFFERENT AGE GROUPS AND CULTURES.** G. McAlonan, E. Loth, S. Chua, E. Daly, S. Curran, V. Cheung, C. Cheung, G. Lam, K. Tai, L. Yip and D. Murphy. University of Hong Kong.

The basal ganglia, and cortico-subcortical neural circuits, are implicated in social, obsessional and repetitive behaviours. However nobody has examined their anatomy and ‘connectivity' in two different autistic samples.

Methods: We carried out two studies on basal ganglia in normal intelligence people with autistic disorder using structural MRI (1.5 T GE); one in the UK, the other in Hong Kong. The UK study included 21 adults with Asperger Syndrome and 24 matched controls; whereas the Hong Kong study included 17 chinese children with autism (aged 8 -14 years) and 17 matched controls. Bulk (grey + white matter) volume of the caudate, and putamen, and lenticular nuclei was measured. Also differences in relative proportions of grey and white matter were measured using voxel based morphometry (VBM). Connectivity of striatal circuits was measured using PPI in the UK, whereas in

Hong Kong it was assessed using intra-regional correlations of brain volume.

Results: Neither sample had significant differences in bulk-volume of the basal ganglia. However both in the UK adults and Honk Kong children those with an autistic spectrum disorder (ASD) had significant ($p<0.001$) differences in the relative grey and white matter proportions of striatal circuits. Further people with ASD had significant differences from controls in PPI, and had significantly ($p<0.001$) less connectivity of and subcortical-cortical circuits.

Funded by grants from the MRC (UK), South London and Maudsley NHS Trust, and the Psychiatry Research Trust

S2.6 **AMYGDALA AND HIPPOCAMPUS ENLARGEMENT IN YOUNG CHILDREN WITH AUTISM.** M. Mosconi, H. Cody, M. Poe, S. Joshi, S. Peterson and J. Piven. University of North Carolina at Chapel Hill.

Several studies have reported amygdala and hippocampal structural abnormalities in autism. These abnormalities rarely have been studied in young children with autism.

Purpose: To compare amygdala and hippocampus volumes in 18-35 month old children with autism, typically developing (TD) children, and children with developmental delay (DD) without autism.

Method: Using structural MRI, we examined amygdalae and hippocampal volumes in 51 children with autism and 22 controls (11 TD children, 11 DD children without autism). Amygdalae were segmented using manual tracing guidelines previously validated and published (Schumann et al., 2004). Hippocampi were segmented using a semi-automated landmarking tool (Haller et al., 1997).

Results: Results suggested that right and left amygdala volumes were significantly increased in children with autism compared to the combined control group. This difference remained significant after co-varying total brain volume (TBV). Comparisons between children with autism and the TD subgroup were significant for right and left amygdalae, but only right amygdalae were significantly enlarged in autism compared to the DD subgroup. Preliminary analyses indicated that right hippocampal volume was increased in children with autism compared to the combined control group, but differences were not significant when performing subgroup comparisons (DD, TD) or after co-varying TBV.

Conclusions: Increased amygdala volumes are evident early in development in autism, but no strong hippocampal differences are seen at this early age. Further, volumetric differences in the amygdala are disproportionate to differences in total brain volume and are evident in comparison to both TD children and DD children without autism.

Research supported by NIMH grant MH61696 (PI: Joseph Piven, MD); NIH MRDDRC Grant 5 P30 HD03110 (PI: Joseph Piven, MD)

S2.7 **AN IN VIVO 1H MAGNETIC RESONANCE SPECTROSCOPY STUDY OF LIMBIC AND PARIETAL REGIONS IN AUTISM.** L. Page, A. Simmons, E. Daly, E. Loth, S. Curran, B. Hallahan, F. Toal, Q. Deeley, G. McAlonan and D. Murphy. Institute of Psychiatry, King's College London.

Background: The neural basis for Autistic spectrum disorder (ASD) is unclear, but abnormalities in the development of limbic areas and in the neurotransmitter glutamate have been suggested. Glutamate is a major excitatory neurotransmitter and is of crucial importance to brain development. Proton Magnetic Resonance Spectroscopy (1H-MRS) can be used to measure the concentration of a number of brain metabolites including glutamate/glutamine. However nobody has examined, in vivo, the concentration of glutamate/glutamine in brain regions which are, and are not, strongly implicated in ASD.

Methods: Thus we used 1H-MRS to investigate the neuronal integrity of the amygdala-hippocampal complex, and a parietal "control" region, in 25 normal intelligence adults with ASD and 21 non-autistic healthy subjects.

Results: People with ASD had a significantly ($p<0.05$) higher concentration of glutamate/glutamine and creatine/phosphocreatine in the amygdala-hippocampal region. Mean Glu/Gln (mM, S.D.) was 13.50 (1.95) vs 12.02 (1.01) respectively in people with ASD and controls. There were no significant between-group differences in the parietal region.

Conclusion: Abnormalities in glutamate/glutamine

may partially underpin the pathophysiology of ASD. Creatine/phosphocreatine is a measure of phosphate metabolism, and so we confirm earlier reports that limbic areas are also metabolically aberrant in the disorder. This research was funded by the MRC (UK), the Psychiatry Resesarch Trust, and the South London and Maudsley NHS Trust

S2.8 **BRAIN MORPHOLOGY IN AUTISM SPECTRUM DISORDERS: AN MRI STUDY.** R. Schultz, L. Win, A. Jackowski, A. Klin, L. Staib, X. Papademetris, T. Babitz, E. Carter, C. Klaiman, A. Fieler and F. Volkmar. Yale University Child Study Center.

Study Objective: To characterize brain morphology among males with an autism spectrum disorder (ASD).

Methods: High resolution structural MRI data (1.2 mm istropic) was obtained for 117 males with autism (n=54), Asperger syndrome (n=42) or PDD NOS (n=21) (diagnosed via the ADOS and ADI), including 20 with FSIQs < 70, and 108 male healthy controls (including 4 with nonspecific mental retardation). The controls averaged 19.5 years of age (± 8.8, range = 8 to 55), with a FSIQ of 111.3 (± 20, range =59 to 149). The ASD sample was 15.95 years old (± 8.4, range = 5 to 46), with a FSIQ of 93.9 (± 23.3, range = 40 to 144). Expert hand tracing using ANALYZE TM and local algorithms were used to measure the volume of the whole brain, and in a subset of 111 persons with an ASD and 102 controls, the major brain subcomponents: brain stem, cerebellum, subcortical complex (thalamus + basal ganglia + internal capsule), the four lobes of each hemisphere, and the fusiform gyrus (FG).

Results: Total brain size and the frontal, temporal and parietal lobes were each significantly enlarged between 3.4% and 6.0% in the ASD group compared to controls, independent of age, IQ, and ASD subtype. The FG was significantly enlarged compared to whole brain in the older group (split by median age).

Conclusion: These results confirm an overall brain size increase (of 3%) in all subtypes of the ASDs, and a specific growth increase in the FG after early adolescence. Funding: NICHD P01-HD03008, U19-HD35482 and NINDS R01-NS35193

S2.9 **NO DIFFERENCE IN THE NUMBER OF NEURONS IN THE AMYGDALA IN POSTMORTEM CASES OF AUTISM: A STEREOLOGICAL STUDY.** C. Schumann and D. Amaral. UC Davis M.I.N.D. Institute.

MRI studies find that young children with autism have a larger amygdala than typically-developing children (Sparks et al., 2002; Schumann et al., 2004). Bauman and Kemper (1985; 1994) found increased cell-packing density in the postmortem autistic amygdala. Density measures are based on neurons per unit volume, but volume changes variably when tissue is processed.

Objective: The goal of this study was to measure true neuron number, density, and size in the amygdala using stereological techniques.

Methods: The intact amygdala was collected from one hemisphere of nine autism cases without seizures, and ten age-matched controls 10-44 years of age. Two cases of autism with seizures, age 13 and 27, were also analyzed. One 100µm section through the amygdala, every 500µm, was stained by Nissl method. The entire amygdaloid complex was outlined then partitioned into five reliably-defined subdivisions: 1. lateral, 2. basal, 3. accessory basal, 4. central, 5. remaining nuclei. The number of neurons was estimated with optical fractionator, subdivision volume measured with Cavalieri, and cross-sectional neuronal area with nucleator using Stereoinvestigator software (Microbrightfield Inc.).

Results: Data on 17 of 21 cases suggests there is no difference between autism and controls in neuron number, density, or size in the subdivisions or total amygdaloid complex.

Conclusion: Volume differences observed in MRI studies are likely not due to the number of neurons, but instead may be due to other factors such as the complexity of dendritic or axonal profiles. Complete data on 21 cases will be presented.

Supported by M.I.N.D. Institute, NAAR, and MH41479.

## Friday, May 6, 2005

S2.10 **CONVERGENT EVIDENCE FOR WHITE MATTER DIFFERENCES IN CHILDREN WITH AUTISM STUDIED USING DIFFUSION TENSOR IMAGING (DTI) AND VOXEL-BASED MORPHOMETRY (VBM).** J. VanMeter, L. Girton, M. Kalbfleisch, A. Hailu, A. Wolfe, E. Mease, J. Mbwana, S. Warburton, P. Daniolos, W. Gallaird and T. Zeffiro. Center for Functional and Molecular Imaging, Georgetown University Medical Center.

Introduction: Previous research has demonstrated morphological differences between autistic and typically-developing (TD) individuals, notably in regions of the corpus callosum (CC). While some groups observed reductions in the genu, others implicate the splenium. Studies using VBM found decreased gray matter (GM) density in the superior temporal sulcus (STS). This study used a novel combination of VBM and DTI to explore differences in brain morphology.

Methods: Autistic subjects, ages 7-12, and a TD age, gender and IQ-matched comparison group were studied using high-resolution structural imaging collected on a 3T MRI system. Multiple volumetric, T1-weighted, MPRAGE scans were collected (TR/TE=1600/4.38ms, 1mm3). VBM analysis involved registration, averaging, and white matter (WM) segmentation. Four diffusion weighted scans were collected (TR/TE=6000/84ms, 3mm3, 6 directions). DTI analysis computed fractional anisotropy (FA) measures with registration and averaging of FA maps. Both VBM (WM) and DTI (FA) maps were transformed into Talairach space. Statistical contrasts examined white-matter (WM) density and fractional anisotropy (FA) differences between autistic and TD groups.

Results: Significant reductions ($p<0.05$) were observed in WM density in the rostral subregion of the CC, right STS, and dentate/nodulus of vermis part of the cerebellum for autistic subjects. Significant reductions were also seen in FA in these same regions.

Conclusions: These findings agree with structural alterations in the anterior portion of the CC. Reductions in both WM density and FA in STS implicates WM differences rather than gray matter. Concordance of VBM and DTI analyses demonstrates significant WM alterations in CC, STS, and cerebellum in childhood autism.

Funding: STAART Center Grant, National Institutes of Mental Health, 1-U54-MH066417-02.

Slide Session 3 ***Emotions & Behavior***

S3.1 **THE REPETITIVE BEHAVIOR SCALE-R: ASSOCIATONS WITH AGE, ADAPTIVE LEVEL, AND IRRITABILITY.** S. Donnelly, C. Wolpert, H. Cope, R. Abramson, H. Wright, A. Hall, S. Ravan, J. Gilbert, M. Pericak-Vance, R. Gabriels and M. Cuccaro. Duke University Medical Center.

Repetitive behaviors are a central feature of autism. The Repetitive Behavior Scale-R (RBS-R) was designed to measure repetitive behaviors in autism.

Objective: To examine the relationship between repetitive behaviors, age, adaptive level, and irritability in individuals with autism using the RBS-R.

Methods: The RBS-R, a caregiver completed rating scale, assesses repetitive behaviors in autism. RBS-R data were collected during our autism genetics study. The RBS-R Total and RBS-R subscale scores for 119 individuals with autism (mean age = 10.7; sd = 5.6) were analyzed in relation to age and the ABC-C Irritability scale (IRR). We also examined the association between the RBS-R indices and the Vineland Adaptive Behavior Scale (VABS) composite score in a subset of 82 participants.

Results: After adjusting for multiple significance tests, significant associations were found between age and the RBS-R Self-Injury ($r= -0.21$, $p=0.02$) and Sameness Behavior ($r= 0.31$, $p=0.001$) subscale scores. The ABC-C IRR score was significantly correlated with the RBS-R Total Score ($r= -0.39$, $p<0.01$) and all subscales with the exception of the Stereotyped Behavior subscale. Finally, the RBS-R Total Score was significantly associated with the VABS composite ($r= -0.30$, $p=0.006$). The Self-Injury ($r= -0.37$, $p=0.001$) and Sameness Behavior ($r= -0.24$, $p=0.03$) subscales were also significantly associated with the VABS composite score.

Conclusions: The RBS-R provides useful information regarding repetitive phenomena in autism. The RBS-R Self-Injury and Sameness Behavior subscales appear to be influenced by age and adaptive level. Also, the role of irritability in repetitive behaviors should be studied further.

This work was supported by NIH grants NS26630 and NS36768 and by the National Alliance for Autism Research (NAAR).

S3.2 **ANXIETY SYMPTOMS IN CHILDREN AND ADOLESCENTS WITH AUTISM.** K. Loveland, D. Pearson and S. Reddoch. University of Texas Health Science Center, Houston.

Persons with Autism are reported to have severe anxiety, although few studies address how anxiety manifests or its relationship to age and ability.

Objective: Compare symptoms of anxiety in children and adolescents with and without autism over a wide range of age and IQ, using parent and teacher reports.

Methods: Persons 7 to 18 years with High IQ Autism (HiAut, n=29), Low IQ Autism (LoAut, n=30), High IQ Control (HiCon, n=30), Low IQ Control (LoCon, n=20), and Typical Preschoolers (Pre, n=16) received the Diagnostic Interview for Children and Adolescents (DICA-IV); Conners Parent and Teacher reports; Vineland Adaptive Behavior Scales Maladaptive Domain, along with Stanford Binet-IV.

Results: HiAut, LoAut and LoCon had significantly greater symptoms of phobias and fears (DICA-IV) than HiCon and Pre ($p<.01$). HiAut had significantly greater symptoms of Generalized Anxiety Disorder ($p< .03$) and Separation Anxiety ($p<.01$) than all other groups (DICA-IV). Conners Parent and Teacher ratings of Anxiety were significantly higher ($p< .001$) in HiAut, LoAut and LoCon (< 64) than in HiCon and Pre (< 50). HiAut and LoAut had significantly higher ratings than Pre, HiCon and LoCon on VABS Extreme Anxiety ($p<.05$), and HiAut had significantly higher ratings than HiCon and Pre on Temper Tantrums ($p<.05$). Anxiety ratings were not significantly related to age or IQ within groups.

Conclusions: Persons with Autism had greater reported symptoms of anxiety than comparable Controls across a variety of measures and a wide range of ages and IQs. The greatest reported concern was fears and phobias, especially for HiAut.

Funded by NICHD grant # P01 HD35471, affiliated with Collaborative Programs of Excellence in Autism network.

S3.3 **EVALUATION OF DIFFERENCES IN SLEEP BETWEEN CHILDREN WITH AUTISM AND CHILDREN WITH TYPICAL DEVELOPMENT USING THE CHILD'S SLEEP HABITS QUESTIONNAIRE.** T. Mandler, A. Herndon, S. Hepburn and A. Reynolds. University of Colorado Health Sciences Center.

Children with autism have been reported to have a high rate of sleep disorders (34-88%); however, little is known about the specific areas of difficulty they experience relative to typically-developing children.

Objective: To evaluate differences in sleep between children with autism and children with typical development based on subtests of the Child's Sleep Habits Questionnaire (CHSQ; Owens et al, 1985).

Methods: The parents of 53 children with autism (mean age=7 years, 3 months) and 18 children with typical development (mean age=5 years 2 months) completed the CSHQ. The diagnosis of autism was determined by ADOS and ADI-R or Social Communication Questionnaire. One-way analysis of variance was used to examine group differences in sleep duration. Subtest scores were compared using a non-parametric technique (Mann-Whitney U Test) due to the nature of the variables studied.

Results: Descriptive data will be presented. Children with autism were reported to sleep fewer hours per night ($F(1,62)=7.62$; $p < .01$). They were also found to have a higher score on the night waking subtest ($z = -2.29$; $p< .05$). The parasomnia subscale scores were also higher, however the differences were not statistically significant ( $p = .059$).

Conclusion: Children with autism have significantly more night waking and shorter sleep duration compared to children with typical development. Association between sleep disturbance and other aspects of functioning (e.g., mood, attention, problem behaviors) requires further investigation. Therapies to address these issues should be studied.

This research was supported by Grant #MO1 RR00069, General Clinical Research Centers Program, National Center for Research Resources, NIH and by Grant # UIDCCU820391, Centers for Excellence for Autism and Other Developmental Disabilities, Centers for Disease Control and Prevention.

S3.4 **A COMPARISON OF SLEEP PATTERNS AND SLEEP PROBLEMS IN AUTISM, ASPERGER'S DISORDER, ADHD, AND TYPICALLY DEVELOPING CHILDREN.** A. Richdale, M. Polimeni and A. Francis. RMIT University.

Sleep problems are common in typically developing (TD) children and more common in children with autism

spectrum disorders (ASD). Little is known regarding sleep in Asperger's Disorder (AD). Few studies have compared sleep in children with ASD to other clinical groups.

Objective: To examine the prevalence and nature of sleep problems in children with autism, AD, ADHD, and TD children.

Method: Parents of 93 TD children, 56 children with autism, 42 children with AD, 39 children with ADHD, and 25 with comorbid ASD/ADHD completed a survey on children's sleep patterns which included the Behavioral Evaluation of Disorders of Sleep (BEDS).

Results: Prevalence of sleep problems was high in all groups: TD 50%, autism 72%, AD 71%, ADHD 94%, ASD/ADHD 92%, with significantly more sleep problems occurring in the ADHD groups and significantly fewer sleep problems occurring in the TD group. There were no differences between groups on sleep problem severity. The AD group was found to have more parasomnias than the other groups and to be more sensitive the environment compared to the autism group. The ADHD group had more expressive sleep disturbance and sensitivity to the environment compared to the autism group. The comorbid ASD/ADHD group had the most severe sleep problems across most BEDS factors.

Conclusions: In this sample of children, the autism group most closely resembled the TD group, with the AD and ADHD groups having more sleep disturbance. However, a group of children with comorbid ASD/ADHD exhibited the most severe sleep problems.

This study was funded by the Division of Psychology, RMIT University, Melbourne.

S3.5 **AUTISM IN VISUALLY IMPAIRED INDIVIDUALS.** N. Mukaddes, A. Kilincaslan, G. Sozen, T. Sevketoglu and S. Tuncer. Istanbul Medical Faculty, Istanbul University.

Objective:To assess the prevalance and associated risk factors of autism in a sample of visually impaired children and adolescents.

Method: 257 blind children and adolescents(age range:7-18 years) from two schools for visually impaired individuals were examined for the presence of autism using a two stage process. In the first stage, parents and teachers were asked to identify possible cases of autism and complete the Autism Behavior Checklist (ABC; Krug et al., 1978). School records and medical charts were also examined. In the second stage, subjects who scored more than 50 on the ABC checklist were directly examined by experienced clinicians over a 50-minute period. Care-givers were interviewed and the subjects were rated on the basis of the Childhood Autism Rating Scale (CARS; Schopler et al.1986). A final diagnosis of autistic disorder (APA, DSM-IV, 1994) was given based on the CARS score and the clinical observation. Subjects with autism were compared with those without autism on the following variables: age; gender; level of intelligence (IQ); age of onset of blindness; seizure disorder; presence of hearing impairement; and cerebral palsy. Results: In the first stage, 57 students were considered as probable cases. However, in the second stage ,only 30 met the criteria for autistic disorder. Cases with the diagnosis of autistic disorder showed statistically a significant difference from the non-autistic group in terms of cerebral palsy ($p< 0.001$) and the IQ($P<0.01$). There were no significant differences between the two group in terms of ophtalmologic problems, age, gender, age of onset, and presence of hearing impairment.

Conclusion: The results of this study show that autism in blind population may be related to neurologic impairment as suggested by the presence of a lower IQ and cerebral palsy, and it is not an effect of blindness per se.

S3.6 **FURTHER EXPLORATIONS OF THE EMPATHISING - SYSTEMISING MODEL OF AUTISM SPECTRUM CONDITIONS.** J. Lawson and S. Baron Cohen. University of Cambridge.

Objective: Further explore the Empathising - Systemising (ES) model of autism spectrum conditions (ASCs) by using newly devised tests looking at cognitive bias.

Design/Method: The Thoughts and Feelings Questionnaire (TFQ) involves self report items regarding approaches to everyday situations. The Moral Orientation Questionnaire (MOQ) involves a number of everyday dilemmas along with two possible solutions, one based upon systemising and one based on empathising. These tests were given to a sample of 120 people (25 AS males, 49 non AS males and 46

non AS females).

Results: ANOVA revealed significant effects of group on both tests. On the TFQ this applied only to the empathising items (F = 14.73, df2, 117, p< .001; non AS females > non AS males (p<.03) and non AS males > AS males (p<.001). On the MOQ a significant effect of group was also found (F = 25.87, df2,80, p< .001; non AS females < non AS-males (p<.001) and non AS males < AS-males (p<.048).

Conclusion: The results are consistent with the idea that people with ASCs have a bias towards systemising and away from empathising in everyday situations and that this pattern exists to a lesser extent in males in the general population.

S3.7 **PATTERNS OF VISUAL ATTENTION AND FACE RECOGNITION IN AUTISM.** J. McPartland, G. Dawson, S. Webb and B. Keehn. Yale Child Study Center.

Research shows that individuals with autism have difficulty recognizing human faces and tend to display abnormal patterns of visual attention during inspection of faces. The relationship between atypicality of visual attention to faces and recognition impairments has not yet been elucidated.

Objective: Examine the relationship between visual attention and face recognition ability in individuals with autism spectrum disorder.

Design/Methods: Participants included 18 individuals with autism spectrum disorder and 17 sex and IQ-matched typical children, aged 12 to 17. Visual attention was measured with a head-mounted eye-tracking system while subjects performed a recognition memory task (view 10 stimuli and then identify them in a set of 20) for five stimulus categories: upright human faces, monkey faces, two-dimensional geometric patterns, abstract three-dimensional figures (Greebles), and inverted human faces.

Results: Repeated measures ANOVA with stimulus category as a within-subjects factor and group as between subjects factor revealed a significant group by stimulus interaction effect for recognition score [F(1,33)=3.29, p<.05]. Individuals with autism obtained lower scores for human faces, monkey faces, and inverted faces. Eye tracking data are currently being analyzed and will be used to examine the correlation between individual recognition ability and normalcy of visual attention to faces (attention to eyes versus attention to mouths).

S3.8 **PERCEPTION OF EMOTION THROUGH FACIAL EXPRESSION AND TONE OF VOICE IN AUTISM SPECTRUM DISORDERS: AN FMRI STUDY.** D. Robins, E. Hunyadi and R. Schultz. Georgia State University.

Deficits in emotional processing have been demonstrated in autism spectrum disorders (ASD) using a variety of unimodal paradigms (e.g., static faces). However, few studies use audiovisual (AV) movies, which require the integration of emotional cues from facial expression and tone of voice.

Objective: Use fMRI to investigate the neural systems underlying perception of AV emotion.

Method: Three types of emotional conditions were presented in a 3T Siemens Trio scanner to typical individuals (N=5) and individuals with an ASD (N=4): Congruent (facial emotion matched voice emotion), Low Incongruent (facial emotion did not match voice emotion, but this was difficult to detect), and High Incongruent (facial emotion clearly did not match voice emotion). A non-emotional control condition (AV bouncing ball) was included.

Results: Typical individuals demonstrated greater selective activation in the superior temporal sulcus to emotional stimuli compared to bouncing ball stimuli, relative to participants with ASD. Typical participants also demonstrated increased activation in the right fusiform face area (FFA) and right orbitofrontal cortex (OFC) when viewing the High Incongruent movies compared to the Congruent movies; this may be due to additional focus on each component of the stimulus (face and voice) when faced with highly incongruent stimuli. In contrast, a group of participants with ASD failed to show this pattern of activation; rather, increased activation was found in right angular gyrus and left superior colliculus during the same comparison.

Conclusion: Individuals with ASD do not use the same neural mechanisms to process complex emotional stimuli.

Funding: NIMH U54 MH066494-01 & NAAR

S3.9 **ATTENTIONAL PATTERNS OF FAMILIAR FACE PROCESSING IN INDIVIDUALS WITH AUTISM.** L. Sterling, G. Dawson, H. Panagiotides and S. Webb. University of Washington.

Inconsistent findings characterize neural activation patterns when individuals with autism view faces. However, recent fMRI work has demonstrated that when individuals with autism view familiar faces, typical fusiform gyrus activation occurs (Aylward et al., 2004; Pierce et al., 2004). One possibility is that attentional patterns underlying these processes differ for familiar versus novel faces in individuals with autism.

Objective: Utilize eye tracking techniques to assess attentional patterns of individuals with autism while viewing familiar and unfamiliar faces.

Design/Methods: Eye movements of adults with autism and typical development were recorded. Stimuli consisted of unfamiliar non-repeating faces, a repeating familiar face (e.g. subject's mother), and a repeating unfamiliar face (termed “new friend”). The new friend stimulus was included in order to assess changes in scanpaths due to increased exposure. Amount of time spent looking at eyes, mouth, scanpath, and number of total fixations were recorded.

Results: Typical individuals spent more time attending to the internal features of the face, particularly the eyes. Preliminary results suggest that adults with autism exhibit atypical patterns of attention, as measured by scanpath. Further analyses will include additional subjects, correlations with autism symptoms, and face memory in order to examine individual variability.

Conclusions: Assessment of eye tracking facilitates understanding of the relationship between neural activation and patterns of attention. Whether repeated exposure to a new face leads to more typical attentional patterns will have important clinical implications for individuals with autism.

S3.10 **ARE INDIVIDUALS WITH AUTISM SPECTRUM DISRDERS “EXPERTS” AT FACE PROCESSING AND IF NOT, WHY NOT?.** S. Wallace, M. Coleman and A. Bailey. Oxford University.

Objectives: typically developing individuals are experts at face processing, relative to non-face object processing, because they use specialised (configural or holistic) processing strategies. We predicted that individuals with ASD's do not use these expert processing strategies but instead process facial features.

Methods: participants were 26 high functioning adults with ASD's and 26 matched controls. Experiment 1 tested participants' sensitivity to changes in the feature or configural (the spatial arrangement of the features) properties of faces and houses. In Experiment 2 face and car stimuli were presented and the first stimulus in a pair was presented for 40, 70 or 100 msec. At 40 msec processing was restricted to holistic properties, at longer durations the feature properties could also be processed. The task in both experiments was to decide whether pairs of faces or control stimuli were the same or different.

Results: in both experiments the control group was more accurate discriminating faces compared to both house and car stimuli, a pattern of performance not observed in the clinical group. In Experiment 1 the control group was more accurate than the clinical group at judging changes to both the configural and the feature facial properties. In Experiment 2, controls were more accurate than individuals with ASD's at discriminating faces at all three exposure durations.

Conclusions: individuals with ASD's do not demonstrate face expertise. Neither a holistic nor a configural account, on their own, can account for the findings. There was no evidence for superior processing of facial features in individuals with ASD's.

Funding: MRC-UK studentship.

## Slide Session 4 ***Early Detection/Diagnosis***

S4.1 **AUTISM SPECTRUM DISORDER IN THE SECOND YEAR: STABILITY AND CHANGE IN SYNDROME EXPRESSION.** K. Chawarska, A. Klin, R. Paul and F. Volkmar. Yale Univ. School of Medicine.

Objectives: For decades limited knowledge regarding expression of ASD in infancy has hindered early identification efforts impacting both clinical practice and research. This prospective study reports on stability of syndrome expression in infants diagnosed with ASD between 14 and 24 months (Time1) and re-evaluated at 3 yrs. (Time2). The presentation will address: 1) Relationship between

standard diagnostic instruments and clinical diagnosis; 2) Relationship between direct observation and parental report at Time1; 3) Stability and change of syndrome expression.

Methods: Thirty-one infants (75% male) underwent a comprehensive assessment and were diagnosed clinically with autism (N=21), PDD-NOS (N=6), or DD (N=4). The assessment was repeated at 3yrs. Developmental skills were measured using the Mullen Scales; social and communicative functioning was assessed with the Autism Diagnostic Observation Schedule-Generic (ADOS-G) and the Autism Diagnostic Interview -Revised (ADI-R) (at Time1 only).

Results & Conclusions: Results suggest very good short-term stability of clinical diagnosis. The agreement between clinical diagnosis and the ADOS-G autism classification was very good, but poor for the ADI-R. Parental report was discrepant with clinical ratings with regard to specific classes of behaviors. Changes in symptom severity were noted in communication and play domains with some symptoms becoming less severe (e.g., improvement in functional play) and others worsening (e.g., echolalia). A majority of the abnormalities in social and stereotyped behaviors domains remained remarkably stable. While the algorithm scores of the ADOS-G declined over time, the decline was related primarily to verbal and nonverbal development. Implications for defining best practice parameters for early diagnosis will be discussed.

Funding source: NIMH, NICHD, NAAR

S4.2 **THE AUTISM DIAGNOSTIC OBSERVATION SCHEDULE (ADOS): REVISED ALGORITHMS FOR IMPROVED DIAGNOSTIC VALIDITY.** K. Gotham, S. Risi and C. Lord. University of Michigan.

Study Objectives: In an effort to improve the sensitivity and specificity of the Autism Diagnostic Observation Schedule (ADOS), we are proposing revised algorithms based on module, language level, and chronological age.

Methods: Analyses were conducted using a dataset of ADOS and psychometric scores for more than 1100 individuals aged 12 to 144 months. 870 cases were derived from individuals with autism; 390 from those with PDD-NOS; and 230 from subjects with various non-ASD developmental delays. ADOS domain total distributions were compared across diagnostic groups, and areas of low sensitivity and specificity were identified by module. Due to a ceiling effect in the communication domain, nonverbal and verbal subjects were examined separately for Module 1. Item distributions by diagnosis were used to identify items that differentiated well between Autism and Nonspectrum subjects, and these items were included in a principal component analysis and logistic regression analysis.

Results: Factor analysis supported findings that ADOS social and communication domain items load onto a single factor. By language level and module, algorithms were revised to include only those items that significantly differentiated between ‘Autism' and ‘Nonspectrum.' These items were then reorganized into a Social-Communication domain and a Restricted and Repetitive Behaviors domain. Domain totals were computed with the revised algorithm items, and cut-offs chosen for increased diagnostic sensitivity and specificity.

Conclusions: The ADOS algorithms proposed here can be applied to existing databases and in future clinical assessments and data collection to improve the diagnostic validity of the instrument.

This study was funded by the National Institute of Mental Health (Validity of Diagnostic Measures for Autism Spectrum Disorders: NIMH RO1 MH066469).

S4.3 **USE OF THE STAT AS AN AUTISM SCREEN FOR CHILDREN UNDER 24 MONTHS.** L. Henderson and W. Stone. Vanderbilt University Children's Hospital.

The Screening Tool for Autism in Two-year-olds (STAT; Stone, Coonrod, & Ousley, 2000; Stone, Coonrod, Turner, & Pozdol, 2004) is an interactive, play-based measure that provides a standardized context for observing key social and communicative behaviors. A cutoff score for children between 24 and 36 months has demonstrated strong psychometric properties, though this cutoff is less specific (.65-.86) for younger children.

Objective: To formulate a developmentally sensitive scoring system for children between 12 and 24 months.

Methods: Chi square tests were used to identify

behaviors observed during the STAT that differentiated between 25 children with autism and 16 children with typical development (TD) of comparable mental age (MA) (17.9 and 18.0 months for the TD and autistic samples, respectively). Signal detection was used to identify a cutoff score for half the sample and then validated on the other half.

Results: Several social-communicative behaviors (e.g., gestures with eye contact) and sensory-motor behaviors (e.g., body/limb posturing) contributed to the initial cutoff score, which revealed a sensitivity of .93 and a specificity of .86. The use of this cutoff score with the validation sample yielded a sensitivity of .91 and a specificity of .99.

Conclusions: The STAT items provide an excellent context for observing key social-communicative behaviors. The use of a revised scoring system shows promise for its utility in screening for autism in children under 24 months.

This research is supported by the National Alliance for Autism Research (NAAR) and the National Institute of Child Health and Human Development (NICHD R01 HD043292).

S4.4 **FUNCTIONAL CONSEQUENCE OF COMMON GLYOXALASE I SNP IN AUTISM.** M. Junaid, B. Madhabi, D. Kowal and P. Pullarkat. New York State Institute for Basic Research in Developmental Disabilities.

We have recently shown by proteomic studies, that glyoxalase I (GLO1) is an autism susceptibility gene (Junaid et al., Am. J. Med. Genet. 131A:11-17, 2004). We now demonstrate that the common GLO1 SNP, associated with autism, results in reduced enzyme activity, and causes storage of methylglyoxal and advanced glycation end products.

Objective: To study the biochemical consequences of the rs2736654 SNP in GLO1 in autism patients.

Methods: Functional assays for Glo1 were performed in autopsy brain samples and cultured lymphoid cells from autism patients using spectrophotometry, Western blot, and metabolite measurement.

Results: The GLO1 rs2736654 SNP is a C/’A change that causes Ala111Glu in the mature protein. The Glo1 enzyme activity is decreased in autism brains and lymphoid cells that are homozygous for the A allele. The Glu-form of Glo1 in these cells is hyperphosphorylated. Western blot analysis of brain proteins in autism revealed elevated levels of advanced glycation end products (AGE). Direct HPLC measurements of the Glo1 substrate, methylglyoxal, also showed increased levels in autism brains. These results demonstrate reduced Glo1 activity in conditions when both alleles code for A nucleotide that encodes Glu-form of the enzyme.

Conclusions: A majority of autism subjects possess homozygous A allele condition for the GLO1 rs2736654 SNP. In these subjects, the Glo1 substrate, methylglyoxal accumulate that reacts with proteins forming AGE. Certain AGE with altered function during crucial neuronal developmental may be responsible for the autism pathology.

Supported by grants from NIH (NS 40691), NAAR and New York State OMRDD

S4.5 **USING THE M-CHAT TO DETECT AUTISM SPECTRUM DISORDERS IN YOUNG SIBLINGS OF ASD CHILDREN.** J. Pandey, K. Toth, S. Sutera, J. Kleinman, P. Dixon, L. Wilson, H. Boorstein, E. Esser, M. Barton, S. Hodgson, T. Dumont-Mathieu, J. Green, G. Marshia, G. Dawson and D. Fein. University of Connecticut.

The current study screened 110 younger siblings of children diagnosed with an ASD using the Modified Checklist for Autism in Toddlers (M-CHAT). The sibling cohort ranged in age from 16 to 30 months (mean age 21 months.) Failure on the M-CHAT is defined as three of twenty-three total items failed or two of six critical items failed. Fifty-seven siblings passed and 53 failed the M-CHAT; thus, the fail rate was approximately 48%. Because screeners were collected from parents who may already have been concerned or who may have had more severely affected older children, this rate is probably higher than would be expected in a population screening of younger siblings. 49 of the 53 children who failed the M-CHAT received a developmental evaluation (mean age 23 months.) Subjects were evaluated with developmental and diagnostic instruments, including the Mullen, Vineland, ADOS, ADI-R, CARS, and clinical judgment based on DSM-IV criteria. Thirty-nine siblings were diagnosed with ASD, 4 with language delay, and six were typically

developing. These diagnoses suggest a positive predictive power for the M-CHAT of 80% (39/49) and false positive rate of 20% (10/49). Thus, in this sample, the M-CHAT appears to be an effective screener for ASD. Specific screening items failed by siblings will be compared to items failed by non-sibling ASD children to see if the siblings have different characteristics than the larger group of ASD children.

S4.6 **THE FIRST YEAR INVENTORY (FYI): A QUESTIONNAIRE TO SCREEN FOR AUTISM RISK IN 12-MONTH OLDS.** L. Watson, G. Baranek, E. Crais, J. Reznick, J. Dykstra, S. Reavis and R. Benton. University of North Carolina at Chapel Hill.

Previous research has identified patterns of behaviors in infants as young as 9-12 months that are associated with a later diagnosis of autism. In clinical practice, however, identification of risk for autism usually does not occur until 2 years of age or later, except in cases where there is a known family risk. There are no validated tools for screening one-year-olds in the general population for autism.

Objective: Develop a screening tool for 12-month-olds to detect risk for autism in the general population.

Design/Methods: We used an extensive review of research on early symptoms of autism as the basis for a series of questions targeting developmental milestones, infant behaviors, and parent adaptations to evoke behavior from the infant. The FYI was revised based on extensive feedback from expert reviewers and parents, and field-testing of the questionnaire. For our primary study, the revised FYI was sent to 3,459 parents of 12-month-olds in the general population in central NC. In a second study, we are collecting retrospective FYIs.

Results: 549 parents of 12-month-olds in the general population have completed FYIs. Based on the distribution of responses, we have created a scoring algorithm for the FYI, and have identified scores representing mild, moderate, and severe risk. We will present detailed data on the normative score distribution. For the retrospective FYI, 56 questionnaires have been returned by parents of preschool children in 3 groups: 31 typically developing (TYP), 19 with autism (AUT), and 6 with DD. Chi-square analyses comparing the TYP and AUT groups indicate a significantly different distribution of responses between the two groups for 45 of 60 individual FYI items. The total mean score for the TYP group is 5.8, compared to 37.1 for the AUT group. Confidence intervals around the mean scores indicate that 95% of the time, the difference score between children in the two groups will fall between 18.5 and 44.2.

Conclusion: The FYI uses a feasible method that may have utility for screening 12-month-olds in the general population for risk of autism. Parent responses to the FYI reflect individual variability on infant symptoms that have been associated with later diagnoses of autism. Retrospective parental responses to the FYI indicate a large mean difference in scores between children developing typically versus children with autism at preschool age. We are continuing validation research on the FYI.

S4.7 **RELATIONSHIP AMONG RED FLAGS FOR AUTISM SPECTRUM DISORDERS IN THE SECOND YEAR OF LIFE AND LATER SYMPTOMS.** N. Watt, A. Wetherby and J. Woods. Florida State University.

Objective: The purpose of this prospective, longitudinal study of the FIRST WORDS project was to determine the relationship among red flags of autism spectrum disorders (ASD) identified in the second year of life and later symptoms in children diagnosed with ASD.

Method: Videotapes of CSBS DP (Wetherby & Prizant, 2002) Behavior Samples gathered on 31 children in the second year of life at a mean age of 22.1 months were analyzed to identify early red flags in the domains of Reciprocal Social Interaction, Unconventional Gestures, Unconventional Sounds and Words, and Repetitive Behaviors and Restricted Interests. Later ASD symptom ratings were obtained on the ADOS (Lord et al., 2002) at a mean age of 47.8 months.

Results: Moderate to large correlations were found between the total rating of red flags observed in the second year and the ADOS total score at a mean age of four years. Moderate to large correlations were also found between some ratings of red flags in specific domains in the second year and later ratings of symptoms in specific diagnostic categories of

the ADOS.

Conclusions: These results suggest that the severity of ratings of red flags for ASD observed in the second year of life is related to the severity of symptoms observed later in preschool. Furthermore, red flags consistent with DSM-IV criteria are observable in the second year of life, through systematic observation, which has important implications for early identification of ASD.

This research was supported by two grants from the U.S. Department of Education, Office of Special Education and Rehabilitation Services (H324M980173 and H324C030112) and from the U.S. Department of Education, Institute of Education Sciences (R305T010262).

S4.8 **SOCIAL COMMUNICATION SKILLS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS, DEVELOPMENTAL DELAY, AND TYPICAL DEVELOPMENT IN THE SECOND YEAR OF LIFE.** A. Wetherby, S. Shumway, N. Watt and L. Morgan. Florida State University.

Objective: The purpose of this prospective, longitudinal study of the FIRST WORDS Project was to compare social communication skills measured in the second year of life in children with autism spectrum disorders (ASD), developmental delay (DD), and typical development (TD).

Method: Videotapes of CSBS DP Behavior Samples (Wetherby & Prizant, 2002) were gathered in the second year of life from 35 children later diagnosed with ASD (mean age 21.5 months), 21 children with DD (mean age 18.8 months) and 35 children with TD (mean age 20.2 months). Social communication measures included gaze shifts, shared positive affect, gaze/point follow, communicative functions, gestures, sounds, words, understanding, and play. Measures of receptive and expressive language were obtained at a mean age of 36.2 months.

Results: Children with ASD showed significant differences from children with TD on all measures of social communication and from children with DD only on measures of gaze shifts, shared positive affect, and initiation of joint attention. For the children with ASD, large correlations were found between the following social communication skills measured in the second year and both receptive and expressive language outcomes at age 3: gaze/point follow, initiating joint attention, conventional and distal gestures, inventory of sounds, inventory of words, understanding, and play.

Conclusions: These results suggest that social communication deficits in the second year of life are early risk indicators of ASD and are important predictors of language outcomes. These findings have important implications for early identification and prognosis of young children with ASD.

This research was supported by two grants form the U.S. Department of Education, Office of Special Education and Rehabilitation Services (H324M980173 and H324C030112) and a grant from the U.S. Department of Education, Institute of Education Sciences, (R305T010262).

S4.9 **EARLY LANGUAGE IMPAIRMENTS IN HIGH-RISK INFANTS SUBSEQUENTLY DIAGNOSED WITH AUTISM.** L. Zwaigenbaum, S. Bryson, J. Brian, W. Roberts, P. Szatmari, B. MacKinnon and S. Mitchell. Department of Paediatrics, McMaster University.

Language impairment is a key feature of autism. However, current knowledge regarding language development of children with autism prior to diagnosis is limited to retrospective reports by parents and analyses of home videos. To better understand early development in autism and to inform early identification efforts, we have been prospectively studying high-risk infants, each with an older sibling with autism ("siblings"), as well as low-risk comparison infants ("controls").

Objective: To prospectively assess language development in the first year of life in siblings and controls, based on direct observations and parental report.

Methods: Language skills at age 12 months were assessed using the Mullen Scales of Early Learning (expressive and receptive language subscales), the MacArthur Communicative Development Inventories-Words and Gestures (CDI-WG), and by parental diaries of early vocalizations in their infants. The 12-month language skills in siblings subsequently diagnosed with autism were compared to those of other siblings and controls using 1-way ANOVA.

Results: 97 siblings and 44 comparison infants have

been followed to at least 24 months of age. ADOS scores at 24 months exceed threshold for autism in 12 siblings (all of whom have received clinical diagnoses), and in no controls. Siblings with autism at 24 months, compared to other siblings and controls, have less advanced expressive and receptive language skills (F=3.58, p=.034 and F=4.56, p=.015, respectively) at 12 months. Siblings with autism also understand fewer phrases (F=6.02, p=.004) and use fewer gestures (F=7.65, p=.001) at 12-months, based on parental report using the CDI-WG. Preliminary analyses of vocalizations recorded in parental diaries indicate less vocalization overall and more atypical vocalizations in siblings subsequently diagnosed with autism. These findings will be illustrated by videoclips of participants' vocalizations at their 12-month assessment visit.

Conclusions: Within a high-risk group, children diagnosed with autism at 24-months demonstrate language impairments by 12 months of age.

S4.10 **SCREENING FOR DEVELOPMENTAL DELAY AND AUTISM SPECTRUM DISORDERS IN GENERAL PEDIATRIC PRACTICE.** S. dosReis, C. Weiner, L. Johnson, N. Lee and C. Newschaffer. Johns Hopkins University.

It is unclear to what extent general developmental/behavioral assessments are performed, whether specific screening for autism spectrum disorders (ASD) is being conducted, and what the barriers to providing such assessments are in routine pediatric practice.

Study Objectives: To assess a) the factors influencing the use of general developmental and autism-specific screening tools in primary care pediatric practice, b) the barriers to providing these assessments, and c) pediatricians' beliefs regarding ASD prevalence.

Methods: A cross-sectional, survey was mailed to a 60% random sample of Maryland and Delaware licensed general, primary care pediatricians in June 2004, and a second non-response mailing in August 2004. Of the 1,119 surveys that were mailed, 446 (40%) were returned and 55% of these (n=245) were eligible.

Results: The pediatrician sample was 50% male, had >14 years experience (69%), in large private practices (>70%), and had fewer than 10 ASD patients (55%). Most (79%) routinely screened for general developmental delays, but only 8% screened for ASD. Main reasons for not screening for ASD were unfamiliar with tools (56%), referred to a specialist (43%), or not enough time (28%). Most specialist referrals (74%) were to a developmental pediatrician. Most pediatricians (68%) believed that ASD prevalence has increased, and nearly all attributed this to changes in diagnostic criteria and treatment.

Conclusions: Provider awareness and familiarity with screening tools as well as time and resources are the primary barriers to routine ASD screening. To improve screening, enhanced provider education and service system limitations must be overcome.

## Slide Session 5 ***Genetics***

S5.1 **PHENOTYPIC CHARACTERISTICS OF AUTISTIC REGRESSION IN AN INTERNATIONAL MULTIPLEX SAMPLE.** A. Bailey, J. Parr, G. Baird, A. Le Couteur, M. Rutter and IMGSAC. Department of Psychiatry, University of Oxford.

Objectives: Some individuals with autism lose skills in the first few years and an environmental aetiology has been suggested. We evaluated the characteristics of regression in a sample of individuals with a genetic predisposition to Autism Spectrum Disorder (ASD).

Methods: IMGSAC recruited 486 individuals with an ASD from 239 multiplex families. Regression was identified using the Autism Diagnostic Interview (ADI). ADI domain scores, Vineland Adaptive Behaviour Scale scores, performance and verbal IQ were compared according to regression status.

Results: There was evidence of regression in 27.3% of individuals (22.8% of families). Considering early regression (loss d36 months), 23.8% of individuals were affected and 21% lost language. Compared with individuals who did not regress, early language regression cases acquired first words significantly earlier ($p<0.001$), had significantly higher ADI domain scores, and significantly lower Vineland Domain and verbal and performance IQ scores. Eighty nine pairs were discordant and 22 pairs concordant for regression. Within discordant pairs, individuals who regressed were generally more impaired than their non-

regression sibling; when these individuals were compared with the eldest case from pairs concordant for regression, no differences in outcome were noted. Non- regression cases from discordant pairs had similar outcomes to cases from pairs concordant for not regressing.

Conclusions: The incidence of regression is similar to that seen in singletons with autism and regression most commonly affected one individual in an affected pair. The findings suggest that regression is an intrinsic but emergent feature of a genetic susceptibility to ASD and indexes more severe phenotypic expression.

Funding: Medical Research Council, The Wellcome Trust, European Commission

S5.2 **LOCALIZATION OF AN AUTISM GENE ON CHROMOSOME 17Q.** R. Cantor, J. Duvall, N. Kono, J. Stone, A. Alvarez-Retuerto, S. Nelson and D. Geschwind. Department of Human Genetics, UCLA School of Medicine.

Linkage of Autism to a region on Chromosome 17q has been identified in 345 affected sibpair families from the Autism Genetics Resource Exchange (AGRE) (Yonan, et al, AJHG, 2003) and replicated in an independent sample of 100 families, from the same AGRE panel (Cantor et al, ASHG, 2004) . Significant linkage in both cohorts derives primarily from the families with no affected females (Stone et al, AJHG 2004). To localize the putative Autism gene(s) in the 20 cM region identified by these analyses, thirteen multiallelic markers were genotyped at approximately 2 cM intervals in both AGRE cohorts. Using the SIBPAL program of the Statistical Analysis for Genetic Epidemiology software, multipoint linkage analyses conducted on the 219 autistic sibpairs from the sibships having no affected females revealed the most significant allele sharing estimate at D17S2180, which has a sex-averaged genetic distance of 66.85 cM from the telomere and is in chromosomal band 17q21.32 (p=.00002). Single point analyses revealed the strongest evidence of linkage to the same marker (p=.00001). A multipoint maximum lod score generated by the Genehunter software on the same families was 4.1 at this marker. A drop of one lod identified an additional peak with a lod score of 3.6 at D17S1299, which has sex-averaged genetic distance of 62.01 cM at 17q21.2. Association analyses are likely to reveal the putative autism gene(s) in this restricted region.

S5.3 **FAMILIALITY OF QUANTITATIVE AUTISTIC TRAITS IS EQUIVALENT FOR SEVERE AND SUB THRESHOLD LEVELS OF SYMPTOMATOLOGY.** J. Constantino, A. Abbacchi and R. Todd. Washington University School of Medicine.

Objective: We examined sibling correlations for quantitative autistic traits among families of children with autism spectrum conditions (n=243) and families in the general population (n=527), in order to identify possible differences in the genetic structure of clinical-level versus sub-threshold autistic symptomatology.

Method: Probands with autism spectrum conditions, general population controls, and their closest-aged non-identical sibs were assessed by teachers and/or parents, using the Social Responsiveness Scale (SRS, parent-teacher correlation r=0.76). We computed intra class (between sib) correlations ICC for total SRS scores, and for DSM-IV autism criterion domain scores derived from the SRS. Since cognitive deficits were more prevalent among clinical subjects, non-verbal IQ was assessed in a sub-sample using the Raven Colored Progressive Matrices (n=75; SRS-NVIQ correlation was non-significant, r=-0.16).

Results: Sib correlation (ICC) for total SRS score was 0.52 for clinical sib pairs (p<.0001) and 0.54 for non-clinical (general population) sib pairs. Sib correlations for DSM-IV criterion domain scores were similar in magnitude; for clinical subjects, ICC=0.50 (social impairment), 0.41 (language impairment), and 0.47 (repetitive/stereotypic behavior); for non-clinical subjects ICC= 0.57, 0.36, and 0.37 respectively.

Conclusions: For clinical-level symptomatology, quantitative autistic traits exhibit the same degree of familiality as is observed for sub-threshold symptomatology in the general population. These findings support an additive genetic model of inheritance for autistic traits across the entire range of severity observed in nature. Incorporation of quantitative phenotypic data in molecular genetic studies involving both clinical and non-clinical populations may increase statistical power to identify

genetic susceptibility factors for autism spectrum conditions.

S5.4 **GENETICS, ENVIRONMENT, NUTRITION EXPLORING AUTISM IN CHILDREN: THE GENE-A STUDY.** E. Fombonne, R. Zakarian, P. Assouad, M. Fischel, E. Golan and E. Dewailly. Department of Psychiatry, Montreal Children's Hospital.

Study Objective: Compare dietary intake and exposure to environmental factors of autistic and normally developing children.

Methods: Patients are recruited from the Autism Spectrum Disorders Clinic of the Montreal Children's Hospital. Patients are assessed by the primary author with the ADI and ADOS-G, resulting in a confirmed diagnosis of Autism/ Pervasive Developmental Disorder (PDD). Blood, hair, and toenail specimens are collected from all children and their mothers. Children's eating and sleeping habits are recorded in a 3-day Food Diary and a 7-day Sleep Log. A telephone interview with mothers is conducted to gather dietary, environmental and medical information on their pregnancy and their child's first year of life.

Results: Data is collected on 71 autistic children and their mothers (mean age=3.7 years; age range=1.6 years to 6.8 years) and 30 controls. 88.7%(n=63) PDD children are males and 11.3%(n=8) are females. Preliminary analyses of 32 autistic children and 15 controls indicate no between-group difference in mercury levels on both the blood and hair of children and their mothers. Immunoglobulin A, M, and G were also similar in both groups of children. Nutrient analyses showed that some PDD children had less than optimal intake of essential amino acids, especially those on a gluten-free, casein-free diet. Results will be presented on a more complete sample.

Conclusion: Considering the rise of Autism and PDD diagnoses, there is concern that environmental risk factors may be causing this increase. Preliminary findings of this study may provide important information on possible contributing factors to childhood autism.

Sponsor: Fonds de la recherche en santé du Québec (FRSQ-MSSS)

S5.5 **THE ICELANDIC AUTISM STUDY - A GENEALOGICAL APPROACH TO THE GENETICS OF AUTISM INCLUDING THE BROADER AUTISM PHENOTYPE.** R. Fossdal, P. Magnusson, E. Saemundsen, G. Bjornsdottir, S. Steinberg, J. Thorhallsdottir, B. Unnarsdottir, C. López-Correa, S. Matthiasdottir, H. Stefansson, B. Lauth, S. Hreidarson, O. Gudmundsson, J. Gulcher, K. Kristjansson, T. Thorgeirsson and K. Stefansson. deCODE Genetics, Inc..

Objective: This study aims at isolating autism susceptibility genes by the genealogical approach to autism and the broader phenotype in Icelandic families.

Methods: To identify and characterize the extended families, relatives of autistic probands are offered participation in a systematic phenotypic ascertainment to identify signs of the broader autism phenotype as judged by existing instruments and scores on a new screening instrument, The Development, Social Interaction and Mood Questionnaire (DSIM). The phenotyping involves answering self- and informant versions of DSIM presented via web-based software. For genome-wide scans we utilize 2182 microsatellite markers. In parallel, haplotype association with the core autism phenotype is studied in previously reported regions. FISH is used to search for chromosomal rearrangements associated with autism in other populations.

Results: In Iceland 217 of 352 individuals diagnosed with autism spectrum disorders have been recruited as well as 1115 of their relatives. Linkage analysis based on the core phenotypes supports several of the previously published linkages (2q, 5p, 15q and X), but no rearrangement was found by FISH in the PWS/AS-region on 15q. The autism family cohort after inclusion of the broader phenotype will be described. Current analysis of DSIM data (945 adult relatives) indicates that 210 (22 %) may be candidates for the broader phenotype.

Conclusions: Studies focusing on the core phenotypes can provide important leads in linkage studies. Including the broader phenotype in genetic studies of autism will greatly increase the size and number of families, thus adding much needed power to the positional cloning effort.

The research is supported by the Simons Foundation

S5.6 **A GENOMEWIDE LINKAGE SCAN USING THE SOCIAL RESPONSIVENESS SCALE (SRS) AS A QUANTITATIVE TRAIT FOR AUTISM.** D. Geschwind, J. Duvall, R. Cantor, The AGRE Consortium, R. Todd and J. Constantino. UCLA.

Autism is a neurodevelopmental disorder that is characterized by language difficulties, social deficits, and repetitive, stereotyped behaviors. Numerous family and twin studies provide compelling evidence that autism has a strong genetic component. However, heterogeneity has limited power to detect autism-related loci, necessitating the identification of endophenotypes or quantitative measures that may provide more analytic power. The Social Responsiveness Scale (SRS) provides a highly heritable, quantitative measure of autistic-like behavior related to social features (Constantino et al., 2003). Here we present the analysis of the first quantitative genome scan using the SRS in 105 families with 223 combinations of sibs. Nonparametric Z-scores and Haseman-Elston LOD scores were calculated with Genehunter, and all possible sib combinations were used. Nine loci, on chromosomes 4, 5, 6, 11, 12, 14, 17,18, and 21, had Z-scores > 2.5, with the highest score on chromosome 11 ($Z = 3.8$; $p < 0.00008$), close to genome-wide significance. These loci show significant overlap with those found in a previous genome scan using the categorical diagnosis of autism according to the Autism Diagnostic Interview - Revised (ADI-R; Yonan et al., 2003). These results demonstrate the power of the SRS to increase our ability to detect autism related genetic loci, by enabling the use of quantitative social behavioral information that may more closely relate to the underlying genetic factors.

S5.7 **GABRB3 EXPRESSION DEFECTS IN AUTISM CEREBRAL SAMPLES.** A. Hogart, R. Samaco and J. LaSalle. U.C. Davis School of Medicine.

Autism is a common disorder of complex genetic etiology. Angelman syndrome (AS), caused by maternal 15q11-13 deficiency or UBE3A mutation, and Rett syndrome (RTT), caused by MECP2 mutation, are examples of a genetic syndromes with comorbid autism. Maternal 15q11-13 duplications are observed in 1-3% of autistic patients as the most frequent cytogenetic abnormality in autism. Linkage and association studies have implicated multiple genes with 15q11-13, especially GABRB3, in autistic families. GABRB3 encodes the ²3 subunit of the GABAA receptor and is therefore an attractive autism candidate gene.

Objective: Determine protein expression of GABRB3 in autism cerebral samples.

Methods: Protein extracts were isolated from frozen postmortem human cerebral cortex, Brodman area 9. Standard immunoblot analyses (2-3 replicates) were performed on 9 autism samples, 3 RTT samples with MECP2 mutations, 2 AS samples with 15q11-13 deletions, 3 Down syndrome (DS), and 11 age-matched control samples. Band intensities were quantitated and the ratio of GABRB3/GAPDH calculated.

Results: When analyzed as combined groups, RTT, AS, and autism samples showed significantly lower GABRB3 expression compared to controls, in contrast to DS. The autism samples showed the highest significant decrease in GABRB3 as a group ($P < 0.0001$ by t-test), despite higher variability between samples. 5/11 or 56% of autism samples showed significant decreases compared to controls, with four samples showing GABRB3 expression at ~5-10% of control levels.

Conclusions: GABRB3 deficiency in the cerebrum is a common defect in autism brain. Our results further suggest an overlap in the pathogenesis of AS, RTT, and autism.

This study was supported by the U.C. Davis M.I.N.D. Institute.

S5.8 **EPIGENETIC OVERLAP IN AUTISM-SPECTRUM NEURODEVELOPMENTAL DISORDERS: MECP2 DEFICIENCY CAUSES REDUCED EXPRESSION OF UBE3A AND GABRB3.** J. LaSalle, S. Rodney and S. Rodney. U.C. Davis School of Medicine.

Autism is a common neurodevelopmental disorder of complex genetic etiology. Rett syndrome, an X-linked dominant disorder caused by MECP2 mutations, and Angelman syndrome, an imprinted disorder caused by maternal 15q11-13 or UBE3A deficiency, have phenotypic and genetic overlap with autism. MECP2 encodes methyl CpG binding protein 2 (MeCP2) that

acts as a transcriptional repressor for methylated gene constructs, but is surprisingly not required for silencing imprinted genes.

Objective: Determine if Mecp2 deficiency affects expression levels of Ube3a and neighboring autism candidate gene Gabrb3 without necessarily affecting imprinted expression.

Methods: Multiple quantitative methods were used to test expression levels of transcripts and proteins in two different Mecp2-deficient mouse strains. Automated quantitation of immunofluorescence and in situ hybridization by laser scanning cytometry on a cerebral tissue microarray, and immunoblot and TaqMan PCR analyses of brain were performed to quantitate expression of Ube3a/UBE3A and Gabrb3/GABRB3. Allele-specific expression was determined by restriction digest polymorphisms in (Mecp2 -/+ x PWK)F1 brain samples.

Results: Significant defects were observed in Ube3a/UBE3A and Gabrb3/GABRB3 expression in Mecp2-null mouse brain compared to wild-type controls. In contrast, no significant defects were observed in the expression level of Snrpn or Ube3a antisense transcripts. Allele-specific analyses demonstrated the expected preferential maternal expression of Ube3a sense transcript, paternal expression of Ube3a antisense and Snrpn, and biallelic expression of Gabrb3, regardless of Mecp2 genotype.

Conclusions: These results implicate MeCP2 in the regulation of Ube3a and Gabrb3 expression in the postnatal mammalian brain and suggest an overlapping pathway of gene dysregulation within 15q11-13 in Rett and Angelman syndromes.

Supported by NIH (R01HD/NS41462) and Rett Syndrome Research Foundation.

S5.9 **EVIDENCE FOR AUTISM LOCI IN THE CHROMOSOME 2Q24-Q33 REGION, IN ADDITION TO AGC1.** N. Ramoz, J. Reichert, C. Smith, T. Corwin, J. Silverman and J. Buxbaum. Laboratory of Molecular Neuropsychiatry, Department of Psychiatry, Mount Sinai School of Medicine.

Objective: Assess the linkage and association of AGC1 and autism, and identify new autism loci in the chromosome 2q24-q33 region

Method: The genotyping of 180 SNPs was performed in 360 autism families (90 simplex and 270 multiplex), which included 653 autism subjects. Eighty five SNPs were selected to cover 40Mbps that corresponded to the 30Mbps of the autism locus on the chromosome 2q24-q33 region and 5Mpbs of flanking regions. Further, 95 SNPs were chosen to increase the density of markers across 26 candidate genes. These include 14 SNPs encompassing the AGC1 gene. Intermarker linkage disequilibrium was computed with Haploview. SNPs were analyzed for linkage using the GENEHUNTER (GH) program and for association using family-based methods (TDT-GH, Transmit, TDTPhase and PDT softwares).

Results: Linkage analysis demonstrated a maximum multipoint non-parametric lod score value of 1.9 (p=0.02) with SNPs across the AGC1 gene. Two other peaks were detected, one of these covering the ITGA4-NEUROD1 region. Significant association was observed between autism and SNPs in AGC1, and there was some evidence for association with SNPs in the ITGA4 region.

Conclusion: We have further evidence for the existence of one, and perhaps more, autism susceptibility genes in 2q24-q33. There is linkage and association between autism and AGC1 and potentially linkage and association with other loci.

S5.10 **GENETIC TESTING FOR AUTISM: CURRENT STATE OF CLINICAL PRACTICE IN THE SOUTHEASTERN UNITED STATES.** C. Wolpert, S. Donnelly, H. Cope, M. McDonald, R. Abramson, H. Wright, J. Gilbert, M. Cuccaro and M. Pericak-Vance. Duke University Medical Center.

Currently, Fragile X testing and/or chromosome analysis is recommended for children with autism who also have mental retardation and/or dysmorphic features. However, it is unknown how many of these eligible individuals actually receive this recommended testing.

Objective: Examine the frequency with which genetic testing is conducted in a sample of individuals with autism.

Methods: Medical records were reviewed from children with a confirmed diagnosis of autism enrolled in a genetic study (n=625). Adaptive functioning and a family history of autism were compared between

participants with and without genetic testing.

Results: In this data set, less than 20 percent of individuals with autism had genetic testing. The most common genetic tests ordered were Fragile X (18%), chromosome analysis (14%), FISH (5.2%), amino acids (9%), and organic acids (8%). Some individuals had multiple genetic tests. The group with genetic testing had significantly lower mean Vineland Adaptive Behavior Scale composite scores (p = 0.0001). The family history positive group had a significantly higher number of individuals who had genetic testing (p=0.004).

Conclusion: Individuals who did have genetic testing have significantly lower adaptive functioning when compared to the rest of the data set or had a positive family history of autism. Although less than 20% of this data set had genetic testing, 72% of the participants have mental retardation, which is one of the indications for genetic testing. Therefore, more than 50% of eligible individuals did not receive genetic testing suggesting that in this data set genetic testing is underutilized for individuals with autism.

This work was supported by NIH grants NS26630 and NS36768 and by the National Alliance of Autism Research.

## Slide Session 6 ***Intervention & Education***

S6.1 **WHERE ARE THEY NOW?: ADULT FUNCTIONING IN AUTISM SPECTRUM DISORDERS.** D. Ellison, C. Clark and B. Langford. Child and Parent Resource Institute and The University of Western Ontario.

Objective: With the availability of many intervention options, it is difficult to know which options have an impact on adult functioning. The objective of the present study is to determine retrospecitively, from a parent and client perspective, intervention options accessed as children that made a difference in adult functioning.

Design/Methods: Questionnaires on current functioning and past treatments options accessed were sent to 100 families of former clients of a Children's Mental Health Center in Southwestern Ontario (current mean age of former client = 22 years; range 18 - 32 years). Twenty-seven families returned questionnaires. Twelve families had moved from their previous address and could not be located. This resulted in a total response rate of 31%. Follow-up interviews were conducted with 15 families to clarify questionnaire responses.

Reults: There was an equal split between the diagnoses of Autism, Asperger's Disorder, and PDD-NOS in this sample. Eighty-two percent of clients were still residing with their parents. Forty percent of clients were employed averaging 14.5 hours per week. Thirty-seven percent of clients volunteered with an average of 4 volunteer hours per week. Interventions that parents and clients believed had made a difference were medication and speech therapy. Only one family mentioned behaviour therapy as having been useful. Parents indicated that, in hindsight, they should have been stronger advocates for their children and focussed their efforts more on life skills and adaptive functioning rather than on behaviour management. Continued concerns for the future revolve around living arrangements, financial security, and social relationships.

Conclusion: The results of this study appear to support a model of intervention that includes skill development for independent living as a major component.

S6.2 **TEACHING CHILDREN WITH ASPERGER SYNDROME TO RECOGNIZE EMOTIONS USING INTERACTIVE MULTIMEDIA.** O. Golan and S. Baron-Cohen. Autism Research Centre, Departments of Experimental Psychology and Psychiatry, Cambridge University.

Recognition of emotions and mental states is a core difficulty for children with Asperger Syndrome (AS). Past attempts to teach emotion recognition to children with AS have focused mostly on basic emotions. Difficulties in complex emotion recognition in AS are more robust.

Objectives: This study evaluated the effectiveness of 'Mind Reading', an interactive computer programme, teaching recognition of both basic and complex emotions from videos of faces and speech segments (www.jkp.com/mindreading).

Methods: The software was given to 20 children with AS, aged 8-11, to use at home for 10-15 weeks. A

control group of 20 children with AS had no intervention during this period. Both groups were assessed before and after this period for their ability to recognize basic and complex emotions in faces and voices, at two levels of generalization. A third group of 20 typically developing children was assessed once to obtain normative data. The three groups were matched on age and IQ.

Results: There was a significant improvement for the software users, in recognition of emotions from faces and voices, compared to the AS control group. Improvement was mostly limited to faces and voices which were included in the software. Generalization to stimuli not included in the software was found in the vocal channel only.

Conclusions: These results suggest that children with AS can improve their ability to recognize both basic and complex emotions using computer-based training, but may need further tutoring to enhance generalization to other situations and stimuli.

This study was supported by the National Alliance for Autism Research, The Corob Charitable Trust, the Shirley Foundation, and the Cambridge Overseas Trust.

S6.3 **GROWTH IN JOINT ATTENTION AND SYMBOLIC PLAY.** C. Kasari. UCLA.

Joint attention and symbolic play remain important targets for intervention with young children with autism. Although interventions targeting responding meet with success, studies have not shown that spontaneous initiations of joint attention and symbolic play skills can be taught, generalized and maintained.

Objective: Assess both the generalization and maintenance of newly learned skills in joint attention and play.

Design/Methods: 58 children with autism between the ages of 3 and 4 years (46 boys) were randomized to a joint attention intervention, a symbolic play intervention, or a control group. Interventions were conducted 30 minutes daily for 5-6 weeks.

Results: Children who received the joint attention intervention initiated significantly more joint attention interactions with their mothers than did children in the other two groups. Similarly children in the symbolic play intervention initiated significantly more symbolic play - acts with their mothers than did children in the other two groups. The next question was whether children would continue to grow differentially in these skills over a one-year follow up. Children in the joint attention group increased their joint attention skills at a faster rate than did children in the other two groups and children in the play group increased their symbolic play skills at a faster rate than children in the other two groups.

Conclusion: Children with autism can learn to initiate joint attention and symbolic play skills, and these skills can generalize to other people not involved in the intervention and be maintained over a long period of time.

Funding: NIH R21MH64927

S6.4 **INVESTIGATING CHANGE IN SOCIAL COMMUNICATION FOLLOWING EARLY INTERVENTION FOR CHILDREN WITH AUTISM.** D. Keen, S. Rodger, M. Braithwaite and K. Doussin. University of Queensland.

The acquisition of social communication skills is a major challenge faced by children with autism. This study investigated factors that may impact on the acquisition of communication and symbolic behavior of young children with autism and issues associated with the measurement of changes in these behaviors.

Objective: To measure the effects of a family-centered intervention on the communication and symbolic abilities of children aged 2-4 years with autism.

Design/Methods: 16 children aged 2-4 years were assessed using the caregiver questionnaire and the behavior sample of the Communication and Symbolic Behavior Scale Developmental Profile (CSBS-DP). The CSBS-DP was administered prior to and following an 8 week family-centered intervention program. In addition, parent measures were taken using the Parenting Stress Index and the Parenting Sense of Competence.

Results: Using Wilcoxon's Z, significant changes in communication and symbolic behavior, as measured by the CSBS-DP caregiver questionnaire were identified following intervention. Differences between pre and post measures on the CSBS-DP behavior sample were not significant. Multiple regressions revealed a greater improvement in communication and symbolic behavior

for children with lower levels of adaptive functioning and for children whose mothers reported lower levels of parenting stress or parental competence prior to intervention.

Conclusions: A relatively short-term intervention for young children with autism demonstrated measurable change in communication and symbolic behavior based on caregiver report. Significant change was not evident based on independent observer ratings during a 30 min behavior sample. Interventionists may need to use a variety of measures to determine the efficacy of an intervention and assessment across different contexts may be necessary to ensure an accurate profile of skills and abilities. This study also found that maternal stress can have a negative effect on children's acquisition of communication and symbolic behavior during intervention, emphasising the need for family-centered approaches that incorporate parent education and support.

Funded by Commonwealth Department of Family and Community Services.

S6.5 **LANGUAGE AND SOCIAL CHANGE IN TODDLERS WITH ASD: EARLY INTERVENTION.** R. Landa, K. Holman, M. Sullivan and J. Cleary. Kennedy Krieger Institute.

Study Objectives were to determine whether language and communication development in toddlers would be related to changes in affective and joint attention development during an early intervention program.

Methods: 19 toddlers (22 to 33 months entry age) with autism spectrum disorder participated in an early intervention program that provided 10 hours per week of direct intervention in a classroom-based model over a six-month period. Weekly parent trainings and monthly home visits were provided also. A multi-modal approach was used including Pivotal Response Training, Discrete Trial Teaching, visual input and output augmentation, and sensory-social routines. Language, communication, and social targets were individualized based on developmental levels. Each child received pre- and post-treatment assessments. The data to be reported are part of a larger study for which all the data are not yet obtained.

Results: The children showed clinically significant change in language and social domains. Mean receptive and expressive language gain in the first cohort was 11 months over a 6-month period. Pre-treatment initiation of joint attention bids was correlated with expressive language improvement over the course of the intervention (r=.855; p=.007, two tailed). Improvement was also noted in joint attention, imitation, social initiations, and shared positive affect.

Conclusions: Toddlers with autism in a multi-modal, classroom-based intervention program show significant changes in language and social functions. The greatest language gains were observed in toddlers with the strongest pre-treatment joint attention skills. Our hypothesis was supported: improvements in language and joint attention were related (affect coding is underway and results will be presented at IMFAR).

Funded by NIH: 5 U54MH066417-02

S6.6 **A COGNITIVE BEHAVIORAL INTERVENTION FOR HIGH FUNCTIONING CHILDREN WITH AUTISM SPECTRUM DISORDERS AND PROBLEM BEHAVIORS.** M. Solomon, M. Ono and B. Goodlin-Jones. U. C. Davis Health System, Department of Psychiatry, MIND Institute.

High Functioning Autism (HFA), Asperger's Syndrome (AS), and Pervasive Developmental Disorder NOS (PDDNOS) are mild forms of autism that affect approximately 1 in 166 children. Studies have found that many children with autism spectrum disorders have difficulties transitioning between activities, verbally expressing and modulating affect, and tolerating frustration. These challenges then may produce externalizing behavior problems.

Study Objectives: There are few evidence-based interventions for high functioning children with ASDs (exceptions exist, e.g. Solomon, Goodlin-Jones & Anders, 2004.) This study reports the effectiveness of a manualized and empirically supported 12-week cognitive behavioral intervention program called Parent-Child Interaction Therapy (PCIT; Mc Neill & Himbree-Kigin, 1995) in 20 children with autism spectrum disorders and clinically significant behavioral problems. In PCIT, therapists work closely with parents using a bug-in-the-ear communication system and a one-way mirror.

Design/Methods: Twenty boys between the ages of

4 and 12 with diagnoses of autism spectrum disorders as confirmed by gold standard measures and clinically significant behavioral problems were recruited. A waiting list control group design was employed for comparison purposes. Pre and post testing using the Behavioral Assessment System for Children (BASC), the Eyberg Child Behavior Inventory (ECBI), individually set goals, and measures of child and parent affect (BDI, CDI, PSI) was completed. 2x2 ANOVA, ANCOVA, and correlation and multiple regression analyses were used to analyze group differences.

Results: It was possible to train parents to master PCIT. There was a statistically significant reduction in several forms of child problem behaviors reported by intervention versus control group subjects. Parents in the intervention versus control group reported a significant reduction in negative feelings about their children's behaviors. There was a statistically significant reduction in aspects of parent reported depression and stress. There was a statistically significant relationship between these parent reports and acquisition of PCIT skills as assessed by clinicians during each session.

Conclusions: PCIT appears to be an effective therapy for reducing some forms of problem behaviors in children with high functioning autism spectrum disorders. It also significantly improves parent perceptions of their children. Furthermore, it was possible to adapt PCIT sessions to target other deficits often presents in children with autism spectrum disorders including social skills issues, pragmatic language problems, behavioral inflexibility, and poor emotional awareness and expression.

S6.7 **PHARMACEUTICAL TREATMENTS IN CHILDREN WITH AUTISM AND ADHD: A REVIEW.**
T. Wisniewski, M. Brimacombe and X. Ming. University of Medicine and Dentistry of New Jersey / Department of Preventive Medicine and Community Health.

Objective. To determine the numbers and overall quality of studies conducted on the most prevalent psychotropic substances prescribed to autistic (ASD) children as compared with attention deficit hyperactivity disorder (ADHD) children.

Methods. Searches were conducted on Medline and Cochrane Controlled Trials Register between June 1, 2004 and August 1, 2004. Peer-reviewed, published studies from domestic and international journals, written in English were included. Studies that were written in another language, but whose abstracts that contained all relevant data in English translation, were also included. We included case reports, provided they met the required sample size, retrospective analyses, open label and controlled trials. We included only studies that focused on children up to 20 years of age, had a minimal sample size of ten participants, and were conducted between 1994 and 2004, inclusive.

Results. We identified 281 studies that fit our inclusion criteria: two hundred forty eight studies within the ADHD population and thirty three within the ASD population. Of the 254 studies for which design data was available, 129 or 50.8% employed a double blind placebo controlled design. Of 269 studies with available sample size data, 106 or 39.4% were conducted with sample sizes of less than thirty participants. Of the 281 studies we reviewed, 184 (182 in the ADHD population, 2 in the ASD population) or 65.5% were focused on methylphenidate. The remaining 34.5% included 97 studies conducted on other stimulants (Adderall, dextroamphetamine, pemoline), antipsychotics (risperidone, olanzapine, haloperidol), antidepressants (desipramine, imipramine, lofexadine, citalopram, fluoxetine, multiple SSRIs, clomipramine, buproprion,venlafaxine), alpha agonists (clonidine), anxiolytics (buspirone), and mood stabilizers (divalproex, levitracetam).

Conclusions. The use of psychotropic medications in children involves a delicate balance between managing symptoms that can severely affect a patient's livelihood and functioning within the daily context of life and assessing the short and long-term safety of such medications with specific consideration given to the developmental processes that occur throughout childhood. Our findings indicate that many studies conducted on children lack scientific rigor, and may or may not adequately address safety and efficacy of their use within the child population. Until such assessments are made through sound scientific studies, the use of psychotropic medications in this population should be treated with caution and concern for the children and their families. Funding: None.

S6.8 **A STUDY OF THE EFFECT OF EARLY INTERVENTION ON THE USE OF VERBAL AND NON-VERBAL COMMUNICATION IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** K. Wittemeyer, B. Rogé, G. Magerotte and J. Fremolle-Kruck. CERPP.

Previous research has shown that with early intervention children with autism spectrum disorders (ASD's) show marked improvements in verbal and non-verbal communication.

Objective: The program used in our study met recognised early intervention design criteria, which included an individually tailored curriculum and an active parental role. We predicted that the children with ASD's who received this intervention would show increased expressive and receptive communication skills. We also aimed to assess their functional use of these skills.

Methods: Over the period of a year we provided an intervention program for a group of 18 children with ASD's aged 2 yrs 5 mths to 4 yrs 7 mths. The children were taught skills to improve their social interaction, communication and stereotyped behaviour, during one-to-one sessions and for a total of 15-20 hours per week. Pre- and post-intervention assessments of the children's verbal and non-verbal communication included: the Early Social Communication Scales; Reynell Scales of Language Development; Vineland Adaptive Behavioural Scales; Test of Pragmatic Skills; Khomsi's Verbal Comprehension Assessment; Childhood Autism Rating Scales; ADOS-G.

Results/Conclusion: Our findings showed striking improvements in the children's verbal and non-verbal communication skills, both on the expressive and receptive measures. Pilot data from 5 control children (who received non-individualised and less intensive intervention) did not show such marked improvements. Moreover, data from the Vineland indicates greater improvement in adaptive communication skills in the intervention group relative to controls, suggesting that our program helps children with ASD's to functionally use the learnt skills.

The study is conducted within the framework of the European AUTI-QOL (Autism ans Quality Of Life) program on early intervention, which is directed jointly by Professors B. Rogé and G. Magerotte. This project has obtained financial aids from the Fond Social Européen. A grant of the Fondation France Télécom has also been attributed in order to realize the intervention program.

S6.9 **VARIABLES AFFECTING OUTCOME IN YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDER AFTER ONE YEAR OF INTENSIVE BEHAVIOR INTERVENTION.** D. Zachor and E. Ben Itzchak. Assaf Harofeh Medical Center, Tel Aviv University.

Studies have noted some children with autism spectrum disorder (ASD) benefited substantially from early intervention, while the others showed only moderate progress.

Objectives: To assess the effectiveness of intensive intervention and the relation between pre-intervention variables (communication, socialization and cognition) to outcome in very young children with autism.

Design/Methods: Sixteen children (1.6-2.6 years) with ASD were assessed for autism severity by Autism Diagnostic Observation Schedule (ADOS) and for cognitive abilities by I.Q. tests. Imitation, Receptive Language, Expressive Language, Non-Verbal skills, Play and severity of Stereotyped behaviors were assessed pre- and post- one year of intensive behavior intervention.

Results: Children were divided into groups based on the severity of communication and social interaction deficits (ADOS) and I.Q scores. Pre -post intervention measures showed significant progress in all the behavioral domains (2x2 ANOVA, $p<.001$). Significant interaction (Time x Pre intervention social deficits) was noted for Expressive language and Play skills (2x2 ANOVA, $P<0.5$), meaning better social scores at diagnosis related to greater post-intervention gains. Communication scores didn't yield any significant interaction of Time x Group. Assessing the effect of pre-intervention cognitive skills, high IQ group showed greater improvement over time than low I.Q, but no Time x Group interaction was found.

Conclusions: The significant progress in all the behavioral measures after one year of intervention emphasizes the importance of early intensive intervention in ASD. Children with fewer baseline social interaction deficits showed better progress. This raises

the value of social interaction level at diagnosis (as measured in the ADOS) for predicting outcome.

S6.10 **SOCIAL SKILLS DEVELOPMENT IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: DEVELOPMENT OF A MODEL CURRICULUM.** k. koenig, W. Susan, M. Amanda, S. Kara, K. Kristin, S. Ethan and S. Lawrence. Yale Child Study Center/Yale University.

School-aged children with autism spectrum disorders (ASDS) frequently express feelings of loneliness and isolation. Depression and anxiety can be an outcome of social isolation. Thus, it is important to investigate how social relationships can be promoted and sustained in children with ASDs.

Objective:

To determine whether children with ASDs demonstrate improved ability to engage in reciprocal social interactions following participation in an intervention that targets social skills development.

Methods:

Twenty-two children with ASDs are enrolled in the Social Skills Development Program, a 12-week, 90-minute intervention, based on applied behavioral strategies within the context of an intensive group socialization experience. Each child is randomly assigned to either the active treatment group or the wait-list group. Each group consists of four children with an ASD diagnosis and two typically developing peers. Typical peers provide practice for the target behaviors. Change is assessed using the Social Competence Inventory (SCI), a Standardized Observation of Social Behavior conducted in a naturalistic setting, and the improvement item of the Clinical Global Impression scored by a clinician blind to treatment status.

Results:

Preliminary data for children in the active treatment group show a 14% increase in social initiation behavior post-treatment based on the SCI score, and increases of 40% in appropriate initiations and contingent responses to others, respectively, based on observation of behavior in the naturalistic setting.

Conclusions:

Children with ASDs can increase social initiations and appropriate social responses to other children as a result of an intensive training program using behavioral shaping techniques and practice with typically developing peers.

## Poster Session 2A: Topic 1

### *Cognition & Neuropsychology*

P2A.1.1 **EXPLORATIONS OF MUSIC AND LANGUAGE PROCESSING OF INDIVIDUALS WITH AUTISM.** R. Accordino, D. Bishop and P. Heaton. University of Oxford.

Researchers have shown that those with autism often exhibit enhanced pitch identification and disembedding from chords. Contrastingly, auditory processing in the language domain may be problematic while it may be enhanced or preserved in the musical domain.

Objective: Analyze the extent and nature of these musical abilities using complex musical forms and the relationship between the auditory processing of music and language.

Design/Methods: Eleven high functioning individuals with autism were group matched on age, gender, musical exposure, and nonverbal IQ to 11 typically developing controls. Using a paired associate learning paradigm, children were introduced to four different melodies, each were 12 notes long, in C Major, and with identical rhythms. After training, the children's abilities to identify the melodies, disembed them from a longer melody with and without harmony, and remember them after a 2 hour break were tested. The children's frequency discrimination of tones was also evaluated as were receptive vocabulary (BPVS II) and phonological short term memory (nonsense word repetition).

Results: A repeated measures ANOVA revealed that neither the group nor the musical task revealed a significant difference. Frequency discrimination and phonological processing was also not significantly different, but receptive vocabulary was lower in those with autism, $p = .010$. Phonological short term memory did correlate with musical task performance in those with autism, $r = .719$, $p = .019$.

Conclusions: Children in both groups exhibit similar melodic processing, and prior research on enhanced frequency discrimination may have been task specific.

P2A.1.2 **BODY POSTURE: WHAT INDIVIDUALS WITH AUTISM SPECTRUM DISORDER MIGHT BE MISSING.** P. Beall, C. Reed, L. Kopelioff, S. Hepburn and D. Pulham. University of Denver.

Autism spectrum disorder (ASD) is a neurodevelopmental disorder primarily characterized by impairments in social reciprocity. Research suggests that abnormal face processing may contribute to these deficits. The face inversion effect (faster RTs and higher accuracies for upright faces than inverted faces) is suggestive of configural processing. Individuals with ASD often do not demonstrate the face inversion effect.

Objective: We investigated whether configural processing deficits extended to other social stimuli, such as body postures. Typical individuals demonstrate a robust body inversion effect, suggesting configural processing of bodies.

Method: Ten high functioning individuals with ASD were tested for inversion effects for social and non-social objects. Participants determined if two successive stimuli (faces, body postures, or houses) presented upright or inverted were the same. The first stimulus was shown for 250 ms. After a brief delay (1000 ms), the second stimulus (same orientation as the first) was presented until participants responded.

Results: For accuracy data, planned comparisons indicated significant inversion effects for faces ($F(1, 9) = 12.90$, $p < .01$), but not for body postures ($F(1, 9) = < 1$, ns) or houses ($F(1, 9) = 1.22$, ns). Similar results were found for RTs.

Conclusion: Some high functioning ASD individuals may process faces configurally, but unlike typical individuals, do not appear to process body postures configurally. They may have strategies for face recognition that are not used for body postures. Given that faces and body postures typically provide convergent social information, this lack of configural body processing may contribute to social deficits.

P2A.1.3 **INTERMODAL PERCEPTION IN CHILDREN WITH AUTISM.** J. Bebko, K. Wells, J. Demark and J. Weiss. York University & ASD-CARC.

Objective: Assess the ability of children with autism spectrum disorders (ASDs) to detect temporal synchrony inauditory-visual intermodal events.

Design/Methods: In three studies, participants were shown visual displays of a variety of events, which were presented using the preferential looking paradigm. Two side-by-side displays of identical events were offset by either 1 or 3 seconds. A soundtrack was synchronized to only one of the displays. The looking behaviors of the participants were recorded and analyzed. A nonrandom looking pattern is taken as evidence that the child is able to discriminate between the displays and is thus able to detect temporal asynchrony.

Results/Conclusions: The results of study 1 suggest that children with ASDs have an impaired ability detecting temporal asynchrony for linguistic events, compared to a matched, typically developing, control group. In Study 2 we found fewer differences between children with ASDs on the one hand, and typically developing children, or those with developmental disabilities or language-impairments in their ability to detect temporal asynchrony. Study 3examines the difference in results nthe first two studies. Differences between the stimuli used in projects 1 and 2, and their impact on the children's performance, are examined. Variables such as the

magnitude of asynchrony between the audio and visual stimuli, and affective content of the stimuli were tested in study 3. Preliminary results suggest that children with autism do, in fact, display impairments in detecting temporal asynchrony for linguistic events, but only under certain conditions.

Partially funded by a CIHR-IHRT grant (#43820) to JJA Holden, JB and ASD-CARC (www.autismresearch.ca) Kerry Wells & Jonathan Weiss are also graduate trainees with the CIHR/NAAR STIHR Inter-Institute Autism Spectrum Disorders Training Program (PI: JJAH).

P2A.1.4 **AUTISM SPECTRUM CONDITIONS AS AN EXTREME SYSTEMIZING COGNITIVE STYLE.** J. Billington and S. Baron-Cohen. Autism Research Centre, Departments of Experimental Psychology and Psychiatry, University of Cambridge.

Systemizing is a cognitive style involving the drive to identify rules governing a non-agentive systems. Individuals with high functioning autism (HFA) and Asperger syndrome (AS) show superior systemizing on

the Systemizing Quotient (SQ) and the Physical Prediction Questionnaire (PPQ). A stronger systemizing drive is assumed to be associated with greater local processing and can therefore be expected to reduce the global interference effect.

Aims: To examine local and global processing in relation to the SQ with IQ- and age- matched males, females and a group with HFA or AS.

Participants: 15 males, 15 females and 15 persons with HFA/ AS.

Method: Participants were required to indicate the presence of an 'A' that could appear at the local or global level in a divided attention task.

Results: There was a significant interaction between group and systemizing score on the processing style preferred, however, there were no main effects of group or systemizing . Higher systemizers in the female group were more likely to use a global processing strategy but the opposite was true for males and for people with HFA or AS.

Conclusions: It can be concluded that males and females prefer local and global processing strategies respectively and that persons with HFA and AS pertain to the male cognitive strategy. Results are discussed in terms of different cognitive processing styles underlying systemizing, and the implications for neurological differences.

Funded by the MRC (UK).

P2A.1.5 **HEAD CIRCUMFERENCE AND COGNITIVE/BEHAVIORAL FUNCTIONING IN CHILDREN WITH AUTISM FROM THE AGRE DATABASE.** D. Black, J. Miyamoto and S. Spence. UCLA Center for Autism Research and Treatment.

Objective: To further delineate the autism phenotype, autistic individuals with head circumferences >95th percentile were compared to autistic individuals with normal head circumferences (>5th-95th percentile) on measures of cognitive ability, adaptive functioning, and autistic symptomatology endorsed from the ADI.

Design/Methods: Head circumference, estimates of verbal (PPVT) and nonverbal (Ravens) IQ (n=227), adaptive functioning (Vineland; n=142), and range of autistic symptoms endorsed from the ADI (n=343) were obtained on autistic individuals (age=9.7±4.1; Verbal IQ=78±30; Nonverbal IQ=96±25) from the Autism Genetic Resource Exchange (AGRE) sample. Individuals with macrocephaly and normal head circumference were compared on all measures. We also attempted to replicate the findings of Deutsch and Joseph (2003) indicating a greater nonverbal IQ vs. verbal IQ among individuals with macrocephaly.

Results: No significant differences between groups were found in cognitive or adaptive functioning or in the autistic symptoms endorsed (all ps>.10). While individuals with macrocephaly and normal head circumference achieved higher nonverbal than verbal IQ (mean difference of 21+/-22 and 12+/-27, respectively), this discrepancy was significantly greater among individuals with a normal head circumference ($t(183)=2.3$, $p=.02$).

Conclusions: Commensurate with previous reports, there were no consistent differences between autistic individuals with normal head circumference and macrocephaly in cognitive or adaptive functioning or in the range of autistic symptoms endorsed. While these findings are generally consistent with those of Deutsch and Joseph, we found greater nonverbal-verbal IQ discrepancies among autistic individuals with a normal head circumference whereas Deutsch and Joseph report greater discrepancies among autistic individuals with macrocephaly.

P2A.1.6 **OCULOMOTOR CORRELATES OF VISUAL SEARCH IN ADOLESCENTS WITH HIGH-FUNCTIONING AUTISM.** L. Brenner, A. Ramos, S. Knust, K. Turner, S. Marshall and R. Müller. San Diego State University.

Individuals with Autism Spectrum Disorder (ASD) are superior to control subjects on visual search tasks. Yet several studies report abnormal saccade generation and slow visual orienting, both of which are critical components of the visual search process.

Objective: To investigate patterns of oculomotor behavior in adolescents with ASD during a visual search task.

Design/Methods: We recruited 6 high-functioning male autistic subjects (mean age 13.8 years) and 4 typically developing male control subjects (mean age 16 years). We obtained eye data for 4/6 autistic subjects and reaction time data for 5/6 autistic subjects. Eye movements were recorded using the binocular

EyeLink II Eye-Tracking System. Our task was a visual search paradigm that varied along the dimensions of inter-distractor similarity (homogeneous or heterogeneous), set-size (6, 12, or 24), and target presence/absence.

Results: Between-group accuracy was not significantly different. As hypothesized, the autism group had significantly lower reaction times than did the control group for difficult conditions (heterogeneous, set-size = 24), $t(8) = 2.31$, $p < .05$. For saccade frequencies, we found a statistically significant within-subjects effect for task difficulty, $F(1,15) = 75.297$, $p < .05$, but there were no statistically significant group differences $F(1,14) = .454$, $p > .05$.

Conclusions: Though the small sample size necessitates a cautious interpretation of the data, our findings suggest that saccade frequency may not account for superior visual search in autism.

Supported by NIH RO1-DC006155

P2A.1.7 **SUPERIOR PERFORMANCE OF AUTISTICS ON RPM AND PPVT RELATIVE TO WESCHLER SCALES PROVIDES EVIDENCE FOR THE NATURE OF AUTISTIC INTELLIGENCE.** M. Dawson, L. Mottron, P. Jelenic and I. Soulières. Pervasive developmental disorders specialized clinic, University of Montréal, Hôpital Rivière-des-Prairies.

Raven Progressive Matrices (RPM), Peabody Picture Vocabulary Test (PPVT) and Wechsler scales (WISC III, WAIS III,) are the instruments used to measure intelligence in autistics (Mottron, 2004). However, these instruments have been normalized for the typical population, but not for autistics.

Objective: Determine if existing norms for Wechsler, RPM and PPVT are actually equivalent in non-autistics, and in autistic children and adults.

Design/Methods: Adults: 8 autistics and 17 Aspergers (AS) received WAIS-III+RPM, 5 autistics and 13 AS received WAIS-III+PPVT, and were compared to 19 non-autistic adults tested with the three instruments. Children: 41 autistics and 20 AS received WISC-III+RPM; 30 autistics and 20 AS received WISC-III+PPVT, and were compared to the test norms.

Results: Adults: RPM scores are consistently higher for AS (56.3th pc) and Autistic group (58.2nd pc) than Wechsler FSIQ (AS=autistic FSIQ=39.1st pc). PPVT resulted in larger differences (AS: PPVT= 75.2 nd pc, Wechsler FSIQ=45 th pc; Autistic: PPVT = 68 th pc, Wechsler FSIQ = 42 nd pc). In contrast, RPM results in lower intelligence levels (47.6 th pc) than Weschler FSIQ (74.1 st pc) and PPVT (86.9 th pc) in the adult comparison group. Similar differences are found in children.

Conclusions: Assessment of intelligence in PDDs results in dramatically different levels according to the test given. A significant proportion of low-functioning autistics move into the high-functioning range when tested with two specific instruments. These results have important consequences for matching strategies in empirical design, and in understanding autistic intelligence.

Support: CIHR #STN- 63728 (LM)

P2A.1.8 **OBJECT CATEGORIZATION IN INDIVIDUALS WITH AUTISM:.** H. Gastgeb, M. Strauss and N. Minshew. University of Pittsburgh.

A critical cognitive ability that has received relatively little attention in individuals with autism is the ability to form categories. Research on categorization has shown that members of categories have “typicality structures” in which some members are better examples of a category than others. It is know that typicality plays an important role in categorization from early in life, and reaction times are faster for typical items in verification tasks. Several studies suggest that individuals with autism can form categories but do so in a different manner.

The current studies are the first attempt to look at the nature of the storage of real world category information in individuals with autism. In these studies, high functioning adults and children with autism and matched controls were tested on four common categories (cats, dogs, couches, and chairs) varying in typicality from very typical to very atypical. One study recorded participants' reaction times to classify these stimuli. A second study had participants rate the typicality of the stimuli.

Results indicate that individuals with autism differ in the way in which they categorize objects. Individuals with autism have higher error rates at the boundaries of categories and do not use the entire range of typicality when rating objects in a given category. Thus, individuals with autism do not process categories in the

same manner as controls. These individuals may not categorize by representing typicality structures but rather by using simple definitive features.

This research was supported by a Pre-doctoral Fellowship from The National Alliance for Autism Research (NAAR), NICHD Grant (HD35469), and by an NICHD Collaborative Program of Excellence in Autism (CPEA).

P2A.1.9 **PARENT REPORTED DIFFICULTY WITH SHIFTING PREDICTS EMOTIONAL DIFFICULTY IN SCHOOL FOR CHILDREN WITH ASPERGER'S DISORDER.** M. Gibbs, A. Nye, L. Gilotty, P. Lee, G. Wallace, D. Black and L. Kenworthy. Children's National Medical Center.

Difficulty shifting in children with Asperger's Disorder may be manifested by difficulties making transitions, flexibly problem solving, switching attention, and changing focus from one topic to another. These behaviors may place children with Asperger's Disorder at risk for behavioral and emotional difficulties in the typical classroom setting where there are frequent demands on the ability to move freely from one situation, activity, or aspect of a problem to another.

Objective: This study investigated the relationship between cognitive and behavioral flexibility and teacher reported emotional difficulty in children diagnosed with Asperger's Disorder.

Design/Methods: A clinically referred group of children with Asperger's Disorder (n=52) were administered a neuropsychological test battery. The Behavior Rating Inventory of Executive Function-Parent Form (BRIEF) Shift Scale was used as a measure of cognitive and behavioral flexibility and the Behavior Assessment System for Children-Teacher Report Scales (BASC) Internalizing Scale was used as a measure of emotional difficulty.

Results: Linear regression analysis indicated that parent report of cognitive and behavioral inflexibility predicts teacher report of emotional difficulty in this population ($R2 = .24$, $p < .02$).

Conclusions: These findings suggest that difficulty with behaviors such as making transitions, switching attention, and flexible problem solving may place children at risk for emotional difficulties in the school setting where demands on cognitive and behavioral flexibility are high.

P2A.1.10 **THE USE OF ORGANIZATIONAL AND REHEARSAL STRATEGY TRAINING TO IMPROVE RECALL AND CLUSTERING PERFORMANCE OF CHILDREN WITH AUTISM SPECTRUM DISORDERS.** G. Goldstein and J. Bebko. York University & CIHR/NAAR STIHR Inter-Institute Autism Spectrum Disorders Training Program (PI: JJAH).

The goal of this research was to focus on four aspects of memory development amongst children with Autism Spectrum Disorders (ASDs): a) their ability to develop and/or increase their meta-memory skills; b) their ability to learn two memory strategies, rehearsal and categorization; c) their ability to use these strategies to increase memory recall and clustering scores; and d) the ability of these children to maintain use of strategies over time and generalize them to different tasks.

Only children who were diagnosed with an ASD (e.g., Asperger Syndrome, Pervasive Developmental Disorder- Not Otherwise Specified, and Autistic Disorder) and were higher functioning, were included in this study. Each child was randomly assigned to one of two cohorts, A or B, and was seen over seven sessions. The two cohorts enabled a multiple baseline design to be used, to evaluate effects of simple exposure to the experimental situation versus training.

Both cohorts increased their grouping scores during training and were able to maintain this strategy across sessions. As well, there was a positive correlation between clustering and recall scores after training, which was maintained over time. These data suggest that children with ASDs exhibit a production deficiency, that is, they have difficulty spontaneously producing the two strategies, but when provided instruction, they are able to use the strategies and increase memory recall.

This research was partially funded by a CIHR-IHRT grant (#43820) to JJA Holden, JB and ASD-CARC (www.autismresearch.ca)

P2A.1.11 **SHIFTING OF ATTENTION IN HIGH-FUNCTIONING AUTISM.** G. Goldstein, D. Williams and N. Minshew. VA Pittsburgh HCS.

Objective: To evaluate whether individuals with high functioning autism have a basic defect in attentional shifting using a simple task that involves minimal reasoning, decision making, or related information processing components. The modality shift reaction time experiment is such a task.

Methods: Participants were 42 individuals with autism and 42 normal controls, aged 16 -55. Stimuli were a red light, a green light, a high tone, and a low tone presented in ipsimodal (light-light; sound-sound) and crossmodal (light-sound; sound-light) sequences responded to by a button press. Normal individuals respond more slowly to the second member of crossmodal than to the ipsimodal sequences reflecting a deficit in attention to a changed modality or modality shift effect (MSE). Because individuals with autism typically have slower reaction times than normal controls, the measure of interest here is the relationship between crossmodal (sound-light or light-sound) pairs and ipsimodal (sound-sound or light-light) pairs or the MSE. The study design was a two-way analysis of variance (ANOVA) with group (autism vs. control) and modality sequence (ipsimodal vs. crossmodal) as the factors. If the autism group had a wider discrepancy between ipsimodal and crossmodal modality sequences than the control group, they would be considered to have a greater MSE.

Results and Conclusion: As expected, the autism group had slower reaction times than the control group indicative of general motor slowness. Both groups also had slower reaction times in crossmodal than in ipsimodal conditions. However, there were no significant interactions, indicating the absence of a significantly different MSE in the autism group.

P2A.1.12 **THE EFFECT OF STRESS ON COGNITIVE FLEXIBILITY AMONG THOSE ON THE AUTISM SPECTRUM.** A. Hillier, J. Alexander, R. Smith, M. Tivarus, H. Campbell, J. Kitzmiller, S. Smyth and D. Beversdorf. The Ohio State University.

Stress is associated with impaired performance on tasks requiring cognitive flexibility but individuals with autism spectrum disorders (ASD) are known to appraise and respond to stressful situations differently than those without neurodevelopmental diagnoses.

Objective: Our purpose is to investigate the relationship between an established social stressor and cognitive flexibility among those with ASD and a matched comparison group.

Methods: Participants attended two testing sessions; one stress condition, and one no-stress condition. In the stress condition participants engaged in a public speaking task and a challenging mental arithmetic task in front of a panel of judges. In the no-stress condition participants simply read a passage out loud and counted backwards from 100 without the panel present. During the tasks participants were continually interrupted to complete an anagram task, a spatial memory task, a verbal associates task, and a simple motor task. Performance on these tasks was compared between conditions and between participant groups.

Results: Whereas performance on the verbal associates was significantly impaired in the stressful condition for the comparison group, no such stress-related impairment occurred among those with ASD, despite responsiveness on some psychological and physiological measures of stress. Other psychological and physiological measures indicated stress during the no-stress condition only for those with ASD.

Conclusion: Whereas typically benign stimuli are sometimes known to cause stress responses in ASD, our study shows that they may be less susceptible to stress-related cognitive impairment for certain types of stressors. However, increased baseline stress in ASD cannot be excluded.

This research was supported by the National Institute of Neurological Disorders and Stroke (NINDS) K23 NS43222-01A1.

P2A.1.13 **THE EFFECT OF CUES ON FALSE BELIEF PERFORMANCE OF CHILDREN WITH AUTISM.** P. Holland and D. Bowler. City University.

False belief failure by children with autism is often attributed to their inability to mentalise (Baron-Cohen, Leslie & Frith, 1985). However it is possible that such failure can be caused by some other process or collection of processes.

Objective: To determine whether visual or auditory

cues, or a combination of visual and auditory cues, can enhance the performance of children with autism on first-order tests of false belief.

Design/Methods: Twenty children with autism (CWA), 20 typically developing children (TDC) and 19 children with intellectual disability (CWI) participated in the study. Participants were matched on verbal mental age (VMA). The CWA and the CWI were also matched according to IQ. All participants received four false belief conditions: standard (SFB); light cued (LFB); voice cued (VFB); light and voice cued (LVFB).

Results: For the TDC and the CWI all cueing conditions were shown to correlate with the SFB and in addition were not significantly different in difficulty from that task. For the CWA similar results were obtained with one clear exception. For the CWA the LVFB did not correlate with the SFB and was shown to be significantly easier than the SFB ($p<.005$, McNemar test).

Conclusions: The provision of multi-modal cues was shown to successfully increase false belief performance for children with autism in a manner that is likely to be autism-specific. Results are discussed in terms of particular encoding and retrieval difficulties faced by this population. Reference is made to the Underconnectivity Theory of Autism (Just, Cherassky, Keller, & Minshew, 2004).

P2A.1.14 **SELECTIVE ATTENTION IN HIGH-FUNCTIONING ADULTS WITH AUTISM.** K. Humphreys, N. Minshew and M. Behrmann. Carnegie Mellon University.

Whether autistic individuals are able to selectively attend to subsets of the input remains an open issue. Moreover, the ability to direct attention in a controlled volitional fashion rather than in direct response to the salience of the input also remain unknown. We investigated selective attention in high-functioning adults with autism using a variety of paradigms.

Objectives: To assess the efficacy of attention processing in autism, specifically attention switching and control mechanisms as well as the selection of space- or object-based representations for preferential processing.

Design/Methods: High-functioning adults with autism participated in experiments testing the ability to focus attention narrowly and broadly and to shift between the two, as well as experiments testing attentional cueing (Posner, 1980). Participants also performed a classic paradigm designed to investigate whether their attentional selection operates on representations of locations in space or representations of objects (Egly, Driver & Rafal, 1994)

Preliminary results: Our preliminary results suggest that some aspects of selective attention may be atypical in autism. In particular, people with autism appear to show difficulties in focusing attention but, when this is successful, selection of objects and locations is good and facilitation (sometimes enhanced facilitation relative to controls) is observed.

Conclusions: There are atypicalities in attentional control in autism. These may in turn underlie the featural processing strategies commonly used by these individuals. We will further discuss how performance on these tasks may have implications for other visual perceptual function.

P2A.1.15 **EXECUTIVE FUNCTIONING AND WEAK CENTRAL COHERENCE: EXPLORING THE RELATIONSHIP BETWEEN THEORIES THAT PURPORT TO UNDERLIE COGNITIVE PROCESSING IN CHILDREN WITH AUTISM.** J. James, M. Gibbs, P. Lee, L. Gilotty, G. Wallace, D. Black and L. Kenworthy. Children's National Medical Center.

Objective: Both weak Central Coherence (CC), which is defined as a tendency towards local versus global processing of information, and deficits in Executive Functioning (EF), which refers to the mental organizational processes associated with initiating, implementing, monitoring, and revising strategies and plans of action have both been demonstrated to be present in children with Autism. However, the relationship between these two competing theories remains to be explored. We hypothesized that the organizational deficits on complex visual tasks described as an aspect of EF are highly related to the strong detail-oriented processing characteristic of weak CC.

Participants and Methods: We examined the relationship between two EF tasks, Copy and Delay Organization of the Rey-Osterrieth Complex Figure and performance on a task of CC, the Embedded Figures

Test, in a mixed sample of 17 children aged 9 to 13 diagnosed with high functioning Autism.

Results: Data were analyzed using multiple regression with measures of EF as the predictors (standard scores) and the Total Time (in seconds) score on the Embedded Figures Test as the outcome variable. The results indicated that the EF measures were not significant predictors of speed of performance on the Embedded Figures Test (F=1.28, p=.31, R-square change = .16).

Conclusion: In this sample, no significant correlation was found between EF measures of visual organization and a task of visual-spatial central coherence. These findings suggest that EF and CC tasks likely account for different aspects or levels of cognitive processing in children with high functioning Autism.

P2A.1.16 **NEW PERSPECTIVES ON GLOBAL-LOCAL PROCESSING IN AUTISM SPECTRUM DISORDERS.** S. Johnson, L. Blaha, I. Hernandez-Ritter, M. Fific, R. Murphy, J. Townsend and J. Stout. Indiana University.

Accumulating evidence from studies of global-local processing suggests a lack of global advantage and lack of global interference in autism spectrum disorders (ASD). Despite the potential importance of differences in this fundamental aspect of information processing, the reason(s) for deviations in global-local performance remains unclear.

Objective: Apply mathematical models of information processing to determine the cognitive strategies underlying global-local performance in individuals with and without an ASD.

Methods: Six individuals with Asperger's Disorder, 8 age-matched comparison subjects, and 13 adult controls completed selective and divided attention global-local tasks. Specifically, the double factorial paradigm (DFP) and capacity measures developed by Townsend and colleagues (Townsend & Nozawa, 1995; Wenger & Townsend, 2000) were used to determine the processing architecture (parallel or serial), stopping rule (self-terminating or exhaustive), and efficiency (limited, unlimited, or super capacity) for each participant. Given the heterogeneity of cognitive abilities in ASD, analyses were completed at the individual and group level.

Results: The majority of subjects completing all tasks (19/23) responded significantly faster to global versus local stimuli. There was no evidence of a local bias in the ASD group. In contrast to previous findings, both global and local interference effects were consistently demonstrated by participants in all groups, including all ASD subjects. Finally, modeling results indicated that cognitive strategies employed during the global-local tasks varied across individuals and that some ASD participants used approaches that were distinct from control subjects.

Conclusions: Results suggest that specific cognitive processing strategies may explain previous global-local performance differences in ASD.

P2A.1.18 **ATYPICAL WECHSLER INTELLIGENCE SCALE PROFILES IN HIGH FUNCTIONING AUTISM.** N. Kojkowski, N. Minshew and G. Goldstein. University of PIttsburgh.

Objective: The prototypical Wechsler Intelligence Scale profile for autism has a low point on Comprehension and a high point on Block Design. However, not all individuals with autism have this profile. It has been reported that sometimes individuals with autism have an IQ profile with characteristics associated with Nonverbal Learning Disability (NLD) with low scores on Arithmetic and Block Design, higher scores on verbal tests, and a substantially lower Performance than Verbal IQ. The objectives of this study were to determine the prevalence of this profile in high functioning autism and normal individuals.

Methods: The NLD profile was defined as presence of a mean Arithmetic and Block Design scaled score <3 points lower than the Vocabulary scaled score and a Performance IQ score that was >15 points below the Verbal IQ. Its prevalence was determined in large samples of child and adult autism and control groups. The percentages of cases meeting each criterion were calculated in each group.

Results: 17.6% of the child autism group had lower Arithmetic/Block Design than Vocabulary scores, with 8.4% for the controls. Among adults the percentages were 16% for the autism group and 8.4% for the controls. 18.6% of the child autism sample and 2.8% of the controls had a >15 point lower Performance than Verbal IQ. Such discrepancies were found in 26.5% of

the adults with autism and 2.8% of the controls.

Conclusion: Components of the Wechsler NLD pattern were found in children and adults with autism in small percentages that exceeded normal prevalances.

P2A.1.19 **NEUROPSYCHOLOGICAL ASSESSMENT OF CASES WITH ASPERGER'S DISORDER (AD).** G. Kucukyazici, N. Mukaddes, A. Kilincaslan and A. Umut. Istanbul Medical Faculty Child Psychiatry Department .

Objective: The objective of the present study was to compare the neuropsychological characteristics of AD patients on intellectual, attention and executive function domains.

Method: 21 individuals (18 boys and 3 girls, aged 7 through 16,5 years) with the diagnosis of AD and 18 volunteer controls (15 boys and 3 girl, at the same age and IQ range ) were compared. The evaluation was based on a)WISC-R b)Wisconsin Card Sorting Test (WCST) c)Stroop Test d)Continuous Performance Test (CPT) e)Controlled Oral Word Association Test (COWAT) and f)Category Naming Test. Statistical analysis was conducted by using Mann-Whitney U Test.

Results: Participants with AD performed significantly larger Verbal-Performance IQ discrepancies (p=0.001), significantly better in similarities subtest (p=0,001) and worse in object assembly (p=0,007) subtest of WISC-R. Also, AD subjects performed worse in WCST with smaller Number of Categories achieved (p=0,003) and Conceptual Level Responses (p= 0,005) and greater perseveration rates (Perseverative Response (p=0,024), Perseverative Error (p=0,01), % Perseverative Error Rate (p=0,009)). While AD patiens were worse in Controlled Oral Word Association Test (p=0,01), there was no statistically significant difference in CPT, Stroop and Category Naming Tests.

Conclusions: These data provide evidence that high rates of perseveration scores on WCST may indicate a deficit in executive function tasks requiring mental flexibility in AD patients. Lower performance in COWAT supports further executive function impairment. Also the higher Verbal-Performance IQ discrepancy in favor of verbal IQ in AD patients is consistent with the previous studies.

P2A.1.20 **ARE CHILDREN WITH AUTISM SUPERIOR AT THREE-DIMENSIONAL DRAWING?.** E. Sheppard, D. Ropar and P. Mitchell. University of Nottingham.

The Weak Central Coherence hypothesis (Frith, 2003) predicts that individuals with autism are less affected by their prior knowledge when processing visual information.

Objective: The research aimed to test the hypothesis that autistic individuals are less affected by aspects of their knowledge when drawing, by manipulating the meaningfulness and dimensionality of copied stimuli.

Design/Methods: Seventeen children with autism and seventeen without were asked to copy a set of sixteen line drawings, within which meaningfulness and dimensionality were factorially contrasted. The accuracy of reproductions was assessed using a line-by-line measure, and drawing process was assessed using three previously used measures of global drawing strategy.

Results: Although both groups produced poorer drawings of three-dimensional than two-dimensional items, the autistic group was less affected by dimensionality (ANOVA group*dimensionality interaction, $F(1,32)=5.353$, $p<0.05$). However, both groups derived similar benefits from meaningfulness. The effects of dimensionality were unrelated to both the use of global versus local drawing strategies and Block Design scores.

Conclusions: Autistic children appear to be specifically less affected by their knowledge about three-dimensional aspects of a line drawing than non-autistic children, and hence made superior copies when a third dimension was involved. As the effects of dimensionality did not relate to measures of local processing, the results are most consistent with a top-down interpretation.

P2A.1.21 **NEUROCOGNITIVE FUNCTIONING IN ADOLESCENTS WITH PDD-NOS, SUBTYPE MULTIPLE COMPLEX DEVELOPMENTAL DISORDER.** M. Simons-Sprong, H. Swaab-Barneveld, P. Schothorst and H. van Engeland. Rudolf Magnus Institute of Neuroscience, Department of Psychiatry, University Medical Center Utrecht, The Netherlands.

Study objectives: Multiple Complex Developmental Disorder (MCDD) is characterized by impairments of affect regulation and anxiety, impaired social behavior/sensitivity and impaired cognitive processing (thought disorder). Although this syndrome is typically regarded as a subtype of the broad group of PDDs-NOS, there is evidence of an overlap with schizophrenia-spectrum disorders and an elevated risk for psychosis. The aim of this study is to compare the neurocognitive profile of adolescents with MCDD with that of adolescents at high risk for psychosis for having subclinical psychotic symptoms and that of healthy controls.

Methods: Interviews and questionnaires on symptomatology as well as an extensive neurocognitive test battery including measures of general intellectual functioning, memory and attention are used in adolescents with PDD-NOS, subtype MCDD, adolescents at high risk for psychosis and healthy controls.

Results: Preliminary results on Ss with MCDD, Ss at high risk for psychosis and controls will be presented.

Sources of funding: ZonMW (Netherlands Organisation for Health Research and Development)

P2A.1.22 **NUMERICAL ESTIMATION: DO INDIVUDALS WITH AUTISM DEMONSTRATE SUPERIOR ABLITIES?.** M. Strauss, K. Turner, Julie and N. Minshew. University of Pittsburgh.

Objective: While is claimed that individuals with autism have superior quantification abilities, there is actually little research. A recent study on counting found that, while individuals with autism demonstrated no superior abilities, they used a different strategy then controls for small numbers. The current study tested the abilities of individuals with high functioning autism (HFA) on a numerical estimation task. Previous research suggests that young children represent magnitude information as a logarithmic function where distances betweensmall numbers are magnified, but large numbers are condensed. In contrast, older children represent all numbers as a linear representation. The current study tested these abilities with HFA individuals.

Design: HFA and controls were presented with a line labeled on the left with a “0” and on the right with either a “100” or “1000”. They were given a set of numbers and asked to make a mark along the line that corresponded to each of the numbers.

Results: The number line estimates of the HFA participants were linear and more accurate then control participants suggesting superior performance on the task. While controls were less accurate on the 1000 line then the 100 line, HFA participants are equally accurate on both. Additionally, while controls became more logarithmic on the 1000 line, this was not true of HFA participants.

Conclusion: HFA participants demonstrated an estimation superiority, and do not seem to be biased to represent large magnitudes logarithmically. Follow-up studies to further explore this lack of a natural bias to represent quantities logarithmically are being conducted.

P2A.1.23 **THE DAY OF THE WEEK WHEN YOU WERE BORN IN 0.7 SECOND: CALENDAR COMPUTATION IN AN AUTISTIC SAVANT.** M. Thioux, D. Stark, C. Klaiman and R. Schultz. Yale University Child Study Center.

Study objective: Understanding the processes underlying calendar computation in one of the most gifted autistic savants (DJ).

Methods: Single case study involving more than 30 experiments.

Results: Response time increases with the distance from present for future years (but not for past years). DJ is unable to name weekdays after the year 10,000. However, he is perfectly able to say that 13,198 and 13,170 have the same calendar, showing he knows the rules of calendar repetition. DJ is unable to name weekdays after 10,000 because he is unable to subtract from a 5-digit number and if trained to this kind of calculation he becomes able to compute such dates. The retrieval of a weekday from memory can be primed by the subliminal presentation of a year associated with

the calendar, showing that DJ learned the 14 possible types of calendar. A visual task does not interfere with the retrieval of a weekday from memory but a verbal task does.

Conclusion: A two-stage cognitive model can explain all aspects of the patient's behavior. The first stage is a calculation step during which a given year is matched onto a year close from present using some arithmetic and some knowledge of the rules of calendars (e.g. the same calendar is repeated every 28 years). The second stage corresponds to the retrieval of the weekday for the given date within one of 14 different calendars stored in verbal memory in the form of 14 associative networks.

This research was supported by grants from the Belgian American Educational Foundation, the National Alliance for Autism Research, and the National Institute of Child Health and Human Development (grant P01-HD03008).

P2A.1.24 **HETEROGENEITY IN GLOBAL AND LOCAL VISUAL PROCESSING STYLES IN AUTISM POPULATIONS.** C. Thomas, N. Minshew, R. Kimchi and M. Behrmann. Carnegie Mellon University.

Objective: Existing literature on the nature of global and local visual processing in autism has been equivocal. We investigated the possibility that the ambiguity in the findings may be due to heterogeneity in individual processing styles among individuals with autism.

Methods: Global precedence in adults with autism (N=10) and matched control participants was first examined using Navon letter stimuli wherein participants reported the global letter (big H/S composed of small letters that varied in the degree of congruence and incongruence) or the local letters (small H/S). Secondly, in a conjunctive visual search task, participants identified the target (composed of few or many elements) either by the global configuration, or by the local elements.

Results: Normal global precedence, characterized by increased interference from the global level while reporting the local elements and the converse in reporting the global pattern was observed in the control group, but not in the autism group. Interestingly, a subset of individuals in the autism group (N=4) who showed high interference from the local level in global processing showed minimal interference from the global level in local processing, whereas a second subset performed more like the control group. In the visual search task, significant group differences in processing global and local targets were found between the two autism subgroups and the control group.

Conclusions: Our findings suggest that the autism population may consist of sub-populations whose predispositions for processing the local or global aspects of the visual world varies along a continuum.

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P2A.1.25 **FREE-CHOICE CONDITION WITH HIERACHICAL STIMULI DEMONSTRATES INTACT GLOBAL PROCESSING, FASTER LOCAL RESPONSE, AND RANDOM LEVEL PREFERENCE IN PERSONS WITH AUTISM.** L. Wang and L. Mottron. 1.Wang Lixin, Institute of Cognitive Neuroscience & Learning, Beijing Normal University; 2. Mottron Laurent, Clinique Spécialisée des Troubles Envahissants du Développement, Hôpital Rivière-des-Prairies, Montréal, Canada.

Objective: Investigate the spontaneous orientation and speed of detection of hierarchical levels of Navon-type stimuli in conditions favoring local or global processing.

Design/Methods: Sixteen adolescents with autism (mean age = 14.2 years, mean FSIQ (WAIS-R) =66) and sixteen non-autistic adolescents participated in the study. The participants were matched on laterality, gender, CA and intelligence score in the Chinese norms of Raven's Standard Progressive Matrices. The participants were asked to name local and global targets of large numbers made of small numbers encompassing various visual angles.

Results: Naming Times (NTs) were shorter for local targets in participants with autism, whereas comparison group exhibited an opposite, global advantage. Overall NTs in the local condition were shorter for autistics than for the comparison group, but equivalent in the global condition. Relative naming choices for local vs. global targets were equally distributed in participants with

autism, whatever visual angle. In contrast, an overall global choice was favored in comparison group, and stimuli subtending a visual angle < 4 degrees, which favors global bias, increased the preference for global targets.

Conclusions: although performing better for local targets and not showing global precedence, persons with autism are able to process global targets. Superior performance for local targets supports the Enhanced Perceptual Functioning hypothesis in autism, which proposes that low-level, static visual information is processed at a higher level in autistic individuals, together with intact processing of static global information.

P2A.1.26 **SENSORY INTERESTS AND IDIOSYNCRATIC REACTIONS IN AUTISM: EVIDENCE FROM AN INTERNATIONAL MULTIPLEX SAMPLE.** E. Weisblatt, J. Parr, J. Alcantara and A. Bailey. University of Cambridge UK.

Background: Sensory interests and idiosyncratic sensory reactions to the environment are frequently seen in individuals with autism spectrum disorders. Sensory interests can occur in any modality, however, atypical reactions are frequently in response to auditory stimuli. These behaviours can be prominent and often disabling, and may be markers of information processing endophenotypes.

Objective: To ascertain the frequency of sensory interests and idiosyncratic reactions to sensory stimuli using standardised research interviews, and to investigate their relationship with outcome, as measured by ADI domain scores, IQ scores and language characteristics.

Design/Methods: As part of the International Molecular Genetic Study of Autism, ADI data on 486 individuals from 239 multiplex families were gathered. Relevant ADI items were analysed, including: sensory interests (SI), idiosyncratic negative response to stimuli (IN) and sensitivity to noise (SN). ADI domain scores and language items, and IQ scores were compared for individuals with and without sensory symptoms.

Results: Eighty nine percent of individuals scored on one or more ADI sensory items; 68% had sensory interests, 41% had idiosyncratic negative sensory reactions and 66% were hypersensitive to noise. Individuals with any sensory symptoms had significantly higher ADI domain scores and significantly lower VIQ and PIQ scores (t-tests, $p<0.05$) than unaffected individuals. Significant associations (chi-square, $p<0.05$) were found between: SI and lower language level; SN and stereotyped utterances; all sensory items and echolalia. Analysis of concordance for specific modalities of sensory interests/idiosyncratic reactions within affected relative pairs will also be presented.

Conclusions: Sensory interests and idiosyncratic reactions to sensory stimuli are common in this multiplex sample and index more severe phenotypic expression.

P2A.1.27 **IMPAIRED COGNITIVE FUNCTIONING IN THE PDD-NOS, MCDD SUBTYPE COMPARED TO PDD-NOS.** B. Lahuis, H. Swaab, J. Pietersen and H. Van Engeland. University Medical Center Utrecht.

Though MCDD subtype of PDD-NOS is defined based on specific symptoms, it is yet unclear whether these symptoms are related to specific cognitive profiles in MCDD.

Objective: Finding differences in cognitive profiles between PDD-NOS, MCDD subtype, and PDD-NOS.

Design/methods: All patients (ages between 6 and 12) admitted to the Child Psychiatric Clinic of the Department of Child & Adolescent Psychiatry at the University Medical Center in Utrecht, between august 1999 and august 2004, classified as having PDD-NOS (n=42), according to the DSM-IV criteria for Pervasive Developmental Disorders were included in this study. 19 patients additionally met the criteria for MCDD, as formulated by Cohen et al., 1986. For consensus the threshold criteria of Buitelaar and Van der Gaag, 1998, were used. All patients received an extensive neuropsychological assessment including tests for intelligence, attention and verbal memory.

Results: Children with PDD-NOS, MCDD subtype were not different from PDD-NOS children with respect to general intelligence or specific patterns of IQ scores. However, children with MCDD showed much more difficulty in sustaining attention and had lightly more problems in verbal memory, compared to PDD-NOS children.

Conclusions: It was found that MCDD children have

much difficulty in directing and sustaining attention as compared to PDD-NOS children of whom we know that they also have much attention problems compared to normal controls. It is suggested that these problems refer to developmental vulnerability that may lead to more serious outcome in MCDD than in PDD-NOS, as was found by van Engeland and van der Gaag in 1994.

P2A.1.28 **NON-VERBAL COGNITIVE AND MEMORY PROFILES OF HIGH AND LOW FUNCTIONING CHILDREN WITH AUTISM.** N. Russo, T. Flanagan, I. Blidner, D. Berringer and J. Burack. McGill University.

Objective: Patterns of performance on psychometric tests of IQ and memory were compared among high and of low functioning individuals with autism in order to differentiate between profiles that are intrinsic to the disorder and those that are unique to specific subgroups.

Method: The Brief IQ scale of the Leiter-R (Roid & Miller, 1997), a standardized measure of visualization and reasoning, was administered to 37 children with autism who were then divided into low and high functioning groups in relation to IQ scores above or below 75. Twenty-one children from the original sample (13 HFA, 8 LFA) also completed the Attention and Memory Battery of the Leiter-R.

Results: No differences were found in the pattern of relative strengths and weaknesses across the domains of cognitive functioning assessed by the Brief IQ scale, although subgroup-specific patterns of memory ability were evident F (1, 20) = 2.97, p .002.

Conclusion: These findings provide evidence of similar cognitive profiles for both high and low functioning subgroups of persons with autism, but of differences on memory processes. These results are discussed with regard to issues of generalizability of research findings from high to low functioning persons with autism.

This project was made possible by a SSHRC grant to the final author, Dr. J.A. Burack as well as financial support provided to the first two authors (N. Russo and T. Flanagan) by the Edith Berringer Foundation.

P2A.1.29 **VERBAL AND VISUAL MEMORY ASSESSMENT IN CASES WITH ASPERGER'S DISORDER (AD).** A. Kilincaslan, N. Mukaddes, G. Kucukyazici and A. Umut. Istanbul Medical Faculty Child Psychiatry Department.

Objective: AD patients are generally are known to have good rote memory skills. The objective of the present study was to evaluate the verbal and visual memory and visuo-spatial abilities of AD patients.

Method: 21 individuals (18 boys and 3 girls, aged 7 through 16,5 years) with the diagnosis of AD and 18 volunteer controls (15 boys and 3 girl, at the same age and IQ range ) were compared. The evaluation was based on a)California Verbal Learning Test-children's version b)Rey-Osterrieth Complex Figure Copying Test (RCFT) c)Benton's Judgement of Line Orientation Test and d)Benton Facial Recognition Test.

Statistical analysis was conducted by using Mann-Whitney U Test.

Results: Participants with AD achieved statistically significantly loower performance on Rey-Osterrieth Complex Figure Copying Test in all subtests (Copy p=0,03, immediate recall p=0,03 and delayed recall p=0,004). There was no statistically significant difference in California Verbal Learning Test-children's version and Benton's Judgement of Line Orientation and Facial Recognition Tests.

Conclusions: Poorer performances in the immediate and delayed recall conditions of RCFT suggests a visual memory deficit in AD patients. This deficit does not appear to be related with visuo-spatial perception. Our study does not confirm a better performance in verbal memory skills.

## Poster Session 2B: Topic 1

### *Broader Phenotype & Families*

P2B.1.1 **BEHAVIORAL AND NEURAL CORRELATES OF SOCIAL REFERENCING IN INFANTS AT RISK FOR AUTISM.** L. Cornew and L. Carver. University of California, San Diego.

Social referencing refers to the ability to regulate one's behavior using the emotional expressions of others. This function is thought to be impaired in children with autism, and may prove useful in later

research as an early predictor of autism in children at risk.

Objective: To investigate early characteristics of the broader autism phenotype by examining social referencing and associated electrophysiology in infant siblings of children with autism.

Methods: Five at-risk and nine control infants were exposed to three novel toys in order to elicit social referencing. The toys were assigned an emotional valence via adults' facial and vocal expressions in each of three conditions (positive, negative, and neutral). Coders rated several behaviors, including the latency from toy presentation until infants' first referential look, and interest in the toys. We subsequently recorded ERPs as infants viewed images of the toys.

Results: Preliminary results revealed that compared to control infants, at-risk infants demonstrated longer latencies to reference, $F = 8.35$, $p = .015$. Additionally, whereas control infants maintained high interest in the toys after adults' emotional signals, at-risk infants showed less interest once the signals were given, $F = 10.814$, $p = .006$. We also observed group differences in ERP components, suggesting that social referencing modulated neural activity in response to the emotional stimuli.

Conclusions: Group differences in social referencing and associated ERPs provide evidence for the broader autism phenotype in infancy. Our results are potentially valuable for the identification of earlier signs of autism.

Funding Agencies: The M.I.N.D. Institute, National Alliance for Autism Research

P2B.1.2 **PEPTIDURIA IN AUTISM AND RELATED DISORDERS: AN EXPLORATORY STUDY.** S. Kahler and E. Cooper. Department of Pediatrics, Johns Hopkins School of Medicine.

Study Objectives: There are reports of excessive amounts of small peptides derived from gluten and casein in the urine of autistic children. Some have opioid activity. We undertook to replicate work published by others (KL Reichelt, R Cade), toward the goal of confirming the identity of the peptides by mass spectrometry, and quantifying them.

Methods: Urine samples (from children ages 0-12 years old diagnosed with autism (N=120), developmental or intellectual delay (89), speech delay (30); and healthy children ages 3-12 (39)) were analyzed by HPLC C-18 reverse-phase column with dual UV detectors, eluted with TFA and acetonitrile. Peptiduria was quantitated as the total area under the curve (AUC) of all peaks after hippurate (~30 min) till the end of the peptide region (~68min).

Results: Up to 35 peaks could be seen in a sample; we recognize that peaks with the same retention time from different samples may not represent the same substance. Putative identifications include cis-indolylacryloylglycine (cis-IAG), casomorphin (CM) A5, beta(b) CM 1-4 amide, trans-IAG, gliadinomorphin (alpha-gliadin), bCM 1-7, bCM 1-8. The identification of bCM 1-4 was confirmed by mass spectrometry. The mean AUC for most peaks and total AUC were similar between controls and patients, but there was notable skewing of the data from the patient groups because of high values and outliers.

Conclusions: Increased amounts of putative peptides in the urine of some children with autism/developmental problems may reflect altered intestinal function or shared etiopathogenesis. Further characterization of the peaks is needed to understand their significance.

Supported by the Murdoch Childrens Research Institute.

P2B.1.3 **NEUROPSYCHOLOGICAL PROFILES IN PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS.** L. Kopelioff, E. Winterrowd, B. Pennington, S. Hepburn, S. Gwen and R. Don. University of Colorado, Health Sciences Center.

Language difficulties have been implicated as a common factor among families of individuals with autism spectrum disorders (ASD), hinting at a broader autism phenotype. Folstein et al. (1999) reported that parents of ASD scored significantly worse on a non-word reading task relative to Down Syndrome parents, and that ASD parents exhibited lower performance IQ than verbal IQ. Positive early language-related difficulties predicted lower verbal IQ and non-word reading scores. In the present study, we sought to replicate Folstein et al.'s findings in the context of a larger neuroimaging study of ASD parents. METHOD: Parents of children with ASD (n=23) were compared to adult controls (n=22) on a series of cognitive and verbal

measures. The ASD parent and control groups were matched on age and gender. RESULTS: Parents of ASD exhibited lower performance on the Matrix Reasoning subtest than controls, but did not show differences in verbal IQ measures, when tested with the Wechsler Abbreviated Scale of Intelligence (WASI). In addition, ASD parents had lower performance on non-word repetition, but did not show differences on tests of figurative language, expressive language, verbal fluency and history of reading difficulties. CONCLUSION: Results from this study are generally consistent with the cognitive profiles reported for parents of ASD. Our finding for non-word repetition, along with others' previous findings for non-word reading in ASD families, suggests problems in phonological processing might be characteristic of the extended ASD phenotype.

This study was supported by a grant from the Cure Autism Now Foundation to D. C. Rojas

P2B.1.4 **DESCRIPTION OF GASTROINTESTINAL SYMPTOMS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS COMPARED TO CONTROLS.** A. Reynolds, A. Herndon, T. Mandler and S. Hepburn. University of Colorado Health Sciences Center.

Gastrointestinal (GI) symptoms have been reported in 15-51% of children with autism spectrum disorders. Symptoms include diarrhea and constipation.

Objectives: This study was designed to describe GI symptoms in children with autism compared to controls using a stool diary. Stool frequency and consistency were recorded using the Bristol Stool Form Scale (Lewis and Heaton 1997).

Methods: Seven day stool diaries were completed for 32 children with autism (as determined by ADOS, ADI-R or Social Communication Questionnaire) and 19 children with typical development . Stool consistency was given a score of 1 through 7 based on the Bristol stool form scale with 1=hard and 7=watery. Prior to beginning the study, abnormal stool pattern was defined as more than 3 stools per day and/or 2 or more stools per week with a consistency of 1, 6, or 7.

Results: Fourteen subjects with autism met criteria for abnormal frequency and/or consistency. Five subjects had loose stools, 4 had hard stools, and 4 had predominantly loose stools with an occasional hard stool. Two subjects had greater than 3 stools per day. Only 2 subjects with typical development had loose stools. Chi-squared analysis found this difference to be significant, $p = 0.0134$.

Conclusion: Children with autism appear to have hard or loose stools more frequently than children with typical development. More study is needed to determine the clinical significance and etiology of GI symptoms in children with autism and to determine whether these symptoms are different from children with other types of developmental delay.

This research was supported by Grant #MO1 RR00069, General Clinical Research Centers Program, National Center for Research Resources, NIH and by Grant # UIDCCU820391, Centers for Excellence for Autism and Other Developmental Disabilities, Centers for Disease Control and Prevention.

P2B.1.5 **GENETIC AND ENVIRONMENTAL INFLUENCES ON AUTISTIC TRAITS AMONG NON-AUTISTIC ADULTS: A TWIN STUDY.** A. Senju, Y. Kunihira, J. Ando, Y. Ono and T. Hasegawa. The University of Tokyo, Japan.

Objective: To examine the genetic and environmental influences on the individual differences in 'autistic traits' among typically developed adults.

Methods: Participants consisted of 336 pairs of Japanese adult or adolescent twins (16-30 years old), who were volunteers in the Keio Twin Project. A Japanese version of Autism-spectrum Quotient (AQ), a self-reporting questionnaire, was used to assess their levels of 'autistic traits'. Because it is known that gender difference strongly affect the AQ score, only the data from same-sex pairs were subjected into the structural equation modeling.

Results: Structural equation modeling revealed that the individual differences in the levels of 'autistic traits' as measured by AQ was best explained by CE model, indicating a strong influence of shared and non-shared environment. When analyzed separately for each gender, CE model best-fitted female data, again indicating the strong environmental influences on the levels of AQ score. On the other hand, AE model best-fitted male data, indicating moderate genetic influence and strong non-shared environmental influence.

Conclusions: Results showed the genetic influences on the levels of autistic traits in males, but not in females. As was discussed by Constantino et al. (2003), it may suggest the increased sensitivity to environmental influences that operate to promote social competency among female, which may relatively protect them from vulnerability to 'autistic traits'.

P2B.1.6 **PRAGMATIC LANGUAGE USE IN AUTISTIC INDIVIDUALS AND THEIR PARENTS FROM MULTI-INCIDENCE FAMILIES.** M. de Jonge, C. Kemner and H. van Engeland. UMC Utrecht.

One of the main characteristics of autism is a disturbance in the social aspects of communication. Some studies found pragmatic language abnormalities in parents of autistic individuals (Landa et al.,1992; Piven et al., 1997). This might reflect a broader phenotype of autism, caused by autism susceptibility genes.

Objective: To ascertain whether both autistic individuals and their parents from Dutch multi-incidence families included in the International Molecular Genetic Study of Autism (IMGSAC) sample show more pragmatic language deficits than matched controls. Furthermore, to assess whether there is a difference in pragmatic language use between fathers and mothers of autistic individuals.

Methods: The Pragmatic Language Scale (PRS) was used in 27 multi-incidence families. 52 parents were assessed and compared to a matched control group of parents. In addition the children of these families older than 15 and with VIQ>70 were assessed as well and compared to matched controls.

Results: a two-tailed Mann-Whitney U-test revealed significant differences between autistic adolescents and controls in pragmatic language use. In addition parents scored significantly higher on the PRS than control parents. There were no significant difference between fathers and mother of autistic children on total PRS score.

Conclusions: As predicted, both autistic individuals and parents showed significantly more deficits in pragmatic use of language than matched controls. We did not find significant differences between the fathers and mothers in our sample. These data support the existence of the broader phenotype of autism in parents from Dutch multi-incidence families.

P2B.1.7 **FAMILY HISTORY AND MOOD DISORDER IN ASPERGERS DISORDER.** A. Hall, R. Abramson, S. Ravan, H. Wright, H. Cope, M. Cuccaro, J. Gilbert and M. Perick-Vance. University of South Carolina School of Medicine.

Anecdotal clinical evidence suggests a preponderance of both mood symptoms and family history of mood disorders in individuals with Asperger's Disorder (ASD).

Objective: To determine if parent reported mood symptoms in individuals with ASD are associated with family history of mood disorders.

Design/Methods: Participants (n=46) were drawn from an ongoing ASD genetics study. ASD diagnoses were confirmed using medical records, clinical evaluations and the Asperger's Syndrome Diagnostic Scale. Difficulty sleeping and family history of mood disorder were abstracted from the research chart. The Aberrant Behavior Checklist-Community (ABC-C) was completed by parents. The ABC-C Hyperactivity, Irritability, and Inappropriate Speech scales were used in our data analyses.

Results: Using Discriminant Function Analysis,(grouping variable= family history of mood disorders), sleep difficulties, the Irritability, Hyperactivity subscale scores, and two questions from the Inappropriate Speech subscale score on the ABC-C were combined to create a new factor of “mood related symptoms (MRS)”. On this factor the variables loaded in the following manner: Hyperactivity=.915, Irritability=.721, Inappropriate Speech=.678 and sleep difficulties=.405. One-way ANOVA ($F(1,45)=4.487$, $p=.04$) showed that the family history of mood disorders group reported significantly more mood related symptoms in children with ASD than the negative family history of mood disorders group.

Conclusions: Children with ASD and a family history of mood disorders may be at a higher risk of having mood related symptoms than those children without a family history of mood disorders. These preliminary findings suggest the need for further investigation of the potential role for mood symptoms in ASD.

P2B.1.8 **FAMILIES OF YOUNG CHILDREN WITH AUTISM: EVALUATION OF DIAGNOSTIC EXPERIENCES.** C. Peterson. University of Rochester.

Objective: To describe parental perceptions of the process of receiving a diagnosis of autism for their young children and to examine the role of the primary care provider.

Design/Methods: A 20-question survey was developed and disseminated to parents of children with autism (birth to 8 years old) to collect information on their perceptions of the process of receiving the diagnosis (including voicing of initial concerns, screening, referral, and eventual diagnosis), with particular emphasis on the role of the primary care provider.

Results: Descriptive statistics were generated based on demographic information. Family experiences that lead to the diagnosis of autism were described. Multiple linear regression and t-test comparisons were used to identify factors that increased or decreased the early identification of autism.

Conclusions: Identified factors that promote the earliest effective screening and evaluation of autism in young children will be discussed.

P2B.1.9 **AUTISM, ATTACHMENT AND PARENTING: A COMPARISON OF CHILDREN WITH AUTISTIC DISORDER, PDD-NOS, MENTAL RETARDATION OR LANGUAGE DISORDER, AND NON-CLINICAL CHILDREN.** A. Rutgers, M. Bakermans-Kranenburg, S. Willemsen-Swinkels, E. Van Daalen and M. Van Ijzendoorn. Department of Education and Child Studies, Centre for Child and Family Studies, Leiden University.

Impairments of children with autism in reciprocal interaction may affect the attachment relationship with their parents and may have an impact on parenting.

Objective: Assessing differences between non-clinical and clinical groups, with an emphasis on children with autism, on parenting and attachment.

Design/Methods: Parenting and attachment were investigated in 89 families with young children (mean age 26.5 months) part of whom was diagnosed at an early age for being at risk to develop autism. Parenting was measured through six questionnaires: Authoritative parenting, Parental daily hassles, Social support, Psychological problems, Internal locus of control, and Parental efficacy. Group therapists scored the child's attachment behaviour with the Brief Attachment Screening Questionnaire (BASQ) after observing the child-parent dyad for at least 90 minutes. Differences between the non-clinical group and the different clinical groups were obtained on both parenting and attachment.

Results: Contrasts between non-clinical and clinical groups and between non-clinical and autism groups (autistic disorder and PDD-NOS) revealed significant differences on both parenting ($p < .05$; significant effect for the comparison of non-clinical versus Language disorder) and attachment ($p < .01$; significant effect for the comparison of non-clinical versus autistic disorder and non-clinical versus PDD-NOS high functioning).

Conclusions: Parents of clinical children report more difficulties in parenting than parents of non-clinical children, and the same is true for parents of children with autism. There were however remarkably few differences between the clinical sub-groups. Children with autistic disorder and high functioning PDD-NOS children exhibited less secure attachment behaviour in comparison with non-clinical children.

P2B.1.10 **DSM-IV AXIS I DISORDERS IN PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS.** E. Winterrowd, S. Hepburn, L. Kopelioff and D. Rojas. Neuromagnetic Imaging Laboratory, University of Colorado Health Sciences Center.

The genetic contribution of DSM-IV Axis I disorders in parents of children with autism spectrum disorders (ASD) may help to explain the variation in presentation of ASD. Although previous research has suggested a higher incidence of anxiety and mood disorders in parents of children with ASD, few have utilized structured interviews. METHOD: We completed the Structured Clinical Interviews for DSM-IV Axis I and Axis II disorders (SCID-I and SCID-II) with parents of children with ASD. RESULTS: Of the 23 parents who participated, 15 were identified with at least one Axis I disorder (65%) based on DSM-IV criteria. Twelve (52%) had a primary diagnosis of a mood disorder and 3 (13%) had a primary diagnosis of an anxiety disorder. Eight of the 23 parents (35%) met criteria for an

additional Axis I disorder. Two (9%) also met criteria for an Axis II disorder. For half of the parents with Axis I disorders, the first clinically significant episode coincided with the autism spectrum diagnosis in his or her child. However, the remaining subjects (30% of the ASD parent group) had age of onsets well before their children were diagnosed. Of these, only 2 were being actively treated prior to the diagnosis of their child. CONCLUSION: Our findings suggest that a large percentage of parents of children with ASD have suffered from diagnosable mental disorders at some point in their lives. The genetic contribution of these disorders may greatly affect the presentation of autism spectrum disorders in their children.

This study was funded by a grant from the Cure Autism Now Foundation.

P2B.1.11 **THE IMPACT OF SPEECH AND FAMILY HISTORY ON MOOD SYMPTOMATOLOGY AND AUTISM.** H. Wright, A. Hall, R. Abramson, S. Ravan, H. Cope, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Department of Neuropsychiatry.

Objective: To determine if family history of mood disorders and overall level of language ability impacts parent report of mood symptomatology in children with Autistic Disorders (AD).

Design/Methods: Participants (n=187) were drawn from a genetic study of

AD. Diagnoses are confirmed using medical records, clinical evaluation and the ADI-R. Question 19on the ADI-R was used to determine overall level of language. Difficulty sleeping and family history of mood disorder was abstracted from the research chart. The Aberrant Behavior Checklist-Community (ABC-C) was completed by parents.

Results: Using Discriminant Function Analysis, sleep difficulties, the Irritability and Hyperactivity subscale scores on the ABC-C were combined to create a new factor of “mood symptoms”. The factor loadings were: Irritability=.588, Hyperactivity=-.157, and sleep difficulties=.156. The results of a 2x2ANOVA showed that there was no main effect for family history. However, there was a significant main effect for level of speech ($F(1,186)=9.0869$, $p=.003$) and a trend in the interaction effect between family history and speech ($F(1,186)=3.600$, $p=.059$).

Conclusions: This finding suggests that parents rate verbal (spontaneous phrase speech) children with AD higher on the mood symptoms factor than nonverbal children. The trend in the interaction effect demonstrates that non-verbal children with a family history of mood disorders are rated lower on the mania factor than any other group. This may suggest the importance of speech in parents' ability to recognize mood symptoms in children with AD.

P2B.1.12 **PARENTAL ATTITUDE AND SOCIAL-EMOTIONAL DEVELOPMENT IN HIGHER FUNCTIONING CHILDREN WITH AUTISM.** N. Zahka, A. Weisman, C. Burnette, C. Schwartz, A. Pradella, H. Henderson, S. Sutton and P. Mundy. University of Miami.

Objective: This study examined how expressed emotion (EE), a measure of parental criticism and attitude, may be related to social-emotional development and symptom presentation in HFA children.

Design/Methods: Twenty-six children with diagnoses of autism were recruited: 25 boys, mean age = 12 years (2.2), mean Verbal Comprehension Index (VCI) = 100. Diagnoses were confirmed with screening questionnaires. Expressed emotion was assessed using the Five Minute Speech Sample (FMSS). Children provided self-report on the measures of emotional functioning. Parents provided ratings of their children's behavior, their own mental status and stress. Two indices from the FMSS were used: presence of dissatisfaction with and number of positive comments about the HFA child.

Results: Results revealed higher FMSS Dissatisfaction was related to parent reports of higher externalizing factor scores ($r = .63$, $p < .01$), lower adaptability ($r = .76$, $p < .001$), and less aloof behavior ($r = .50$, $p < .05$). FMSS dissatisfaction was related to parent reports of their own Interpersonal Sensitivity ($r = .51$, $p < .05$) and Hostility ($r = .75$, $p < .001$). FMSS Positive Comments were related to fewer symptoms of autism ($r = -.50$, $p < .05$), less aloof behavior ($r = -.53$, $p < .05$), less evidence of internalizing comorbidity ($r = -.45$, $p < .05$) and higher ratings of Adaptability ($r = .64$, $p < .05$).

Conclusions: These data suggest that the FMSS

Dissatisfaction and Positive Comment indices may reflect independent parental attitude variables that are related to differences in social-emotional development among HFA children.

## Poster Session 2B: Topic 2

### *Early Development*

P2B.2.1 **THE ORIGINS AND DEVELOPMENT OF JOINT ATTENTION IN INFANCY AND ITS CONTRIBUTION TO SOCIAL UNDERSTANDING AND SOCIAL RESPONSIVENESS IN PRESCHOOL-AGED CHILDREN WITH AUTISTIC DISORDER.** S. Clifford and C. Dissanayake. School of Psychological Science, La Trobe University.

The current research aimed to assess the early development of joint attention (in the first two years of life) and its contribution to later social understanding and social responsiveness among preschoolers with autism (aged 3 to 5 years).

Methods: Participants: 36 children with autism, matched to a control group of 27 (19 developmentally delayed and 8 typically developing) children all aged between 3 - 5 years.

Design: As autism is generally not diagnosed until around the age of 3 years, early development of joint attention was assessed retrospectively by (1) parent interview and (2) observations of home videos of the children when they were aged 0-24 months. During two testing sessions, which included developmental assessments, children were administered a range of social understanding (e.g., theory of mind) and social responsiveness (e.g., prosocial and empathy tasks) tests. The relationship between early joint attention measures and children's current social understanding and social responsiveness was then assessed.

Results: Home video observations demonstrated that children with autism showed social deficits in smiling and eye contact from as early as 6 months of age, with the parental interviews confirming these findings. Both studies showed that problems with initiating and responding to joint attention emerged before the age of 2 years. In contrast, requesting behaviours were less problematic. The associations of early joint attention abilities in infancy to later social understanding and responsiveness at preschool age remain to be explored.

Conclusions: The combined findings of the retrospective studies demonstrate that autism development may be deviant from as early as the fist 6 months of life. It is anticipated that these deficits will have significant consequences for preschool development of social understanding and social responsiveness.

P2B.2.2 **INTELLECTUAL GROWTH BETWEEN INFANCY AND TODDLERHOOD IN CHILDREN WITH DEVELOPMENTAL DISORDERS.** C. Dietz, S. Willemsen-Swinkels, J. Buitelaar, E. Van Daalen and H. Van Engeland. University Medical Center, Department of Child and Adolescent Psychiatry.

A trend towards earlier diagnosing developmental disorders like Autism Spectrum Disorders (ASD) can be seen. As a consequence, psychological testing takes place earlier and the prognostic value of cognitive testing will be of importance.

Objective: Investigating early cognitive development longitudinally in children with developmental disorders and controls.

Methods: Cognitive development was investigated between age 14 and 48 months using the Mullen Scales of Early Learning (MSEL). Children were diagnosed with ASD (n = 44), Mental retardation (n = 17) or Language Disorder (n = 37). A control group contained children with minor or no developmental problems (n = 176). Cognitive profiles were disentangled to find specific areas of growth or decline.

Results: The ASD-and LD-group showed significant growth in cognitive level of 16 and 18 points respectively. The MR-group showed stable cognitive development on global and subscale level. Growth was found on subscales "visual reception" and "receptive language" for the ASD-group, while children with LD improved in expressive language as well. The control group showed gradual growth in cognitive level of 6 points, distributed evenly on subscales.

Conclusions: Intellectual growth was found for children diagnosed with ASD and LD. A stable cognitive pattern was found within the MR-group. For children with developmental disorders, growth was related to specific areas of development, in contrast with controls showing gradual growth on all subscales.

Although findings might challenge the prognostic value of early cognitive measurements, they can also emphasise early brain plasticity and the possibility of catching-up in children suffering from developmental disorders.

P2B.2.3 **DEVELOPMENT OF VISUAL FILTERING AMONG PERSONS WITH AUTISM.** A. Grivas, T. Flanagan, L. Pasto, N. Russo, D. Berringer and J. Burack. McGill University.

Study Objectives: A forced choice reaction time (RT) task was used to assess developmental changes in filtering and the related ability to narrow the focus of the attentional lens among persons with autism as compared to a group of typically developing children matched on different standardized measures.

Method: The participants included 39 persons with autism and 45 typically developing children with mental ages between 5 and 9 years on at least one of three matching measures (Leiter-R, PPVT-III, EOWVT). Group comparisons were based on median splits for each measure. The participants were administered a forced-choice reaction time (RT) task with conditions that varied with regard to the presence or absence of distractors, distractor proximity (none, close, far) to a target stimulus, and the presence or absence of a visual window within which the target was presented.

Results: For both the persons with autism and the typically developing children, the RTs of the older participants were less affected in conditions with distractors than the younger participants. For the comparisons based on the vocabulary matching measures but not the Leiter-R, the RTs among persons with autism were similarly affected by close and far distractors, whereas those of the typically developing participants were slower with close as compared to far distractors.

Conclusions: The primary findings are that development changes in visual filtering are evident for both persons with autism and typically developing children with MAs between 5 and 9 years, and that deficits evident among the persons with autism may be contingent on the matching measure.

P2B.2.4 **REDUCED CORTICAL THICKNESS IN BOYS WITH AUTISM OR AUTISTIC SPECTRUM DISORDER.** M. Hediger, L. England, C. Molloy, D. Warren, K. Yu, P. Manning-Courtney and J. Mills. National Institute of Child Health and Human Development.

Background: Children with autism/ASD may have poor nutrition, decreased physical activity, and be on dairy-restricted diets, placing them at risk for abnormal bone development.

Objective: To determine if bone development in boys with autism/ASD is abnormal.

Design/Methods: Seventy-five boys, ages 4 to 8 years, with diagnoses confirmed by ADOS-G, were evaluated for growth. On x-rays for bone age, second metacarpal shaft cortical thickness (CT) and medullary width (MW) were measured and compared with medians (% deviation) and means (z-scores) from the Fels Longitudinal Study and Ten-State Nutrition Survey, respectively. Data were analyzed by ANCOVA, adjusting for height (<110, 110-120, 120-130, 130 cm), bone age, and the use of dairy-restricted diets and anti-epileptic drugs.

Results: Subjects were 6.6±1.5 y, 88% white, and 12% on dairy-restricted diets. The boys were relatively tall (z-score +0.59±1.01) and heavy (z-score +0.87±1.12) for age. CT increased with age from 4 to 8 years, 2.3±0.4 to 2.9±0.4 mm (P-value<0.001), while MW was constant over these ages (3.2±0.5 mm). At ages 4 and 5 the CT % deviations did not differ from zero; by 6 to 8 they differed from zero and were below the median reference (P-value=0.02 for trend). The CT % deviation values were +3.6±4.9%, -6.0±4.2%, -16.7±3.4%**, -19.9±3.7%**, -25.1±4.8%**, at ages 4 to 8, respectively. The trend was similar for CT z-scores (z-scores +0.70±0.30*, +0.22±0.26, -0.21±0.21, -0.50±0.23*, -0.85±0.30**, at ages 4 to 8, respectively); MW z-scores did not change appreciably over these ages (P-value=0.96 for trend) and did not differ from zero. Dairy-restricted diets were associated with a major negative impact; for all ages combined, those on dairy-restricted diets had a CT % deviation of -18.9±3.7%, almost twice that of boys on unrestricted diets (-10.5±1.3%, P-value<0.04).

Conclusions: Boys with autism/ASD show progressive fall-off in appositional bone growth between ages 4 and 8. Their bone development should

be monitored carefully, especially if they are on dairy-restricted diets.

*Different from zero at P-value<0.05, **P-value<0.01

P2B.2.5 **FOLLOW-UP OF CHILDREN DIAGNOSED WITH PERVASIVE DEVELOPMENTAL DISORDERS; STABILITY AND CHANGE DURING THE PRESCHOOL YEARS.** S. Jonsdottir, E. Saemundsen, G. Asmundsdottir, S. Hjartardottir, B. Asgeirsdottir, H. Smaradottir, S. Sigurdardottir and J. Smari. The State Diagnostic and Counseling Center.

Objective: Description of a clinical group in Iceland with PDD ICD-10 diagnoses and receiving eclectic services in preschool settings.

Methods: Forty one children met intake criteria and were assessed twice during the preschool years. At Time 1, all the children had a physical examination including PNE and a thorough diagnostic work-up using the ADI-R and the CARS and appropriate cognitive tests (BSID-II; WPPSI-R). At Time 2, the cognitive tests were applied again as well as the CARS and a measure of adaptive behavior (VABS). Children diagnosed with Childhood autism (CA group) were compared with children with other PDD diagnoses (Other PDDs group).

Results: Mean cognitive performance of the whole group was stable (p>.05) over time but autistic symptoms decreased (p<.01) as measured by the CARS. Over 90% of the children diagnosed with CA at Time 1 received the same diagnosis at Time 2. Outcome measures at Time 2 showed more impairment for the CA group than for the group with Other PDDs: autistic symptoms were more severe (p<.01), and mean IQ/DQ scores (p<.05) and VABS scores were lower (p<.05). Of the CA group, 30% had IQ/DQ scores of e 70 and 60% had phrased speech, while the figures for the Other PDDs group were 73% and 100% respectively.

Conclusions: It is important to monitor the general development and the symptoms of autism of preschool children diagnosed with PDDs. Children diagnose with PDDs in this study, seem to fare better as a group than reported in previous studies on children with autism.

P2B.2.6 **GROSS MOTOR SKILLS OF TODDLERS WITH AUTISM AND PDD.** M. Lloyd, S. Risi and C. Lord. University of Michigan.

Objective: Recently, the gross motor skills of young children with autism and PDD are attracting more attention (Dawson, et al., 2000; Molloy, et al., 2003; Teitelbaum, et al., 1998). The purpose of this study is to determine the status of the motor skills of a cohort of 250 young children, mean age = 33 months.

Design/Methods: Each child was administered the Mullen Scales of Early Development (MSEL), and the Pre-Linguistic Autism Diagnostic Observation Schedule (PL-ADOS). In addition, the parents were interviewed using the Vineland Adaptive Behavior Scales (VABS). There were three groups: those diagnosed with Autism (n= 132), PDD (n= 72), or non-spectrum (n= 45).

Results: Both the autism and PDD groups, on average, achieved independent sitting, and walking within typical developmental ranges. Both groups were approximately 9 months behind on gross motor skills on measured by MSEL and VABS gross motor scales. Non-verbal IQ appears to be the most salient predictor of gross motor skills as it was significantly correlated with independent sitting (Autism, r = -.251 and PDD, r = -.333); independent walking (Autism, r = -.204 and PDD, r =-.461); as well as the MSEL (Autism, r = .306 and PDD, r = .246) and VABS (Autism, r= .222 and PDD, r= -.281) gross motor age equivalents.

Conclusions: Although children with PDD are generally considered to be clumsy, they also had higher verbal and non-verbal IQ's. Therefore, young children with autism and PDD may be delayed in gross motor skills and IQ may predict motor performance.

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P2B.2.7 **TEMPERAMENT MATTERS: IMITATIVE ABILITIES OF YOUNG CHILDREN WITH AUTISM, FRAGILE X, AND DEVELOPMENTAL DELAY.** S. Nichols, S. Hepburn, I. Smith and S. Rogers. University of Colorado Health Sciences Center and JFK Partners.

Little research has examined the role that temperament might play in imitation. Insight into how temperamental attributes affect a child's imitative behavior may further our understanding of the

processes involved in imitation and influence directions for intervention.

Study Objectives: Expanding on our (Nichols & Smith) previous work with typically developing infants, we examine relationships between dimensions of temperament and imitation in young children with developmental disorders.

Methods: Imitative abilities and temperament profiles of 22- to 48-month-old children (32 Autism Spectrum Disorder, 23 Fragile X, 40 Developmental Delay) were assessed using the Carey Temperament Scales and multiple imitation measures: elicited imitation tasks, ADI-R imitation scores, and ADOS observations.

Results: Controlling for cognitive ability, temperament characteristics of imitators differed across diagnostic groups and imitative contexts. Temperament dimensions most strongly associated with imitative skill included Approach, Intensity, Persistence, Mood, and Adaptability. Children in the DD group demonstrated a pattern similar to that observed in young, typically developing infants: children who appeared skilled on elicited imitation tasks were rated as more withdrawn ($r = .61$, $p < .004$), less adaptable ($r = .64$, $p < .002$), and more negative ($r = .50$, $p < .02$). In contrast, imitation in naturalistic contexts was associated with positive scores on the same dimensions for both the DD and the Fragile X groups. Imitators in the autism group were rated as more persistent (one way ANOVA, F test; $p < .02$), more distractible ($p < .01$), and more intense ($p < .01$).

Conclusions: Findings demonstrate that aspects of temperament are associated with imitation in children with developmental disabilities and that unique profiles emerge in disordered versus delayed development. Implications for intervention are discussed.

P2B.2.8 **FACTORS ASSOCIATED WITH AGE OF ENTRY TO EARLY INTERVENTION.** M. Novak, C. Zubritsky and D. Mandell. University of Pennsylvania/ Center for Mental Health Policy and Services Research.

Outcomes for children with autism can be enhanced through early intervention (EI). EI is available to children with autism through IDEA, even before diagnosis. Little research has examined factors associated with age of entry to early intervention for this group.

Study Objectives: To examine clinical and demographic factors among a group of children with autism associated with age of entry into EI.

Methods: We surveyed 1018 caregivers of individuals with autism in Pennsylvania. This study included the 283 caregivers who had a child less than 6 years old. Participants were asked about age of entry into services, age of diagnosis, and autistic symptoms. Linear regression was used to examine factors associated with age of entry into EI.

Results: Average age of entry into EI was 28 months. Having a severe language delay was associated with a 4-month decrease, and having stomach problems associated with a 5-month decrease in age of service entry. Receiving an autism diagnosis prior to entry into EI was associated with an 11-month increase in the age of service entry. Greater parental education was associated with lower age of entry into EI.

Conclusions: The fact that severe language deficits and not other core symptoms of autism predicted earlier entry into EI suggests that professionals may miss other warning signs. Stomach problems in children may be associated with increased contact with the medical system, which may facilitate earlier entry into EI. The search for a diagnosis may delay entry to EI and suggests emphasis should be placed on diagnosis and service provision simultaneously.

P2B.2.9 **AN EXPLORATION OF THE PREDICTIVE AND CONCURRENT RELATIONSHIPS BETWEEN EARLY SOCIAL COGNITIVE BEHAVIORS AND SUBSEQUENT INTELLECTUAL AND COMMUNICATION OUTCOMES: INSIGHTS FROM THE RETROSPECTIVE ANALYSES OF HOME MOVIES.** K. Poon, L. Watson and G. Baranek. University of North Carolina at Chapel Hill.

Objective: To understand the concurrent and predictive relationships between early social cognitive features of children with autism spectrum disorders (ASDs) (joint attention [JA], imitation [IM], and object play [OP]) and subsequent indicators of positive prognosis (language and intellectual functioning).

Method: Edited home-movie footages featuring infants between 9 to 12 months and 15 to 18 months

were retrospectively coded for frequency (JA-Frq, IM-Frq, and OP-Frq) and for quality (JA-Qly, IM-Qly, and OP-Qly). Their predictive relationship with language and intellectual functioning, both based on assessments when the child was assessed between 3 to 7 years of age, was examined.

Results: Preliminary analyses of video footage from 12 participants suggest no relationship between the social cognitive behaviors and outcome variables. Correlations between the frequency and qualitative ratings were found for JA ($r = .658$, $p < .05$) and OP ($r = .629$, $p < .05$) at 15-18 months and IM ($r = .714$, $p < .01$) at 9-12 months . There were also correlations between JA-Qly with IM-Frq ($r = .617$, $p < .05$), JA-Qly with IM-Qly at ($r = .696$, $p < .05$) at 9-12 months, IM-Frq with OP-Qly ($r = .749$, $p < .01$), and JA-Qly with OP-Frq ($r = .710$, $p < .05$) at 15-18 months.

Conclusion: The lack of relationship between early social cognitive variables and outcome measures is understandable due to the small sample. The relationships between coding and rating methods lend support to the suggestion that both tap a similar construct. The strong concurrent relationships between JA, IM, and OP also suggest a commonality in social cognition that children with ASD have particular difficulties with. It is expected that the relationships between these variables will become clearer as the study progresses (data from about double the participants will be presented in the May conference).

This study was partially supported by a grant by the Cure Autism Now Foundation and by the Smith Grant of the Graduate School, University of North Carolina at Chapel Hill.

P2B.2.10 **HEAD CIRCUMFERENCE AT BIRTH IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** J. Richler and R. Oti. University of Michigan.

Objective: Brain size, as measured by head circumference, has been the subject of many recent studies of children with Autism Spectrum Disorders (ASD). While there is some evidence for accelerated head growth in the first few years of life, the findings regarding birth head circumference (BHC) have been mixed, with some reporting higher rates of microcephaly in children with ASD and others reporting no difference between children with ASD and typical controls. The present study examines BHC in children with ASD as compared to typical children.

Methods: Preliminary analyses were conducted on a sample of 61 children diagnosed with ASD (52 males, 9 females). BHC was obtained from medical records for this sample. These measurements were compared to those of typical children, as estimated by the Centers for Disease Control and Prevention norms. Future analyses will include approximately 150 additional children and will examine head circumference as a predictor of later outcomes, including developmental regression, nonverbal IQ, verbal IQ, adaptive behaviors, and restricted and repetitive behaviors.

Results: Findings indicate that females' mean BHC was at the 15th percentile according to population norms, while males' BHC was at the 25th percentile. Furthermore, 7.6% of the males had microcephaly at birth (defined as two standard deviations below the population mean). Consistent with previous studies, there were no cases of macrocephaly in either sample.

Conclusion: Preliminary results indicate that children with ASD, on average, have smaller BHC than typical children. Implications for trajectories of development will be discussed.

This research was funded by the NIMH Early Diagnosis of Autism MH46865 and NICHD Neurobiology and Genetics of Autism U19 HD35482.

P2B.2.11 **DEVELOPMENTAL MILESTONES IN HIGH FUNCTIONING AUTISM AND ASPERGER'S DISORDER.** A. Schropp, M. Gibbs, P. Lee and L. Kenworthy. Suffolk University.

Determining whether a child has AS or HFA depends on the presence or absence of language delay (e.g., single words used by 2 years, communicative phrases used by 3 years). Furthermore, both the ICD-10 and DSM-IV-TR include “clumsiness” as a feature commonly associated with AS, but not autism.

Objective: Address the confusion regarding whether or AS is diagnostically distinct from HFA by investigating language and motor milestones.

Design/Methods: Participants were HFA (N = 18) and AS (N = 12) patients consecutively evaluated through a hospital-based neuropsychology service. Descriptions of early language development and motor

skills were obtained through phone interview.

Results: Significant differences were obtained for language milestones (MANOVA, F (1, 29) = 5.72, p = .003). Post Hoc tests revealed HFA participants were significantly more delayed regarding age at which they spoke in sentences (ANOVA, F (1, 29) = 14.43, p = .001) and asked “wh-questions” (F (1, 29) = 19.80, p = .000), but not on age at which they babbled (ANOVA, F (1, 29) = .206, p = .654) or acquired their first word (ANOVA, F (1, 29) = 1.82, p = .189). No significant differences were obtained between groups for motor skills (MANOVA, F (1, 29) = 2.17, p = .10).

Conclusions: Results indicate that there is evidence that supports the diagnostic differentiation of these two disorders based on the development of language that persists through milestones acquired at later ages. However, there was no evidence in terms of the acquisition of motor skills.

## Poster Session 3A: Topic 1

### *Cognitive Neuroscience & Functional Neuroimaging*

P3A.1.1 **EYEBLINK CONDITIONING IN AUTISM.** T. Arndt, K. Chadman, E. Peloso, D. Watson, M. Stanton and P. Rodier. University of Rochester School of Medicine and Dentistry.

Eyeblink conditioning is a form of Pavlovian conditioning in which repeated pairings of a tone with an airpuff to the eye causes the subject to blink their eye in response to the tone alone. Over 25 years of animal and human research has shown that brainstem-cerebellar circuitry is critically involved. Parts of the circuit (e.g. posterior vermis of the cerebellum, deep cerebellar nuclei, hippocampus) have also been reported to be abnormal in human cases of autism.

Objective: To assess the performance of children with autism on eyeblink conditioning.

Design/Methods: In this study, 16 children underwent 2 sessions of short delay eyeblink conditioning, followed by two sessions of long delay conditioning. Ten children were typically developing boys, and 6 were high functioning boys with autism. All children were between the ages of 8 and 12, and had an IQ within the normal range.

Results: The children with autism acquired the conditioned response more quickly than typically developing children and achieved a higher rate of conditioned blinks throughout the sessions ($p<.05$). There was no baseline difference in response to unpaired stimuli prior to conditioning trials.

Conclusions: Of more than 15 neurological disorders that have been studied utilizing eyeblink conditioning, autism is unique for showing this pattern of enhanced classical conditioning. This outcome, together with similar results observed in a rodent model of autism, supports the hypothesis that early gestational injury to brainstem is involved in the etiology of autism.

This work was supported by NICHD grant P01HD034969.

P3A.1.2 **LATERALIZED CORTICAL SEROTONERGIC ABNORMALITIES IN AUTISTIC CHILDREN ARE ASSOCIATED WITH SOCIAL SUBTYPES.** M. Behen, S. Chandana, O. Muzik, C. Juhasz, H. Chugani and D. Chugani. Departments of Pediatrics, Radiology, Neurology, Children's Hospital of Michigan/Wayne State University.

Previous studies in our lab have shown relationships between symptom profiles and in vivo uptake of alpha[C-11]methyl-L-tryptophan (AMT), a PET tracer for brain serotonin synthesis in autistic samples (Chugani et al., 2004).

Objective: To determine whether cortical asymmetries in serotonin synthesis are associated with social subtypes within a sample of autistic children.

Method: We subclassified 47 autistic children (32 males, mean age=91.6+ 31 months) using the Wing Subgrouping Questionnaire (WSQ, Castelloe & Dawson, 1993), and compared their AMT PET findings. We objectively identified areas with abnormal cortical decreases in AMT uptake based on asymmetry measurements of small homotopic regions.

Results: The WSQ placed 17, 17, 13 children into the active-but-odd, passive, and aloof groups, respectively. Between-group comparisons on AMT PET revealed an increased incidence of cortical asymmetry (decrease) in both the Passive and active-but-odd groups as compared with the Aloof group, $X2(2)=7.018$, $p=.03$. Further, the passive group had greater incidence of asymmetry, with AMT uptake lower on the left, as compared to the active-but-odd group

which was more variable with regard to the side of the decreased frontal AMT uptake.

Conclusions: Autistic children with active-but-odd and passive social subclassifications have increased incidence of lateralized cortical serotonergic decreases as compared to autistic children with aloof subclassifications. These results are consistent with previous work demonstrating different EEG patterns in autistic children defined by social subtype (Dawson et al., 1995), and support the utility of subclassification schemes in studies investigating neurobiological correlates of autism.

Supported by NIH Grant ROI HD34942

P3A.1.3 **CHARACTERIZING ATYPICAL LOW-LEVEL VISUAL INFORMATION PROCESSING FOR PERSONS WITH HIGH-FUNCTIONING AUTISM (HFA).** A. Bertone, L. Mottron, P. Jelenic and J. Faubert. École d'optométrie, Université de Montréal.

Purpose: Decreased complex motion sensitivity in autism has been attributed to a dorsal visual stream dysfunction (pathway-specific hypothesis). We have previously demonstrated a decreased sensitivity for complex, texture-defined (or second-order), but not for simple, luminance-defined (or first-order) motion in HFA. This was attributed to a limitation in low-level neuro-integrative mechanisms (complexity-specific hypothesis). This interpretation is tested here on static information processing in HFA by measuring the sensitivity to simple (luminance-defined) and complex (texture-defined) gratings.

Methods: Orientation-discrimination thresholds for HFA and typically developing (TD) participants were measured using static gratings differing only in the attribute defining their orientation: luminance (first-order) vs. texture (second-order). We also measured flicker sensitivity mediated by « magno » and « parvo » systems to dissociate the pathway and complexity-specific hypotheses.

Results: The ability of persons with HFA was found to be superior for discriminating the orientation of first-order gratings but inferior for second-order gratings. No differences in flicker sensitivity were found between groups for either the « magno » or « parvo » conditions.

Conclusions: These results demonstrate both enhanced and diminished low-level visual information processing in HFA, according to the complexity of presented stimuli. They support the complexity-specific hypothesis since complex, texture-defined information is less efficiently processed by persons with HFA, whether dynamic or static in nature. Furthermore, the similar flicker sensitivity for the « magno » condition between groups provides additional evidence against the pathway-specific hypothesis. The finding of enhanced HFA sensitivity to simple, luminance-defined gratings is discussed in terms of abnormal synaptic connectivity mediating lateral inhibition.

Support: CIHR # MOP- 5353291 (JF), STN # 63728 (LM) & CIHR graduate fellowship (AB)

P3A.1.4 **ANOMALOUS N400 AND GAMMA-BAND RESPONSES TO SEMANTIC VIOLATION STIMULI IN INDIVIDUALS WITH AUTISM SPECTRUM DISORDER.** S. Braeutigam, S. Swithenby and A. Bailey. Department of Psychiatry.

It has been argued that individuals with autism spectrum disorder (ASD) exhibit weak central coherence; an account supported by experimental studies showing that affected individuals are less likely to use sentence context spontaneously while reading.

Objective: To use magnetoencephalography to examine the neural correlates of semantic processing of words and sentences in individuals with an ASD.

Design/Methods: Whole-head MEG was used to study the neural responses in 11 adults with ASD and 11 normally developing adults. Participants read single words presented sequentially (200 ms display, 550 ms separation) to form 100 syntactically correct sentences. Fifty sentences ended with an appropriate noun (congruous C) and half with a semantically incongruous (I) noun. Participants performed a task to maintain their attention on sentence context. All participants in this study gave written informed consent before the experiment (Helsinki Declaration).

Results: N400-like evoked components following I-words were significantly reduced over left temporal cortices in ASD compared to control participants. In individuals with an ASD, phase-locked gamma band (20-45Hz) activity at 200-300 ms following C-words was significantly enhanced over bilateral pre-frontal and right parietal areas compared to I-words. No such effect was observed in control subjects.

Conclusions: Firstly, these findings suggest that individuals with ASD employ different-from-normal strategies to resolve semantic incongruity, relying to a lesser extent on cortical areas typically associated with language processing. Secondly, individuals with an ASD appear to show abnormal binding of semantic networks in situations in which meaning can readily be derived. This may indicate unusual mechanisms for retrieving meaning in affected individuals.

This work was supported by the Welton Foundation and the Ferguson Trust.

P3A.1.5 **AUDIOVISUAL SPEECH INTEGRATION IN AUTISM: AN FMRI STUDY.** E. Collins, K. Pelphrey and J. Morris. University of Rochester.

Research on multi-sensory integration in autism suggests that persons with autism may have difficulty integrating audiovisual speech. Interestingly, integration of audiovisual speech has been localized to the Superior Temporal Sulcus (STS), an area of the brain associated with activation during several social cognition tasks, many of which elicit different patterns of activation in persons with autism when compared to controls.

Objectives and Methods: This study uses fMRI to address the question of whether brain activity during audiovisual speech integration is abnormal in persons with autism by comparing four conditions in high functioning individuals with autism and matched controls (n = 12): 1) auditory speech 2) visual speech 3) audiovisual matched speech and 4) audiovisual mismatched speech.

Results: In persons with typical development, integration of audiovisual speech occurred in two ways. First, the Blood Oxygen Level Dependent (BOLD) response to audiovisual matched speech was greater than the addition of the responses of the two unisensory stimuli, indicating over-addition of matching stimuli. Second, the BOLD response to audiovisual mismatched speech was less than the addition of the two unisensory responses, indicating inhibition of mismatching stimuli. However, preliminary analysis of the BOLD response in persons with autism suggests that both over-addition of matching stimuli and inhibition of mismatching stimuli appear absent.

Conclusion: These results suggest that persons with autism do not differentiate between matching and non-matching audiovisual speech, but instead respond to the two types of stimuli as if integration were not occurring.

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P3A.1.6 **REDUCED SENSITIVITY TO VOWEL-CONSONANT PAIR ANOMALIES IN CHILDREN WITH AUTISM: AN MEG STUDY.** E. Flagg, J. Oram Cardy, T. Roberts and W. Roberts. University of Toronto.

MEG evidence shows the timing of neural activity evoked by Vowel-Consonant stimuli depends on their status with respect to native language phonology. In adult English speakers, the neural response to the consonant in phonologically anomalous nasal V-oral C sequences peaks later than in congruent oral V-oral C pairings. This delay is predicted by native language knowledge. In English, nasal vowels arise via assimilation with a following nasal consonant; an oral C after a nasal V violates speakers' expectation of a nasal C.

Objective: Determine whether children with autism (CWA) show evidence of intact or impaired phonological knowledge of vowel nasalization patterns using an established passive MEG paradigm.

Methods: Neuromagnetic activity during auditory presentation of anomalous and congruent VCV stimuli was recorded from six CWA and typically developing (TD) controls using a 151-channel whole head biomagnetometer. Stimuli (congruent: [aba] and [ãma], initial V and C matched for nasalization; anomalous: [ama] and [ãba], initial V and C mismatched) were randomly interleaved. Latency and amplitude of the consonant response for each stimulus were measured from MEG data averaged over 105 trials/token.

Results: TD children showed an adult-like ~20ms delay in anomalous VC pairings (85ms [aba] vs. 107ms

[ãba]), but CWA did not (115ms [aba] vs. 125ms [ãba]). Consonant responses overall peaked significantly later in CWA than TD controls (122ms vs. 91ms, p<0.05).

Conclusions: Reduced neuromagnetic sensitivity to anomalous VC sequences provides a neural correlate of language impairment, differentiating children with autism from typically developing peers using a short, non-invasive, passive MEG paradigm.

Grant support: National Alliance for Autism Research (TPLR)

P3A.1.7 **CORRELATION BETWEEN CEREBRAL BLOOD FLOW DISTRIBUTION AND AUTISM CLINICAL SEVERITY.** I. Gendry Meresse, N. Chabane, N. Boddaert, L. Laurier, I. Sfaello, Y. Samson and M. Zilbovicius. INSERM-CEA.

Bilateral temporal hypoperfusion at rest was described in children with autism by two independent studies (Zilbovicius et al., 2000; Onishi et al., 2000). These regions are implicated in social perception, language and “theory of mind” abilities which are severely impaired in infantile autism.

Objective: To investigate a putative relationship between regional cerebral blood (rCBF) flow measured at rest with positron emission tomography (PET) and the clinical profile of autistics children.

Methods: rCBF was measured at rest in forty-five autistic children (37 boys; mean age: 8 ± 2.2 years; mean IQ: 44 ± 22). Autism was diagnosed according to the DSM-IV and the autistic behaviour was evaluated with the Autism Diagnosis Interview Revised (ADI-R). rCBF was determined from the distribution of radioactivity measured with PET (ECAT-EXACT-HR+) after bolus intravenous injection of H215O. The correlation analysis was a whole brain covariance analysis performed with SPM99 (covariance rCBF vs ADI-R global score).

Results: In this group, mean ADI-R global score was 50 ± 13. Significant negative correlation (p<0.005) was observed between rCBF in the left superior temporal gyrus and the ADI-R score in autistic patients. The more ADI-R score is high (the more the autistic syndrome is severe), the more rCBF is low in this left superior temporal region. This was the only significant correlation observed.

Conclusion: These findings suggest that left superior temporal hypoperfusion is related to the global severity of the autistic behavior.

P3A.1.8 **MEG AND BEHAVIORAL MEASURES OF SPEECH PERCEPTION.** N. Gage, A. Isenberg, P. Fillmore and M. Spence. University of California, Irvine.

Language dysfunction and sound reactivity are central features of autism disorder (AD), motivating investigations of auditory processing in this population. In previous studies, we used Magnetoencephalography (MEG) and behavioral techniques to evaluate sound processing in AD children. We focused on the M100 component in the auditory evoked neuromagnetic field, reflecting an intermediate stage between sensory (acoustic) and perceptual (representational) processing. Results showed elevated perceptual thresholds for AD children vs. age-matched typically developing (TD) controls combined with reduced M100 dynamic range of response to non-speech contrasts varying across spectrotemporal dimensions.

Objectives: Here we evaluate speech perceptual acuity and M100 responses to distinctive feature contrasts in Consonant/Vowel (CV) and Vowel/Consonant/Vowel (VCV) syllables in AD and TD children (8-11 yrs).

Results: Behavioral results from Discrimination tasks show (i) TD children performed overall at higher levels than AD, (ii) both groups performed better on VCV vs. CV contrasts, perhaps aided by the steady state leading vowel, and (iii) both groups had most errors for voice onset time vs. place of articulation and manner contrasts in both CV and VCV conditions. For TD children, M100 latency varied by distinctive feature, similar to previous findings for adults. Results for AD children were more variable but showed a general reduced modulation of M100 response for distinctive feature contrasts.

Conclusions: AD results show poor speech perceptual acuity for features critical to speech decoding coupled with reduced M100 modulation, providing evidence for abnormalities both in perceptual processes and neural mechanisms for feature extraction in AD children.

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P3A.1.9 **NEURAL SYSTEMS FOR COGNITIVE CONTROL IN CHILDREN WITH AUTISM STUDIED USING FUNCTIONAL MAGNETIC RESONANCE IMAGING (FMRI).** L. Kalbfleisch, J. VanMeter, L. Girton, A. Hailu, E. Mease, A. Wolfe, S. Warburton, P. Daniolos, W. Gaillard and T. Zeffiro. Center for Functional and Molecular Imaging, Georgetown University Medical Center.

Cognitive control has been described as a left hemisphere function involving dorsolateral prefrontal (DLPFC) and anterior cingulate cortices, becoming more bilateral during development. We explored this process in children with autism and a typically-developing (TD) comparison group using a flanker task, a well-documented method for assessing cognitive control, the ability to determine relevant from irrelevant information and an important aspect of executive function.

Design/Methods: Children with autism (CA), ages 7-12, and a TD comparison group that was age, gender and IQ-matched participated in an fMRI study investigating neural systems of cognitive control. The flanker measures cognitive control by assessing the ability to respond to a directional target. The stimulus is a 3x3 matrix figure consisting of a central target arrow surrounded by distractor arrows on all sides. Subjects respond to the direction of the central target arrow pointing up, down, left, or right.

Results and Conclusion: Both groups performed the task with similar speed and accuracy and activated common areas in the left premotor cortex, right thalamus, and bilateral parietal and visual areas. Activations in frontal cortex differed between groups with TD activating right DLPFC and CA activating right middle and inferior frontal gyri. Additionally, TD exhibited activation in bilateral temporal and right cingulate cortices, whereas CA appeared to rely on more posterior mechanisms in left inferior parietal and right cerebellar cortex. This differential pattern of activation is consistent with development of compensatory neural systems for cognitive control in individuals with autism.

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P3A.1.10 **ATTRIBUTION OF MENTAL STATES IN HIGH FUNCTIONING AUTISM: EVIDENCE FOR CORTICAL UNDERCONNECTIVITY.** R. Kana, T. Keller, D. Williams, N. Minshew and M. Just. Center for Cognitive Brain Imaging, Department of Psychology, Carnegie Mellon University.

Objective: Neuroimaging studies have suggested that the ability to attribute mental states may be associated with certain circumscribed brain regions uniquely activated in theory of mind tasks. The main objectives of the present study were to investigate the neural correlates underlying theory of mind in autism and to explore the communication among the brain regions involved in the theory of mind network by using fMRI.

Methods: Eleven adults with high-functioning autism and eleven matched control participants were scanned during the performance of a mental state attribution task consisting of animations involving geometric figures. The animations consisted of random, goal-directed and theory of mind themes.

Results: Participants with autism showed reduced brain activation relative to controls in medial prefrontal regions and superior temporal sulcus at the temporoparietal junction during the attribution of mental states. These brain regions were previously identified as part of the theory of mind network in the brain. However the brain activation in the occipital regions during mentalizing was similar in both groups. Functional connectivity analysis revealed that individuals with autism showed reduced connectivity between the frontal (anterior) and temporal and parietal (posterior) regions.

Conclusion: Evidence from this study adds to the findings of lower synchronization in the autistic brain in tasks involving the processing of complex cognitive and social information.

This research was supported by the University of Pittsburgh-Carnegie Mellon University-University of Illinois at Chicago Collaborative Program of Excellence in Autism (CPEA), Grant P01-HD35469 from the National Institute of Child Health and Human Development.

P3A.1.11 **CAN YOU SEE WHAT IS NOT THERE? LOW-LEVEL AUDIO-VISUAL INTEGRATION IN PERVASIVE DEVELOPMENTAL DISORDER.** C. Kemner. Rudolf Magnus Institute of Neuroscience, Department of Child and Adolescent Psychiatry, University Medical Center.

Recent studies suggest that there are widespread neurodevelopmental abnormalities in PDD that might be related to the integration of information from multiple brain regions. This is especially relevant to the problems of language and emotion processing shown by subjects with PDD, since these types of processing require the integration of visual and auditory cues.

Objective: To test low-level integration of auditory and visual stimuli in subjects with Pervasive Developmental Disorder (PDD).

Methods: High-functioning adult subjects with PDD and age- and IQ- matched adults were tested using a task that evokes illusionary visual stimuli, by presenting sounds concurrently with flashes. An earlier study in normal subjects has shown that the number of presented beeps influences the number of flashes perceived.

Results: In both groups the number of beeps presented significantly affected the number of flashes perceived.

Conclusions: Using this illusionary task, subjects with PDD did not show any evidence for abnormal early visuo-auditory integration. However, the results do not exclude the possibility that there are abnormalities in multimodal integration in low-functioning or younger subgroups with PDD.

The work described was supported by a VIDI-NWO grant (nr 402-01-094) to CK, and a VENI-NWO grant (nr 451-02-094) to MJvdS.

P3A.1.12 **BRAIN ACTIVATION TO FACE STIMULI IN A WORKING MEMORY TASK IN HIGH FUNCTIONING AUTISM.** H. Koshino, R. Kana, N. Minshew and M. Just. Department of Psychology, California State University San Bernardino.

Objective: Individuals with autism have been reported to have a selective deficit in face processing. We examined brain activation during the processing of faces by individuals with autism in a working-memory task. Unlike previous studies that have looked at face processing in a discrimination task, we used an n-back task to manipulate the working memory demand during face processing.

Methods: The participants were 10 adults with high functioning autism and 10 matched controls. While in a magnetic resonance imaging scanner, they completed an n-back working memory task with faces with three experimental conditions. The three conditions provided an incremental increase in the working memory load for storing and updating an ordered set of faces. Each face was presented for 1000-msec with an inter-stimulus interval of 1500-msec. The stimuli consisted of 24 male faces oriented forward that were taken from the Warrington Recognition Memory Test for Faces.

Results and Conclusion: Although the two groups activated the same set of areas, the two groups differed in how they were affected by the increase in working memory load as n increased from 0 to 2 in the n-back task. As n increased, the level of activation of the right prefrontal cortex increased more in the autism group than in the controls in the face-processing task. This result suggests that the increased number of faces to store presents a greater burden for the group with autism. By contrast, an n-back task with alphabetic letter stimuli did not show this difference. Comparisons of functional connectivity between the two groups across the three conditions indicated lower functional connectivity in the group with autism. An exploratory factory analysis indicated that there were changes in the cortical network organization with increasing task demands.

Funding: This research was supported by the University of Pittsburgh-Carnegie Mellon University-University of Illinois at Chicago Collaborative Program of Excellence in Autism (CPEA), Grant P01-HD35469 from the National Institute of Child Health and Human Development.

P3A.1.13 **GUSTATORY FUNCTION AND FOOD PREFERENCES IN HIGH-FUNCTIONING AUTISM.** E. Kuschner, L. Bennetto and L. Silverman. University of Rochester.

Children with autism are often reported to have unusually selective eating habits, but very little research has addressed the nature of this behavior or explored its etiology.

Objectives: To assess food preferences and behaviors in autism and their relationship to basic gustatory function.

Methods: Participants were 12 children with high-functioning autism and 12 typically-developing controls matched on age, gender, and FSIQ. Parents rated children's preferences for different Food Groups, Flavors, Textures, and Temperatures, as well as other eating behaviors, medical conditions, and household/cultural eating practices. Taste was assessed via a chemosensory taste examination. Solutions of sucrose, NaCl, citric acid, and quinine were presented randomly to the right and left anterior portions of the tongue. Subjects responded by pointing to a word/representative picture.

Results: Overall, children with autism were more restrictive than controls in their eating ($p=.003$). They were particularly restrictive based on food textures ($p<.0001$) and flavors ($p=.01$), and showed peaks within those groups. In the autism group, flavor-based restrictions were related to those based on textures ($r=.75$).

Children with autism were less accurate overall in identifying tastes than controls ($p=.02$). Specifically, they were less accurate for sour ($p=.02$) and marginally less accurate for bitter tastes ($p=.09$).

Correlations between domains showed that overall taste accuracy was related to greater acceptance of food flavors ($r=.54$) and textures ($r=.59$).

Conclusions: These data suggest that selective patterns of eating in autism may be related, in part, to decreased taste sensitivity, suggesting a biological mechanism for these behaviors.

Supported by NAAR, NIMH (U54MH066397).

P3A.1.14 **NEURAL CORRELATES OF FACE AND GAZE PROCESSING IN CHILDREN WITH AUTISM.** A. Kylliainen, S. Braeutigam, J. Hietanen, S. Swithenby and A. Bailey. Department of Psychology, University of Tampere.

Objective: The developmental aspects of face processing in autism are still largely unknown. We compared the neural mechanisms underlying face and gaze processing in children with autism and control children.

Design/Methods: Magnetoencephalography (MEG) was used to study face and gaze processing in 10 boys with autism and 10 normally developing boys, aged between 8 and 11 years. Participants performed two tasks in which they had to discriminate whether images of faces presented sequentially in pairs were identical. There were four different gaze categories: direct gaze, eyes averted to the left or right and closed eyes, but no instruction to focus on the direction of gaze. Images of motorbikes were used as control stimuli.

Results: In contrast to our previous findings in adults, both groups showed strong posterior evoked activity at about 100ms in response to all face stimuli, but relatively weak and bilateral occipito-temporal activity at 140ms. The 140ms responses over right extrastriate cortex were (insignificantly) weaker in the boys with autism than in the control children. Eyes averted left or right evoked a strong right lateralized component at 240ms in the normally developing boys that was weak/absent in the clinical group. By contrast direct gaze evoked a left lateralized component at 240ms only in the boys with autism.

Conclusions: In boys with autism the neural activity evoked by faces already differs from the pattern seen in normal development by middle childhood. Most strikingly the neural activity evoked by gaze direction is already clearly differentially represented by this age.

P3A.1.15 **GETTING A GRIP ON MOVEMENT SKILLS IN AUTISTIC SPECTRUM DISORDER.** L. Livingstone, J. Williams, S. Ross and M. Mon-Williams. University of Aberdeen.

Movement execution problems have long been described as a feature of Autistic Spectrum Disorders (ASD) but evidence from objective tests performed in the absence of a social context is lacking. We attempted to determine whether two critical components of catching (reach-to-grasp movements and interceptive timing) are impaired in ASD.

Method: Optoelectronic recording equipment measured precisely unimanual reach-to-grasp and interceptive timing behaviour in ASD and control populations.

Results: We found no differences between ASD and controls on any kinematic measures despite the children with ASD showing poor performance on a standard movement assessment battery.

Conclusions: An inability to execute movements skillfully does not appear to be a core feature of ASD. The apparent clumsiness seen in children with ASD may reflect missing influences of social learning on motor development or the impact of social context on motor performance.

Acknowledgment: This work was part of a research programme supported by a grant from the Health Foundation.

P3A.1.16 **CHARACTERISTICS OF INSOMNIA IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** B. Malow, L. Henderson, S. McGrew and W. Stone. Vanderbilt University.

Objective: To examine characteristics related to insomnia in children with autism spectrum disorders (ASD) on dimensions of the Child Sleep Health Questionnaire (CSHQ; Owens, 2000), a validated scale previously used in ASD (Honomichl, 2002).

Methods: Parents completed the CSHQ and the Parental Concerns Questionnaire (PCQ, Mc Grew and Staples, unpublished) which quantifies parental concerns about a child's functioning in 13 different areas, including sleep. Using the PCQ, we defined three groups of children (ages 4-10 years)-those with ASD and no or mild parental sleep concerns ("good sleepers"; n = 20), those with ASD and moderate to severe parental sleep concerns ("poor sleepers"; n = 12) and typical children without sleep concerns (n = 49).

Results: Compared to typical children, those with ASD had higher CSHQ dimensions of bedtime resistance, sleep onset delay, sleep duration (too short), sleep anxiety, and night wakings (all $p < 0.03$; independent samples two-tailed t tests). Restricting comparison to "good sleepers" produced similar results-- these children with ASD differed from typical children on CSHQ dimensions of bedtime resistance, sleep duration, sleep anxiety, and night wakings (all $p < 0.05$). The "poor sleepers" differed from the "good sleepers" on sleep duration ($p < 0.0001$) and greater sleep anxiety ($p = 0.046$).

Conclusions: Children with ASD exhibit insomnia. Those characterized as being "good sleepers" slept longer and had less sleep anxiety than "poor sleepers", although both groups differed from typical children in bedtime resistance, sleep duration, sleep anxiety, and night wakings. The etiology of insomnia in children with ASD warrants further study.

P3A.1.17 **TYPICAL BRAIN ACTIVATION FOR VOICES IN HIGH FUNCTIONING AUTISTIC INDIVIDUALS; A PRELIMINARY STUDY.** I. Pelletier, P. Belin, H. Gervais, B. Jemel, L. Mottron and M. Zilbovicius. CERNEC, University of Montreal, Département de Psychologie.

Objective: A recent fMRI study found that 4 of 5 autistic individuals failed to show an STS activation in response to voices (Gervais et al. 2004). The present study aimed to replicate these results in a different population of high functioning autistic individuals.

Design/Methods: 10 autistic (CA = 18, FSIQ = 105.6, ADI Soc.= 22.4 Com. = 17.6 RIRB = 7.2) and 8 non autistic subjects (CA = 18.6; FSIQ = 110) were scanned on a 1.5T MRI scanner during passive listening. Energy matched blocs (20 s) were composed of either only vocal sounds (21 blocs 33% of speech and 67% of non speech vocal sounds) or only non-vocal sounds (21 blocs from environmental sources), separated by 10-s interval of silence.

Results: 8 individuals showed a normal pattern of activation when sounds were compared to silence (technical acquisition problem in 10). In those subjects, 3 out of 4 controls and 3 out of 4 high functioning autistic individuals showed activation in the STS, when vocal sounds were contrasted to non-vocal sounds.

Conclusions: Using the same stimuli presentation that in Gervais et al. (2004), some high functioning autistic individuals show typical voice-selective activation along the STS. As recently shown with passive viewing of faces (Hadjikhani, 2004), difference in attention strategies (possibly resulting from the addition of a fixation cross) may modify activation during perceptual tasks. Differences in the cognitive strategies used by the autistic group rather than presence or absence of category-specific impairments may therefore explain inconsistencies among studies.

Support: CIHR # STN- 63728 (LM)

P3A.1.18 **MAGNETOENCEPHALOGRAPHIC STUDIES OF LANGUAGE IMPAIRMENT IN AUTISM SPECTRUM DISORDER: MISMATCH DETECTION AND RAPID TEMPORAL PROCESSING.** T. Roberts, J. Oram Cardy, E. Flagg and W. Roberts. University of Toronto, Dept. of Medical Imaging.

Objective: Determine neuromagnetic signatures of abnormal auditory processing in children with autism and language impairment (LI).

Methods: 40 children were studied, with diagnoses of Autism (with LI) (n=14), Asperger Syndrome (n=8), Specific Language Impairment (SLI) (n=6) and typical development (TD) (n=12). Effects of autism spectrum disorder (ASD) could thus be distinguished from those of LI. Magnetoencephalographic recordings used a 151-channel biomagnetometer during passive presentation of: 1) oddball vowels "/u/" in a stream of "/a/", 2) oddball tones 300Hz in a stream of 700Hz, 3) two 1kHz stimuli separated by 150ms (demanding rapid temporal processing, RTP). In oddball paradigms, the magnetic mismatch field, MMF, a signature of feature change detection, was defined as the first peak in activity after the early sensory component (M100). In paradigm #3, existence of either a 50ms or 100ms response to the second tone was noted.

Results: MMF was delayed in children with Autism compared to TD (131±14ms vs. 89±8ms w.r.t. M100 latency, p=0.015) for vowels and tones. A second tone RTP response was observed in 85% of children with TD and 63% with Asperger Syndrome, but only 43% and 33% in children with Autism and SLI respectively, yielding an effect (Ç2, p<0.01) of diagnosis on neural response. Post hoc tests showed a significant effect of LI but not ASD.

Conclusion: Neural evidence for difficulty parsing transient differences in sounds is revealed in MMF and RTP paradigms. Such abnormalities in acoustic/phonological representations may be fundamentally associated with diagnoses incorporating LI, rather than showing specificity for ASD.

This work was supported by the National Alliance for Autism Research

P3A.1.19 **PHYSIOLOGICAL VARIATIONS IN SELF-MONITORING AND AFECTIVE PRESENTATION IN HIGHER FUNCTIONING CHILDREN WITH AUTISM.** C. Schwartz, H. Henderson, C. Burnette, N. Zahka, S. Sutton, A. Pradella and P. Mundy. University of Miami.

Deficits in autism including social interaction, joint attention, theory of mind, and self-monitoring may be related to altered anterior cingulate cortex (ACC) functioning (Ohnishi et al.,2000; Mundy,2003).

Objectives: Examine physiological (EEG/ERP) reactions to errors among High Functioning Children with Autism (HFA) and relations with social/emotional presentation. The error related negativity (ERN) and error positivity (Pe) are ERP components seen immediately following errors that are thought to reflect error detection and affective reactions to errors, respectively, based on localizations in the caudal versus rostral portions of the ACC (van Veen & Carter, 2002).

Design/Methods: EEG was recorded from 18 scalp sites while 46 children (24 HFA, 22 control; ages 8-14 years) completed a computerized Flanker task. EEG was averaged across error trials and amplitudes of peak negative (ERN) and positive (Pe) waveforms were measured. Emotional functioning was assessed using parent report measures (Behavior Assessment Scale for Children; Social Anxiety Scale for Children).

Results: Across all participants, ERN amplitude was maximal at frontal/central sites (Fz, FCz, Cz) and Pe amplitude was maximal at central/parietal sites (Cz, Pz). HFA participants showed smaller negativities at Cz ($F(1,44)=3.42$, $p=.07$) and smaller positivities at Cz and Pz versus controls ($F(1,44)=3.68$, $p=.06$). Among HFA children, greater Cz negativities predicted higher social anxiety ($r=-.61$, $p=.04$) and greater Cz positivities predicted fewer atypical behaviors ($r=-.60$, $p=.04$).

Conclusions: Preliminary results suggest that HFA children are less responsive to errors relative to controls. Individual differences in self-monitoring and related ACC functions may provide important information regarding affective and behavioral presentation among HFA children.

This research is funded in part by the University of Miami Center for Autism and Related Disabilities Research Fund.

P3A.1.20 **IMPLICIT LANGUAGE LEARNING IN CHILDREN WITH AUTISM: AN FMRI STUDY OF WORD SEGMENTATION.** A. Scott, K. Stamm, S. Lee and M. Dapretto. University of California, Los Angeles.

Objective: To investigate differences in the neural mechanisms subserving language learning (i.e., implicit word segmentation during exposure to continuous streams of speech) in high-functioning children with autism (ASD) and typically developing (TD) children.

Methods: During the fMRI scan, subjects listened to 3 counterbalanced streams of nonsense speech. In two artificial language conditions, distributional cues were available to guide word segmentation as the continuous speech was generated by first arranging 12 different syllables into 4 trisyllabic words and then randomly concatenating these words. The Unstressed Language condition contained solely statistical cues to word boundaries, whereas the Stressed Language condition also contained prosodic cues (stress on word-initial syllables). In a Random Syllables condition, the 12 syllables were randomly concatenated such that no 3-syllable string was repeated more than twice.

Results: Greater activity was observed for the two artificial language conditions than for the random syllables in both groups. However, the TD group showed stronger and more left lateralized activity in temporal cortices than the ASD group. Moreover, only the TD group reliably activated frontal regions including inferior and middle frontal gyri, as well as ventromedial prefrontal cortex. Importantly, when we modeled changes in signal intensity occurring within each condition, the TD group showed increased activation in the left superior temporal gyrus (STG) for the two artificial languages and the right STG for the random syllables. In contrast, no reliable signal increases were detected in the ASD group in any condition. These findings suggest that individuals with autism recruit strikingly different neural networks when presented with nonsense speech and fail to show evidence of implicit language learning.

P3A.1.21 **OVERLAP BETWEEN THE NEURAL SUBSTRATE FOR JOINT ATTENTION, AND WHITE AND GREY MATTER VOLUME DIFFERENCES IN AUTISTIC SPECTRUM DISORDER.** J. Williams, G. Waiter, O. Perra, A. Whiten and D. Perrett. University of Aberdeen.

Background: Although much is now known about eye-movement detection, little is known about the higher cognitive processes involved in joint attention and whether these brain areas are affected in autistic spectrum disorder (ASD).

Methods: We developed video stimuli which when watched, engender an experience of joint attention in the observer. This allowed us to compare an experience of joint attention to non-joint attention within an fMRI scanning environment. We were then able to examine how the area associated with joint attention matched with areas of abnormal grey and white matter volume in a study using optimised voxel-based morphometry (VBM) to examine anatomical differences between controls and individuals with ASD.

Results: Joint attention was associated with activity in the ventromedial frontal cortex, the left superior frontal gyrus (BA10), cingulate cortex and caudate nuclei. The ventromedial frontal cortex has been consistently shown to be activated during mental state attribution tasks. BA10 may serve a cognitive integration function, which in this case seems to utilize a perception-action matching process. The activation we identified in BA10 overlaps with a location of increased grey, and decreased white matter density in ASD. A further overlap occurred between white and grey matter group differences in right posterior parietal and temporoparietal cortex.

Conclusions: Our study constitutes evidence that the neural substrate of joint attention also serves a mentalising function. The developmental failure of this substrate, particularly in the left anterior frontal lobe may be important in the aetiology of autistic spectrum disorder.

P3A.1.22 **FUNCTIONAL MRI STUDY OF SENSORIMOTOR DEFICITS IN AUTISM.** Y. Takarae, N. Minshew, B. Luna and J. Sweeney. Center for Cognitive Medicine, Univ of Illinois at Chicago.

Objective: Examine neurological substrate of oculomotor deficits that have been reported in previous studies of autism.

Design/Methods: Brain activation during visually guided saccades and smooth pursuit was examined. 13 high-functioning individuals with autism and 14 age and IQ matched healthy individuals participated in

the study.

Results: Individuals with autism had lower activation in brain areas involved in attention and sensorimotor processes, including all cortical eye fields, during both eye movement tasks. Individuals with autism had HIGHER levels of activation in prefrontal cortex, cingulate cortex, caudate nucleus, medial thalamus, and dentate nucleus during visually guided saccades. Activation in area MT that is involved in visual motion processing was not reduced during the pursuit task suggesting normal sensory processing of visual motion information.

Conclusions: Previously reported oculomotor deficits are likely related to sensorimotor deficits rather than sensory problems. Involvement of the frontostriatal system during visually guided saccades suggests that this circuity, which is typically involved in cognitive control of eye movements, provides compensatory input to the sensorimotor system during this simple sensorimotor task. This functional rededication may explain widely reported deficits in executive function and other higher cognitive functions mediated by prefrontal cortex.

This study was funded by a grant from the NICHD PO1 HD35469 to Nancy Minshew, which is part of the NICHD/NIDCD Collaborative Programs of Excellence in Autism, NS33355, MH01433 and the National Alliance for Autism Research.

P3A.1.23 **UNDERSTANDING IRONY: NEURAL CORRELATES OF INTERPRETING COMMUNICATIVE INTENT IN CHILDREN WITH AUTISM.** A. Wang, S. Lee, M. Sigman and M. Dapretto. UCLA, Los Angeles, CA 90024.

Objective: Examine, at both the behavioral and neural levels, (1) whether children with autism spectrum disorder (ASD) will utilize facial and prosodic cues available in the input as they attempt to infer the communicative intent behind a potentially ironic remark, and (2) the effect of explicit instructions to attend to these social cues.

Method: While undergoing fMRI, typically developing (TD) and ASD children viewed drawings of characters in a conversational setting while listening to short scenarios ending with a comment made by one of the characters. Participants decided whether the speaker meant what she said. Experimental conditions varied on instructions given before each block of scenarios. Instructions were neutral in the first block, but specific to attend to either the tone of voice or facial expression before the second and third blocks.

Results: No behavioral differences were observed between groups. Across conditions, both groups recruited canonical language areas, but ASD children showed less activity than TD children in frontal regions, including the inferior and middle frontal gyri as well as the medial prefrontal cortex, an area associated with understanding the mental states of others. These differences were most apparent in the condition in which instructions were neutral and abated when attention was explicitly directed to a particular type of cue.

Conclusion: Children with ASD may recruit more normative neural networks when attempting to infer communicative intent if their attention is explicitly directed to important social cues, yet continue to show impairment when automatic processing is required.

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P3A.1.24 **A FUNCTIONAL MRI STUDY OF MENTAL ROTATION IN AUTISM.** D. Williams, H. Koshino, R. Kana, N. Minshew and M. Just. Department of Psychiatry, University of Pittsburgh, School of Medicine.

Objective: This study examined the brain activation in a spatial task in which individuals with autism might plausibly have a processing advantage. Prior research and clinical reports suggest that individuals with autism have potential strength in visual processing. The majority of evidence demonstrating atypical visual processing in autism is related to an enhanced performance on visuospatial tasks that involve the detection or matching of simple geometric patterns among a more complex visual field. In this study, the participants were asked to decide if two polygons were the same or different. We manipulated the amount of orientation disparity between the two figures, as well as the figural complexity, and the interstimulus interval. Brain activation levels, inter-regional functional

connectivity, and network organization were measured.

Methods: The participants were 10 high-functioning adults with autism (WAIS-R, 80 or above) and 10 healthy controls matched for age, Verbal, Performance, and Full Scale IQ (Autism M=102.5; Control M=108.0; t(18) = 1.09, p=0.29). The stimuli were polygons of the type of angular shapes originally developed by Attneave and Arnoult (1956). They were either simple (6 or 8 vertices) or complex (16 or 24 vertices). The two figures to be compared differed in orientation by either 0 o or 90o, and were presented at an ISI of either 0 msec or 1000 msec. These manipulations were intended to vary the load placed on the cognitive computations or the maintenance function. There were a total of six experimental conditions.

Results: The participants with autism showed lower levels of brain activation than the controls in bilateral frontal and parietal areas, particularly in the two hardest conditions. Functional connectivity, the correlation between the time courses of activation of two regions, was measured for various regions of interest. The functional connectivity was lower in the autism group, and the differences between the two groups on this measure became larger as the stimuli became more complex or as mental rotation was required. An exploratory factor analysis of the functional connectivity measures indicated that the factor structure differed between the groups. Each factor corresponds to a subnetwork of brain areas that are working together. The first factor for both groups included left and right parietal areas, as expected for a visuospatial processing task. However, the groups differed in the pattern of factor loadings. For the controls, the first factor in the two hardest conditions included bilateral midfrontal gyral areas. These areas and the additional areas of right inferior frontal gyrus and medial frontal gyrus loaded on the first factor for the individuals with autism in the easiest condition. This suggests that the cortical subnetworks used by the individuals with autism are organized differently than those used by the controls.

Conclusions: The same frontal and parietal brain areas were activated for the autism and control group but the individuals with autism had lower levels of activation. Functional connectivity was lower in the group with autism and the organization of activated areas into subnetworks differed between the autism and control group. The behavioral results suggest that there was no advantage for the individuals with autism in this visuospatial task.

Funding: This research was supported by the University of Pittsburgh-Carnegie Mellon University-University of Illinois at Chicago Collaborative Program of Excellence in Autism (CPEA), Grant P01-HD35469 from the National Institute of Child Health and Human Development.

## Poster Session 3A: Topic 2

***Intervention & Education***

P3A.2.1 **VALUES OF KAPPA AS LOW AS .34 CAN INDICATE 90% CODER ACCURACY.** N. Bainbridge, C. Taylor and P. Yoder. Vanderbilt University.

Introduction: Interobserver agreement (IOA) statistics quantify the degree to which two observers apply a measurement system in the same way and are crucial to minimizing observer drift and maximizing reliability. Kappa is a widely used estimate of IOA that has the desirable property of controlling for chance agreement between coders but varies with the degree to which we think reliability coders should be "accurate" and the base rate of behaviors. The current analysis demonstrates that instead of using .70 or some other fixed criterion as "adequate", the criterion kappa must vary by the base rate of behaviors and target "accuracy." A recommended method for selecting the criterion kappa is made.

Methods: Two independent observers coded the object engagement of five children with autism during a 20-minute parent-child interaction session. The mean base rate and mean kappa were calculated for all codes as follows: engaged (M = .83; kappa = .64), nonengaged (M = .09; kappa = .49), or uncodeable (M= .08 kappa = .55). Using .7 as a criterion, the kappa for all codes would have been judged insufficient and retraining or redesign of the coding system would have been necessary. A better method for making decisions about the sufficiency of kappa is to set criterion accuracy and determine the value of kappa that would reflect that accuracy given your best estimate of the base rate. If criterion accuracy were set to 90% the criterion kappas would be engaged (Kc = .50), nonengaged (Kc = .37), and uncodeable (Kc = .34).

Using this decision logic, we would decide that kappa was sufficient for all engagement codes. An accuracy x base rate kappa table will be provided by the authors with the formulas necessary for calculation.

P3A.2.2 **STABILITY OF VOCAL REPERTOIRE IN TWO OLDER NON-VERBAL CHILDREN WITH AUTISM.** M. Boner, E. Andersson and B. Gordon. Loyola College in Maryland.

Few studies investigate vocalizations in older non-verbal children with autism. We previously (Boner et al., IMFAR, 2004) reported that the spontaneous vocalizations of IA (at age 12) and SR (at age 8) showed some patterns consistent with typically developing infants, yet also showed deficits in muscle use for sound production. A second study was undertaken to determine if vocalizations change over time and whether they do so in a manner consistent with delayed or disordered development.

Objectives: To compare the subjects' vocalizations after a four-year interval to determine changes in: phonemic repertoire within or between subjects; frequency, variety, and/or modality of communicative intent; frequency or variety of intentional vocalizations.

Methods: For each subject, five hours of videotapes of activities (therapy, breaks, ADLs) recorded four years after the first set were analyzed. Two speech-language pathologists coded gestures and transcribed vocalizations. Twenty percent of the sessions were checked for inter-rater reliability.

Results: On preliminary analyzes, inter-rater reliability was acceptable. There were no substantial changes in the vocal repertoires. Both subjects, did, however, increase their use of vocalizations with communicative intent. These were expressed through inconsistent sound combinations and word approximations, regardless of cueing level.

Conclusion: The current results show that there could be progress in the development of vocal communication skills, despite the age of the subjects (16 and 12). However, the patterns of sound production are more consistent with neuromotor mechanisms being truly disordered, rather than just delayed.

P3A.2.3 **EFFECTS OF AN INDIVIDUAL WORK SYSTEM ON THE INDEPENDENT ACADEMIC WORK SKILLS IN CHILDREN WITH AUTISM.** K. Hume, R. Loftin and S. Odom*. Indiana University.

Maximizing independent functioning in students with ASD, without the use of treatment contingencies or close adult supervision, is vital to promote classroom and community success. Work systems, an element of structured teaching developed by Division TEACCH, provide visual information to increase independence and decrease teacher correction. To date, despite its widespread use, the efficacy of work systems has not been empirically demonstrated.

Objective: Assess the effects of an individual work system on the independent academic work skills in children with autism.

Design/Methods: An ABCAC withdrawal design across three elementary aged students with ASD was used to assess the research question. The phases (baseline, training, and use of individual work systems) were conducted in the student's classroom during independent work periods. Maintenance, generalization, treatment integrity, interobserver agreement, and social validity data were also collected.

Results: Data collection is ongoing, however early analysis reveals positive increases in on-task behavior, as well as task completion, and a reduction in teacher prompts. The expected results, analyzed through the visual inspection of the trends and levels, will likely illustrate that a work system is effective in increasing independent academic work skills across all subjects.

Conclusions: This study will demonstrate that children with autism can increase independent functioning and maintain higher levels of on-task behavior and task completion through the use of the work system. This study will also extend the research related to TEACCH-based interventions as effective learning and teaching tools, and as potential components to classroom interventions.

Funding for this project provided by the Organization for Autism Research (OAR).

P3A.2.4 **SELF-MANAGEMENT OF SOCIAL INITIATIONS: THE RELATIONSHIP BETWEEN SOCIAL INTERACTION AND STEREOTYPIC BEHAVIOR.** R. Loftin. Indiana University, Bloomington.

Students with autism have difficulty initiating social interactions. Many also exhibit stereotypic behavior, which can be socially stigmatizing. Emerging research suggests when social interaction increases, a collateral decrease in stereotypic behavior results, addressing both issues with a single intervention.

Study Objectives: This study examines the relationship between social interaction and stereotypic behavior, while also investigating an intervention package to address the pivotal behaviors of self-initiation and self-management.

Methods: A multiple baseline design was employed across 3 elementary school aged participants with autism. The intervention was conducted in a school cafeteria with the target child and his preferred peers. After initial baseline periods, the researcher used direct instruction techniques to teach participants to make social initiations. When data were stable for the direct instruction condition, participants were taught to use a self-monitoring device. Finally, maintenance data were collected for several weeks following the intervention. Data were collected on social interaction, target child social initiations, and stereotypic behavior.

Results: Direct instruction alone led to a substantial increase in social interaction, as well as a reduction of stereotypic behavior. The addition of self-monitoring greatly increased social initiations. These findings maintained following intervention and also generalized to the recess setting and to additional, non-targeted peers. Social validity data demonstrate that the intervention was viewed as important and effective by both parents and teachers.

Conclusions: Targeting the behaviors of self-management and self-initiation skills for intervention is an efficient and effective way to increase social behavior, while decreasing stereotypy.

This study was funded by a grant from the Organization for Autism Research.

P3A.2.5 **THE ROLE OF TECHNOLOGY IN DEVELOPING LITERACY FOR ADULTS WITH AUTISM SPECTRUM DISORDERS.** M. Louis, L. Markowicz, C. Martin, K. Steiner, J. Holden and ASD-CARC. Centre for Neuroscience Studies, Queen's University.

Objective: To describe changes in functional literacy based on sensory amelioration in an adult with ASD.

Design/Methods: The communication changes in "Don", a 52-year old man diagnosed with ASD and moderate hearing loss, were observed for one year. Initial testing revealed a language age-equivalency between three and four years, with profoundly impaired articulation. Following assessment, Don used a personal FM system daily for activities such as watching TV and playing computer games. After several months, he began individualized instruction on a phonics keyboard, which provided auditory feedback on both the letters chosen and the word formed. Literacy activities were then transitioned to a standard computer system with a modified keyboard and auditory-based software, and finally to a standard keyboard. Progress was monitored through journals kept by the support worker, videotapes capturing one-on-one instruction, formal SLP reports, and participant interviews.

Results: Don's written vocabulary has expanded from zero to more than fifty words, including the use of grammatical conventions such as upper-case letters and punctuation. Improvements also occurred in expressive language and articulation.

Conclusions: The changes found were startling and serve as pilot data for a larger study beginning in 2005. The improvement in attention derived from the FM system apparently facilitated the remarkable progress in literacy and expressive communication shown.

Funding: CIHR IHRT grant (#43820) to JJAH and ASD-CARC (www.autismresearch.ca) and a SSHRC graduate scholarship to ML. ML is a trainee with the CIHR/NAAR STIHR Inter-Institute Autism Spectrum Disorders Training Program (PI: JJAH).

P3A.2.6 **PREDICTORS OF QUALITY OF LIFE IN ADULTS WITH AUTISM SPECTRUM DISORDER.** J. Renty, H. Roeyers and M. Meirsschaut. Ghent University.

Objective: Over the past three decades the concept of Quality of Life (QoL) has increasingly been used as a framework for evaluating the well-being of a population and for identifying indicators of good practice in supporting individuals with a disability. However, little attention has been paid to the QoL of individuals with Autism Spectrum Disorder (ASD). The aim of this study was to determine predictors of QoL in adults with ASD.

Design/Methods: The participants were 58 high functioning adults with ASD (between age 18 and 53). QoL was assessed using the Quality of Life Questionnaire (QOL.Q). The relationships between QoL and the availability of (informal) social support (ISEL), met and unmet formal support needs (CAN), self-determination (Arc's Self Determination Scale), community integration (Community Integration Questionnaire), and psychosocial distress (SCL-90) were examined.

Results: The results of a linear regression analysis reveal that multiple factors affect QoL in adults with ASD, including the availability of (informal) social support, the number of unmet formal support needs and self-determination. The $R^2$ effect size (.569) was large and significant. The number of met formal support needs, community integration and psychosocial distress were no significant predictors in this model.

Conclusions: The results reinforce (a) the need to design professional services which effectively support individuals with ASD across their individual and specific needs, (b) the significance of self-determined choices and (c) the importance of a supportive social network for the person with ASD.

P3A.2.7 **PLASTICITY OF THE NEURAL MECHANISMS UNDERLYING FACE PROCESSING IN CHILDREN WITH ASD: BEHAVIORAL IMPROVEMENTS FOLLOWING PERCEPTUAL TRAINING WITH FACES.** J. Tanaka, C. Klaiman, K. Koenig and R. Schultz. University of Victoria.

Objective: Previous research has shown that children with autism spectrum disorder (ASD) are impaired in their recognition of facial expression and identity. An important question is whether face processing skills, like other forms of perceptual expertise, can be enhanced through perceptual training. To address this issue, a computer-based intervention, the Let's Face It! program, was developed to improve the face processing skills of children with ASD.

Design/Methods: In the current study, pre-adolescent and adolescent children clinically diagnosed with ASD participated in the Let's Face It! intervention. All children enrolled in the intervention played the computer games for thirty minutes a day for a six-week intervention period. Compliance was monitored via weekly computer log files.

Results: Pre- and post-intervention assessments showed that children demonstrated reliable gains on several diagnostic measures. The children showed improvement in their ability to perceptually match facial expressions across changes in identity ($p < .01$) and to match facial identity across changes in viewing orientation ($p < .01$). These results suggest that their perceptual representations of identity and expression generalized to novel images. Children also showed improvement in their ability to label the emotions of disgusted, frightened and sad ($p < .06$).

Conclusions: Collectively, these results suggest that face recognition abilities, like other types of visual expertise, can be improved through perceptual learning and practice. The plasticity of the face processing system has direct implications for inquiries into how perceptual training might influence the neural circuitry of brain areas associated with the recognition of facial identity and emotion.

## Poster Session 3B: Topic 1

### *Early Detection/Diagnosis*

P3B.1.1 **EARLY PREDICTORS OF COGNITIVE FUNCTIONING IN 4-YEAR-OLDS WITH AUTISM SPECTRUM DISORDERS.** H. Boorstein, E. Esser, P. Dixon, J. Kleinman, J. Pandey, L. Wilson, M. Barton, T. Dumont-Mathieu, J. Green, S. Hodgson, G. Marshia and D. Fein. University of Connecticut.

Objective: Determine which factors at age 2 (adaptive functioning, cognitive functioning, or number of failed critical items on the M-CHAT) may predict

cognitive functioning at age 4 in children diagnosed with autism spectrum disorders (ASD).

Methods: The 38 children were part of a larger study that used the Modified Checklist for Autism (M-CHAT: Robins, Fein, Barton, & Green, 2001) to screen children at age 2. Children who failed the screener were assessed at both age 2 and age 4. These participants were all diagnosed with autism spectrum disorders at their 2-year-old assessment. Adaptive functioning was measured by the Vineland Adaptive Behavior Scales. At age 2, the participants' cognitive functioning was measured by the Bayley Scales of Infant Development or the Mullen Scales of Early Learning; cognitive functioning at age 4 was measured by the Mullen or by the Differential Ability Scales.

Results: Multiple regression analysis was conducted with the 3 predictors. Adaptive functioning, as measured by the Adaptive Behavior Composite on the Vineland, was the only significant predictor ($R2=.309$, $F(3,34)=5.067$, $p<.01$, $t(38)=2.667$, $p<.02$) of cognitive functioning at age 4. Cognitive scores had little predictive value, $t(37)=1.231$, n.s.

Conclusions: Cognitive testing results in young children with ASD can be inconstant and may be affected by various factors, including educational and behavioral interventions, as well language development. As cognitive ability is one of the most important factors in the prognosis of children with ASD, further research is needed in this area.

P3B.1.2 **DIFFERENTIAL EFFECTS OF PLATELET ACTIVATING FACTOR ON THE LYMPHOBLASTS OF AUTISM AND NORMAL SUBJECTS.** V. Chauhan, A. Chauhan, A. Sheikh, T. Brown and E. Park. NYS Institute for Basic Research in Developmental Disabilities.

Objectives: Recently, we reported increased oxidative stress (Chauhan et al. (2004) Life Sci. 75, 2539) and abnormalities in membrane phospholipids levels (Chauhan et al. (2004) Life Sci. 74, 1635) in autism as compared to control subjects. These results suggested that receptor-coupled signal transduction might be affected in autism. Therefore, we studied platelet activating factor (PAF) - mediated signal transduction in lymphoblasts from autism.

Design/Methods: We compared the effects of PAF on intracellular calcium mobilization (using Fura-2 fluorescence probe), cell proliferation (by thymidine incorporation), and cytotoxicity (by MTT assay) in lymphoblasts of autistic and control subjects.

Results: PAF induced significantly higher intracellular calcium concentration in autistic lymphoblasts as compared to controls. Thymidine incorporation into lymphoblasts, an index of cell proliferation, was higher in autism as compared to controls. Treatment of cells with PAF (1.25 micro g / ml) for 24 hr resulted in reduced thymidine incorporation in both autistic and control lymphoblasts indicating that PAF induces cytotoxic signal. PAF-mediated cytotoxic effect was more pronounced in autistic cells as compared to control cells. Results of MTT assay showed that treatment of cells with PAF (1.25 micro g / ml) significantly reduced number of living lymphoblasts in autism while it had no effect on control lymphoblasts. At higher concentrations of PAF (i.e., 2.5 micro g /ml), control cells also died. However, the percentage of dead lymphoblasts in autism was much higher (35 %) than in controls (15%).

Conclusion: These results suggest that PAF-mediated increase in intracellular calcium triggers a more pronounced cytotoxic signal in autistic lymphoblasts as compared to controls.

P3B.1.3 **PRESENCE OF DSM-IV CRITERIA IN TODDLERS WITH ASD.** P. Dixon, J. Pandey, J. Kleinman, E. Esser, L. Wilson, H. Boorstein, M. Barton, S. Hodgson, J. Green, T. Dumont-Mathieu, G. Marshia, F. Volkmar, A. Klin, K. Chawarska and D. Fein. University of Connecticut.

Young children with Autistic Spectrum Disorder (ASD) present differently than older children with ASD. They often do not show all of the classic signs, especially the ones from the repetitive behaviors/restricted interests domain. In addition, Stone et al. (1999) found that many toddlers with ASD do not display impaired conversational ability, stereotyped and repetitive use of language, and inflexible adherence to routines and rituals, presumably because of their young developmental level. The inapplicability of some diagnostic features to this age group may result in their not being appropriately diagnosable by DSM-IV.

Objective: The purpose of the current study is to investigate which of the DSM-IV criteria for Autistic Disorder are applicable to toddlers.

Method: Eighty toddlers with ASD participated in the study. All of the children received a developmental evaluation at the University of Connecticut or at the Yale Child Study Center. The mean age of the sample was 26 months, ranging from 18 months to 33 months.

Results: The mean number of criteria met in each of the three domains was: social 2.89, communication 1.72, and repetitive behaviors 1.45. A majority of the children with ASD did NOT display impaired conversation (98.8%), stereotyped language (90.0%), adherence to routines (87.5%), restricted interests (72.5%), or preoccupation with parts of objects (60.0%). Frequency tables will be presented for each individual criterion.

Conclusion: The results confirm that several of the DSM-IV criteria for Autistic Disorder may not be applicable to toddlers, suggesting that separate diagnostic criteria may be needed for very young children.

P3B.1.4 **CHARACTERISTICS OF TODDLERS WITH AUTISTIC SPECTRUM DISORDERS SCREENED FROM HIGH RISK AND LOW RISK SETTINGS.** T. Dumont-Mathieu, J. Kleinman and D. Fein. University of Connecticut.

Autistic spectrum disorders (ASD) are estimated to affect between 1 in 250 and 1 in 1000 children. Early detection and intervention lead to improved outcomes. The Modified Checklist for Autism in Toddlers (M-CHAT) is a parent-report questionnaire consisting of 23 yes/no items designed to screen children 16 to 30 months old. Characteristics of the children with ASD detected by the M-CHAT have been reported for a combined sample of high-risk and low-risk children (Robins et al, 2001).

Objective: To assess whether there are differences in the children diagnosed with ASD when the M-CHAT is completed at primary care provider offices as part of the health maintenance visit (low risk), as compared to early intervention sites (high risk).

Design/Methods: Parents complete the M-CHAT at either their child's primary care provider (PCP) or early intervention provider (EI). If the responses on the M-CHAT indicate a "fail," the family is contacted by phone for a scripted interview. If at the end of the phone interview it is determined that the M-CHAT is a "fail," the child is offered an evaluation which consists of the administration of the Mullen Scales of Early Learning, Vineland Adaptive Behavior Scales, Childhood Autism Rating Scale, Autism Diagnostic Interview-Revised, Autism Diagnostic Observation Schedule and the DSM-IV criteria.

Results: Of the 38 children evaluated from PCP, 18 were diagnosed with an ASD. From the EI sites, 152 evaluations yielded 115 children with ASD. Chi-Square tests showed that the difference in proportion of an ASD diagnosis is statistically significant ($p<.001$). Results from the evaluations revealed mean CARS scores of 33 and 32.86 for PCP and EI sites. Mean Vineland Communication standard scores were 62.615 and 64.531 for PCP and EI sites. Mean Vineland Socialization standard scores were 65.077 and 67.222 for PCP and EI sites. No statistically significant differences between the groups were found for any of the assessment instruments.

Conclusions: The higher number of "fails" and the higher proportion of ASD diagnoses from the EI sample confirm its status as "high risk." However, the lack of statistically significant difference in autistic symptoms, cognitive functioning and adaptive skills between the PCP and EI sites suggests that once identified, children from the two samples diagnosed with an ASD are very similar.

P3B.1.5 **PREDICTORS OF DIAGNOSIS IN YOUNG CHILDREN WITH AUTISTIC SYMPTOMS.** E. Esser, H. Boorstein, P. Dixon, J. Kleinman, J. Pandey, L. Wilson, M. Barton, T. Dumont-Mathieu, J. Green, S. Hodgson, G. Marshia and D. Fein. University of Connecticut, Department of Clinical Psychology.

In young children with symptoms of autism spectrum disorders (ASD), early predictors of later diagnosis are important in determining prognosis.

Objective: To determine if IQ, adaptive functioning, and symptom severity at age two can predict diagnosis at age four.

Method: Forty-seven children were evaluated at age two after failing the Modified Checklist for Autism in Toddlers (M-CHAT: Robins, Fein, Barton, & Green,

2001) and were re-evaluated at age four. Instruments administered included the Vineland Adaptive Behavior Scales, and the Bayley Scales of Infant Development or the Mullen Scales of Early Learning.

Results: A discriminant function analysis was conducted. The overall Wilks' lambda was significant, L = .684, c2 (3, N = 47) = 16.53, p < .01, indicating that the predictors differentiate between the two diagnostic groups, ASD or non-autism (typical development and language, motor, and global delay). A table summarizing the within-group correlations between the predictors and the discriminant function and standardized weights will be presented. Adaptive functioning has the strongest correlation with the discriminant function; the non-autism group shows significantly higher scores. The predictors, together, correctly classified 81% of the total 47 cases. One limitation of this study is the floor effect of scores on the cognitive predictor variable.

Conclusion: The results of this study suggest that adaptive functioning is the most salient predictor of later diagnosis in young children who present with symptoms of autism spectrum disorders early in development.

Grant: NIH NICHD 5 RO1 HD39961-03

P3B.1.6 **THE AUTISM-SPECTRUM DIAGNOSTIC PROCESS: WHEN ARE PARENTS SATISFIED?.** R. Goin, V. Mackintosh and B. Myers. Virginia Institute for Psychiatric and Behavioral Genetics.

Parents of children with autism-spectrum disorders (ASD) have reported frustration with the diagnostic process (DP) because of the length of time to receive a firm diagnosis and feelings that their opinions are dismissed by professionals.

Study Objectives: We aimed to understand the aforementioned phenomenon further by examining parental satisfaction with the DP and the ages at which children received their diagnoses in relation to parental demographic characteristics and the number of professionals visited en route to the ASD diagnosis.

Methods: Parents of affected children (n = 494; 90.3% female; mean age = 37.8 years) completed an online questionnaire regarding their children's development. Focal children's average age was 8.3 years (SD = 4.3). All children were reportedly diagnosed with autism (59.9%), Asperger's syndrome (23.5%), or PDD-NOS (16.6%).

Results: Child-diagnostic age was negatively associated with parent satisfaction with the DP (r = -.15, p = .001), parent level of education (r = -.13, p = .007), and annual family income (r = -.11, p = .017). Greater satisfaction with the DP was inversely related to the number of professionals visited en route to the diagnosis (r = -.31, p = .001). A logistic regression revealed the number of professionals visited as predictive of parent satisfaction with the DP, Ç²(2) = 36.0, p < .0001.

Conclusions: Parents were more satisfied with the DP when they saw fewer professionals and when children received diagnoses at younger ages. These findings have implications for improving/extending the ASD-diagnostic training of all diagnosing-health professionals.

P3B.1.7 **COMPARISON OF TEMPERAMENT DATA OF AFFECTED AND UNAFFECTED INFANT SIBLINGS AT-RISK FOR AN AUTISM SPECTRUM DISORDER.** K. Holman and R. Landa. Kennedy Krieger Institute/Johns Hopkins.

Introduction: Infant siblings of children with autism (“autism sibs”) provide a unique opportunity to investigate early manifestations of autism due to the increased genetic risk in siblings with a positive family history. The data reported here are derived from a longitudinal study designed to prospectively identify early markers of autism in at-risk infants. The assumption that an individual's temperament reflects individual differences in biology provides an opportunity to compare differences in temperament in siblings at risk for autism and gain insight into the processes underlying the development of psychological adjustment or psychopathology.

Objective: Compare temperament ratings at 14 and 24 months of infant siblings judged to have an autism spectrum disorder (ASD) at 24 months with siblings who were not judged to have an ASD and typically developing controls.

Design/Methods: Seventy-four children had longitudinal temperament data at both 14 and 24 months. The temperament of autism sibs rated as having an ASD (n=19) and unaffected children (n=44)

were rated using Toddler Temperament Scale (TTS) (Fullard, McDevitt, & Carey, 1995).

Results: Comparison of mean TTS scores at 14 and 24 months showed a significant difference between groups (one-way ANOVA) the distractibility domain at both 14 (p=.031) and 24 (p<.000) months. The following variables were significantly different at 24 months only: activity (p=.012), approach (p=.005), adaptability (p=.002), and mood (p=.041)

Conclusions: Group differences in temperament characteristics per parent report were detected at both 14 and 24 months. Implications for the use of temperament characteristics as early markers for autism will be discussed.

Funding Source: National Institutes of Mental Health
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P3B.1.8 **RESPONSE TO NAME IN 12-MONTH-OLD SIBLINGS OF CHILDREN WITH AUTISM OR TYPICAL DEVELOPMENT.** A. Nadig, S. Ozonoff, G. Young, S. Macari, S. Rogers, M. Sigman and A. Rozga. UC Davis M.I.N.D. Institute.

Lack of responding to name is one of the most consistent early indicators of autism (Adrien et al., 1993, Osterling & Dawson, 1994). It was the only behavior to reliably distinguish children with ASD from those with typical development in home videotapes from 8- to 10-months (Werner et al, 2000). It also discriminated children with ASD from those with non-autism developmental delays by 12 months (Baranek, 1999; Osterling, Dawson, & Munson, 2002).

Objective: Assess the tendency to orient to name at 12 months in a controlled experimental setting in infants at risk for autism (younger siblings of children with autism) and controls (siblings of typically-developing children).

Design/Methods: 15 autism siblings and 13 typical siblings have been tested at 12 months. The examiner gave the child an object to play with and walked out of view. She then called the child's name up to three times, pausing between each call. This press was repeated later, for a maximum of six name calls. Participants' responses were scored on a scale of 0 (no response after 6 name calls) to 3 (clearly orienting to name on the 1st or 2nd call).

Results: Infants in the autism sibling group oriented to their name significantly less (mean score= 2.33, SD=1.05) than infants in the typical sibling group (mean score = 2.92, SD=.28), t (16) = -2.09, p=.05). Tendency to orient to name was positively related to Mullen receptive language raw scores (corrected for "recognizes own name" item), r=.53, p=.004. Three of four children later diagnosed with autism did not orient to their name at 12 months.

Conclusions: Our findings suggest that decreased orientation to name at 12 months may be a characteristic of the broader autism phenotype, as well as a prospective indicator of autism. Responding to name was related to general receptive language ability. Additional testing is underway, including a group of DD siblings.

This work was supported by R01-MH068398-02, awarded to the second author.

P3B.1.9 **COMPARING SCQ AND PDDST SCORES IN A 3-5 YEAR OLD SPECIAL EDUCATION POPULATION.** C. Newschaffer, L. Lee, A. David and N. Lee. Center for Autism and Developmental Disabilities Epidemiology, Johns Hopkins Bloomberg School of Public Health.

Objective: This is an update to a presentation made at IMFAR 2004. Last year we presented Social Communication Questionnaire (SCQ) data on this sample. Here we compare the performance of both the SCQ and the Pervasive Developmental Disorders Screening Test (PDDST) in identifying autism spectrum disorder (ASD).

Methods: A questionnaire including both SCQ and PDDST items was mailed to all parents in one Maryland school district (n=740) and a group of volunteers from one Delaware school district (n= 73) with children age 3-5 years in special education. 34% (n=279) returned usable questionnaires. Parent-reported diagnosis and/or special education classification were considered ASD gold standards. ADI-R's were offered to all who returned questionnaires - only 30 have completed the interviews thus far.

Results: Half the respondents had either positive SCQ or PDDST scores at standard cutpoints. Agreement between SCQ and PDDST was poor, with a Kappa of 0.33. Using parent-reported diagnosis combined with special education classification as a

gold standard, the sensitivity and specificity of the SCQ were 56% and 92% compared to 91% and 61% for the PDDST. Among the 30 ADI-R completions, 24 were positive for autism. Of these, 21 had screened positive on the SCQ and 22 had screened positive on the PDDST.

Conclusion: Agreement between these two autism screeners was poor. Since one tool appeared to favor sensitivity and the other specificity, this is not surprising. Head-to-head comparison of different ASD screening instruments represents another means of learning more about, and potentially improving, the performance of these tools.

This study was supported by CDC cooperative agreement U10/CCU320408-04.

P3B.1.10 **DIFFERENTIATING LANGUAGE IMPAIRMENT AND AUTISM SPECTRUM DISORDER USING THE SOCIAL COMMUNICATION QUESTIONNAIRE (SCQ).** C. Norbury. University of Oxford.

Objective: Efficient means of distinguishing language impairment from autistic spectrum disorder (ASD) are desirable for early identification and intervention, as well as facilitating research recruitment. The current study investigated the utility of the Social Communication Questionnaire (SCQ) in differentiating primary language impairment and ASD.

Method: Parents of 117 children aged 8 to 14 completed the SCQ. Children were grouped according to existing diagnoses: Language Impairment (LI), Pragmatic Language Impairment (PLI), Pervasive Developmental Disorder (PDD), High-functioning Autism (HFA), Asperger Disorder (ASP) and Typically Developing (TD).

Results: Mean total scores of the HFA and ASP groups (means = 26.12, 26.06) were significantly higher than the LI and PLI groups (means = 13.56, 12.93), but not significantly different from the PDD group (mean = 20.04). However, the scores of the LI and PLI groups were significantly greater than TD peers (mean = 2.96). Furthermore, 61% of the LI group and 43% of the PLI group had total scores of 15 or greater, the ASD cut-off. Domain scores revealed no differences amongst the clinical groups in Communication, while scores in the Social domain followed the same pattern seen for total scores. In the Restricted/repetitive Behaviours domain, the LI group did not differ from TD peers, whereas all other clinical groups demonstrated more severe impairment.

Conclusions: These results suggest that the power of the SCQ to segregate cases of LI and ASD might be improved by providing cut-off scores in each SCQ domain and assigning greater weight to the Social and Repetitive Behaviour domains.

Funding: This work was supported by a Wellcome Trust Prize Studentship.

P3B.1.12 **THE USE OF AUTISM DISCRIMINATOR BEHAVIORS TO DIFFERENTIATE CHILDREN WITH AND WITHOUT AN AUTISM SPECTRUM DISORDER (ASD).** C. Rice, J. Baio, L. Wiggins, G. McGee, M. Morrier and C. Lord. Centers for Disease Control and Prevention.

Study Objectives: This study examines the development and utility of using behaviors believed most likely to occur in children who have an ASD, called Autism Discriminators (ADs), to distinguish ASD Cases from Non-Cases in a population-based surveillance system to determine the prevalence of the Autism Spectrum Disorders (ASDs).

Methods: The study team developed a coding scheme based on the DSM-IV criteria for the Pervasive Developmental Disorders to apply to abstracted evaluation records for children with a range of developmental disorders. Nineteen ADs were identified and added into the scoring scheme following a literature review, clinical input, and evaluation using an earlier population-based sample. Clinicians maintained inter-rater reliability standards of at least 80-90% on individual variables and overall case classification.

Results: Based on data obtained in the 2000 Study Year, 98.2% of the ASD Cases had the presence of at least one AD as compared to 25.2% of Non-Cases ($p<.01$). Excluding the children who had a previous ASD diagnosis, 96.5% of the ASD Cases had an AD as compared to 23.9% of Non-Cases ($p<.01$). All 19 of the ADs were present more often in the Case group than in the Non-Case Group ($p<.01$ in bivariate model); however, a multivariate regression analysis indicated that 8 ADs were most predictive of ASD Case status ($p<.01$ - $p<.05$). The most commonly reported AD for

ASD Cases was “Little or no interest in children, others, or adults in a familiar setting”.

Conclusions: Over time, data from this surveillance system will enhance understanding of trends in rates, population characteristics, and risk factors associated with ASD. This analysis indicates that identification of behaviors most likely associated with ASD is possible in a population-based surveillance system, and the use of AD behaviors helps distinguish children with an ASD from those with other developmental disorders.

P3B.1.13 **EFFECT OF LANGUAGE DEMANDS ON THE DIAGNOSTIC EFFECTIVENESS OF THE AUTISM DIAGNOSTIC OBSERVATION SCHEDULE: THE IMPACT OF MODULE CHOICE.** S. Risi, B. Klein-Tasman, C. Corsello and C. Lord. University of Michigan Autism and Communication Disorders Center.

The ADOS (Lord et al., 2001) was developed to empirically characterize the social-communicative deficits of individuals with autism spectrum disorders beyond documentation of expressive language deficit. Module choice is based on the child's language level.

Study Objectives: To determine the effect of module choice on classification of children with clinical diagnoses of Autism or PDD-NOS. Administration of a module with higher language demands is expected to yield more impaired performance, whereas a module with weaker language demands is expected to yield less impaired performance.

Methods: Two modules of the ADOS were administered in a single session, with one module designated by the examiner as preferred based on the child's language level. For 74 participants (52 with AUT, 22 with PDD-NOS), M1 and M2 were administered. For 64 participants (25 with AUT, 39 with PDD-NOS), M2 and M3 were administered.

Results: For the M1/2 analysis, 51/74 participants maintained the same ADOS classification. Seventeen participants showed more impaired M2 classifications while six participants showed more impaired M1 performance. For the M2/3 analysis, 39/64 participants maintained the same ADOS classification. Twenty-four participants showed more impaired M3 classifications, while one participant had more impaired M2 performance. More detailed analysis of the role of clinician's judgment of appropriate module will be reported, indicating that clinical judgment of module choice is particularly critical for appropriate classification of PDD-NOS cases.

Conclusions: The hypothesis that more impaired performance would be indicated if a module with more language demands is administered was supported, particularly for PDD-NOS cases.

This research was supported by grants NIMH RO1 MH066469 and 1 K05 MH01196-01 to Catherine Lord.

P3B.1.14 **TEST RETEST RELIABILITY OF A SCREENING CHECKLIST FOR AUTISM SPECTRUM DISORDERS IN YOUNG CHILDREN.** S. Schjolberg. Inistitute of Psychology at University of Oslo.

Objective: A screening checklist was developed for the purpose of identifying children of high risk of being within the autism spectrum (ASD). The checklist was developed as part of a population based study on early identification of ASD in children younger than 30 months. The Non Verbal Communication Checklist (NVCC) consisted of 10 questions concerning deficits in use of nonverbal behaviors expected to develop during the first two years of life. Test-retest reliability of the NVCC was assessed.

Methods: Mothers of 117 children completed the checklist twice within 3 weeks as part of a well-baby checkup and being invited to participate in the early screeningstudy. The test-retest reliability of each item, total score and screen positive were assessed using Kappa statistics.

Results: The mean age of the total sample when first completing the NVCC was 22.6 months (sd=7.1). The Kappas of single items ranged from .32 to .65 and for seven of the 10 items the kappa value exceeded .50. Kappa for screen positive, using a cutoff established in the population based study, were .81. The test-retest-score for the NVCC total score varied with whether the child had developmental problems or not.

Conclusion: The majority of items on the NVCC screening checklist showed from moderate to good agreement on test-retest reliability and the kappa for screen positive showed very good agreement.

This work were supported through a grant from the Norwegian Research Council: 128134/320.

P3B.1.15 **INCREASED SERUM CATHEPSIN D LEVELS IN AUTISM.** A. Sheikh, V. Chauhan, A. Chauhan, I. Cohen, T. Brown and M. Malik. NYS Institute for Basic Research in Developmental Disabilities.

Objectives: We recently reported increased oxidative stress in autism (Chauhan et al. 2004). The lysosomal protease Cathepsin D (CD) mediates apoptosis induced by oxidative stress. CD plays an important role in lysosomal-endosomal protein trafficking. Serum levels of CD increase in cancer, and its polymophism has been linked to Alzheimer disease and general intelligence. In order to investigate whether lysosomal functions are abnormal in autism, the levels of serum CD were measured.

Design / Methods: Serum levels of CD were compared by enzyme-linked immunosorbent assay in autism and their normal siblings. Autism was diagnosed based on the Autism Diagnostic Interview-Revised (ADI-R) criteria, and by direct observation of the child using Autism Diagnostic Observation Schedule-Generic (ADOS-G) criteria.

Results: Serum dilution of 1: 200 was found to be optimal for measuring CD levels. Serum CD (Mean ± S.E.) was significantly higher in autism (46.37 ±1.6 micro g / ml) as compared to normal siblings (43.03 ± 1.4 micro g / ml) ($p< 0.0004$, $N = 18$). Analysis of samples based on sex was: male autism vs. male siblings ($p < 0.01$, $N = 8$), male autism vs. female siblings) ($p< 0.004$, $N =5$), and female autism vs. female siblings ($p < 0.05$, $N = 4$). Only one pair had female vs. male grouping, and therefore could not be compared statistically.

Conclusion: This study indicates that in general, autistic subjects have higher CD levels as compared to their normal siblings. This increase in the serum CD levels in autism may reflect a defect in the lysosomal processing of proteins in autism.

P3B.1.16 **UPDATE ON THE MODIFIED CHECKLIST FOR AUTISM IN TODDLERS.** L. Wilson, P. Dixon, J. Kleinman, J. Pandey, H. Boorstein, E. Esser, M. Rosenthal, S. Sutera, A. Verbalis, D. Robins, M. Barton, T. Dumont-Mathieu, J. Green, S. Hodgson, G. Marshia and D. Fein. University of Connecticut.

While the importance of early intervention for Autistic Spectrum Disorders (ASDs) is well established, ASDs are often not diagnosed until after 3 years of age. The Modified Checklist for Autism in Toddlers (M-CHAT) (Robins et al., 2001) is a parent-report checklist designed to screen children between 16 and 30 months for ASDs.

Study Objectives: Provide an update on the validation of the M-CHAT including outcome data.

Methods: The M-CHAT was designed for use in both unselected and high risk populations. Children who screen positive on the M-CHAT and a confirmatory telephone follow-up receive a developmental/diagnostic evaluation. All children are re-screened between 42 and 48 months and the previously evaluated children plus the newly detected children are evaluated at this time.

Results and Conclusions: To date, over 3500 children have been screened. Of the 214 toddlers evaluated thus far, 153 were diagnosed with an ASD, 53 with language, motor, or global developmental delays, 5 with other disorders (e.g., Attachment Disorder, ADHD), and 3 were found to be typically developing. At present, 57 children have been re-evaluated around the age of 4 years. Based on 4-year old outcome data, the specificity of the M-CHAT administered at Time 1 with telephone follow-up was .97 and sensitivity was between .83 and .94 (as some possible misses could not be verified). Positive and negative predictive power were found to be .55 and .99, respectively. Thus, the M-CHAT appears to be an effective ASD screener for toddlers.

This research has been made possible by a Federal Public Health Service Grant from the NIH and the NICHD (Grant # 5 R01 HD039961-03).

P3B.1.17 **PARENTAL RECOGNITION OF AUTISM SYMPTOMS AND SUBSEQUENT INTERACTIONS WITH THE HEALTHCARE SYSTEM.** C. Zubritsky, M. Novak and D. Mandell. University of Pennsylvania.

Little research has focused on why autism is diagnosed late relative to the appearance of symptoms.

Objective: to examine recognition of symptoms and parents' interactions with the healthcare system in the processes leading up to the diagnosis of autism.

Methods: Seven focus groups comprising 68

caregivers of individuals with autistic spectrum disorders were conducted in five counties in Southeastern Pennsylvania. Focus groups were facilitated using open-ended questions, and the resulting transcripts analyzed for themes related to parents' recognition and interpretation of children's behaviors; interactions with health care professionals; and sources of information and support. Focus group responses were compared with relevant questions from a survey of 1018 to determine their prevalence.

Results: Parents varied in their recognition of symptoms, the amount of time until they brought their concerns to the attention of a healthcare professional, and the language they used to express their concerns. Many parents were frustrated by physicians' responses, resulting in their changing practices, going directly to specialty care, or otherwise circumnavigating the primary care system. Once the diagnosis was received, parents felt that they had few sources of information and support; most turned to the Internet or to other parents for information on prognosis and treatment.

Discussion: Parents may not have a specific vocabulary to express concerns about their children's development. Physicians should be sensitive to even general expressions of concern, which may facilitate timely diagnosis and help maintain continuity of care for children with autism. Mechanisms for providing parents with timely and accurate information about the prognosis and treatment of autism should be improved.

P3B.1.18 **A COMPARISON OF THE ADI-R AND THE SCQ.** C. Corsello, C. Lord, V. Hus and S. Qiu. The University of Michigan Autism and Communication Disorders Center.

Parent questionnaires, such as the Social Communication Questionnaire (SCQ), have been developed for screening purposes, but have not been validated for diagnostic purposes.

Objective: Compare the diagnostic validity of the SCQ and the Autism Diagnostic Interview - Revised (ADI-R).

Design/Methods: The ADI-R, ADOS and psychometric assessments were completed as a part of a diagnostic evaluation for 435 participants (236 Autistic, 105 PDD-NOS, & 94 non-spectrum) between the ages of 17 months and 15 ½ years of age. Parents also completed the SCQ. Diagnosis based on the ADI, the SCQ and each measure in combination with the ADOS was compared with clinical diagnosis.

Results: Correlations between the total SCQ score, and the total and domain ADI - R scores were moderate and significant. Sensitivity and specificity were calculated for the ADI -R, SCQ (e15), alone and in combination with the ADOS compared to clinical diagnosis to determine diagnostic validity. Sensitivity was slightly higher for the ADI-R (.88) than for the SCQ (.80), when discriminating autism from non- autism (including pdd.nos). However, specificity was low in both cases, (ADI -R = .57 & SCQ =.56). The combination of the ADI-R and ADOS resulted in the best sensitivity (.82) and specificity (.86) for discriminating the autistic group from the non-autistic group (including pdd.nos). The SCQ and ADOS resulted in lower sensitivity (.79) and specificity (.75).

Conclusions: Decisions to replace the ADI-R with the SCQ should take into account that the SCQ has slightly lower sensitivity and specificity.

P3B.1.19 **RELIABILITYOF THE DIAGNOSIS AUTISTIC SPECTRUM DISORDERS IN A POPULATION-BASED SAMPLE OF VERY YOUNG CHILDREN.** E. van Daalen, C. Dietz, S. Willemsen-Swinkels, J. Buitelaar and H. van Engeland. Dept of Child and Adolescent Psychiatry, University Medical Centre Utrecht.

Background: The detection and diagnosis of autistic spectrum disorders (ASD) in children at a very early age is hindered by the lack of diagnostic procedures, criteria and algorithms of ASD below age 2 years. Reference: C. Lord, 1995. Follow-Up of two-Year-Olds Referred for Possible Autism, J Child Psychol Psychiatry, 36, pp1365-82.

Aim: To evaluate the possibilities of predicting autism spectrum disorders in a Dutch sample of children with ASD younger than two years of age.

Method: Children with ASD below age 2 year are identified via an ongoing population screening of about 30,000 children at age 14 months and thoroughly assessed using ADOS-G, Vineland, and clinical observation, this procedure is repeated at follow-up. The reliability of the diagnosis at such a young age is measured.

Results: Autism spectrum disorders were diagnosed in 75 children at the first assessment and in 74 children at follow. The interrater reliability: 73,3%, kappa= .60 (preliminary data).

Conclusion: autism spectrum disorders can be diagnosed at a very early age in a reliable manner.

P3A.1.20 **USING THE ADI-R AND ADOS TO DIAGNOSE ASD AND AUTISM: DISCREPANCIES IN INSTRUMENT DIAGNOSIS.** S. Chandler, G. Baird, T. Charman, E. Simonoff, A. Pickles, T. Loucas and E. Rowley. King's College London.

Objective: To compare ADOS and ADI-R diagnosis.

Methods: The ADI-R and ADOS were used alongside clinical review to diagnose autism and ASD among a population-representative sample of 251 children with special educational needs.

Results and Discussion: Within this sample of 9-14 year olds, the ADI diagnosed significantly more cases of autism (135), than the ADOS (81), with both instruments agreeing on autism for 68 cases. However, the ADI diagnostic algorithm uses information about the child at 4-5 years, whereas ADOS diagnosis is based on observations of current behaviour. When the ADI algorithm was re-calculated using information on current behaviour, the ADI and ADOS diagnosed a similar number of autism cases (86, and 81 respectively), but only 46 cases received an autism diagnosis from both instruments. These 46 cases had significantly lower IQ than the rest of the sample. A further issue for comparing ADI and ADOS is that the ADI has one diagnostic cut-off (autism), while the ADOS has two (autism, ASD). Suggested ASD cut-offs for the ADI were therefore explored. Applying an additional ASD cut-off to the ADI 4-5 algorithm led to 165 ADI diagnoses of ASD+autism combined, compared to 127 ADOS diagnoses of ASD+autism. When the ADI algorithm was repeated for current behaviour, the ADI diagnosed 124 cases with ASD+autism. Clinical review did not indicate any false positive cases on the ADI. High IQ accounted for some ADOS false negatives, with ADI diagnosis taking primacy for most of the discrepant cases.

Funder: Wellcome Trust and Department of Health.

## Poster Session 3B: Topic 2

***Intervention & Education***

P3B.2.1 **NUTRITIONAL STATUS OF CHILDREN WITH ASD:FATTY ACID DEFICIENCY AND HYPERACTIVITY OF RBC PHOSPHOLIPASE A-2.** T. Audhya. Vitamin Diagnostics, Inc..

Objective: Assessment of RBC fatty acid and phospolipase A2 (PLA2) level in Autistic Children.

Essential polyunsaturated fatty acid (PUFA) and PLA2 levels in RBC membranes were measured in a study with 67 children with autism spectrum disorder (ASD; age 9 - 17; mean 14) and 42 age matched healthy children. Blood samples were taken from ASD and control children. The phospholipids were extracted from RBC membrane and their fatty acid composition were analyzed using GCMS. PLA2 was purified using procedure of Horigome et al.

Children with ASD have significantly higher level of 18:2n-6 ,18:3n-6, 20:3n-6 and 22:2n-6 in their RBC membrane compared to age matched controls ($P<0.05$). Conversely the level of 20:4n-6, 20: 5n-3, 22: 5n-3 and 22:6n-3 in their RBC membrane were significantly lower compared to controls ($P<0.05$). A dramatic elevation in PLA2 activity in ASD children compared to controls (444 units/mg vs. 280 units/mg) was also observed. Preliminary characterization of membrane PLA2 shows that the enzyme from both ASD and controls had similar molecular weight (30 KD), and PI (4.6). Both were heat stable, activated by calcium and inhibited by zinc. The physiological and clinical implication of these findings will be discussed at the presentation.

The level of RBC membrane PUFA in deficient ASD children was measured after administration of omega-3 enriched oil for 9 months (2 grams/day; n = 26). Percentage of RBC membrane 20:5n-3 and 22:6n-3 were significantly enhanced (120% and 96% respectively; n = 21) compared to un-supplemented ASD children (n = 31). Change in improved clinical parameters as well as the ATEC subscale score will be discussed at the presentation.

P3B.2.3 **A GROUP RANDOMISED CONTROL TRIAL TO INVESTIGATE THE EFFECTIVENESS OF THE PICTURE EXCHANGE COMMUNICATION SYSTEM FOR CHILDREN WITH AUTISM.** K. Gordon, G. Pasco, T. Charman and P. Howlin. St. George's Hospital Medical School.

The Picture Exchange Communication System (PECS; Bondy and Frost, 1994) is a symbol communication system that was designed specifically for children with autism spectrum disorders. Despite its extensive usage in specialist schools, there exists little independent empirical research into the effectiveness of PECS. The present study represents the first randomised control trial of PECS and one of the largest studies ever conducted of a psychoeducational intervention for children with autism.

Sample: 85 children (4 to 10 years) from 16 specialist school classes, all with formal diagnoses of autism and with little or no speech. The ADOS was completed with all children at baseline.

Design/Method: Classes were randomly allocated into 1 of 3 treatment groups: An immediate treatment group, a delayed treatment group and a no-training control group. All children were assessed at baseline, and then again after approximately 12 and 21 months. At each time point, children were assessed on the ADOS, on standardised tests of expressive and receptive language and of nonverbal ability. Each child was also filmed in the classroom, including during a snack session that was similar in format for all groups. The primary outcome measures were the social-communication behaviours (i.e. spontaneous initiation and assessment of form and function of communication) observed in these settings. A multi-level modelling approach is used to investigate the variation in outcome between the treatment groups and between individuals; the impact of child and environment variables on outcome is also explored.

This study was supported by funding from The Three Guineas Trust.

P3B.2.4 **EARLY INTENSIVE STIMULATION FOR YOUNG AUTISTIC CHILDREN.** C. Mantoulan, B. Rogé, G. Magerotte and J. Fremolle-Kruck. CERPP.

Specialists in autism spectrum disorder's (ASD's) understand how important it is to provide early educational support to improve the prognosis of children with ASD's.

Objective : The objective of this study is to design a global early intervention program, with respect to 6 criteria: the age at which intervention is given; the intensity of intervention; tailoring the program to the individual; generalisation of learnt skills; the inclusion of a parental role; identifying neural correlates of changes in abilities, to promote the quantity and the quality of the child's play.

Methods: This study was carried out during a year with 18 children with autism aged 30 to 70 months, having a minimum of fifteen hours a week of individualised intervention.

The follow-up of the group was done by an analysis of a single case protocol focusing on play abilities.

Results: The results have shown a decrease of sensory motor play as well as an increase of functional play, paired with a decrease of challenging behavior. For some children, stereotyped symbolic play appeared when for others we note complex and spontaneous symbolic play

Conclusion: The study based on the child's global stimulation, can help in the acquisition of play as well as in establishing creative and imaginative play. We predict that the development of an early intervention program for children with ASD's will promote the development of play behaviour early in life, will lead to spontaneous play activities and will be integrated into the child's repertoire.

P3B.2.5 **AUTISM THERAPIST TRAINING EFFECTIVENESS IMPROVING KNOWLEDGE & SKILLS.** A. Morgan, B. D'Entremont and M. Paul. University of New Brunswick.

There currently exists a great shortage of trained personnel to staff intervention programs for young children with Autism Spectrum Disorder (ASD). Indeed, most individuals working with children with ASD, such as teachers, daycare workers, and TA's, are untrained in Applied Behavioural Analysis (ABA) methodology. This study examined the effectiveness of an Autism therapist training program.

Objective: This study examined the effectiveness of an Autism therapist training program.

Design/Methods: Training involved an 8 week

distance education lecture series followed by a 2 week intensive onsite practicum. Trainee's knowledge of Autism and behavioural principles, and their practical ABA skills, were evaluated via questionnaire and videotape before the training began, following the lecture component, and again following the practicum.

Results: Preliminary analysis of the data concludes that Trainees ability to give clear and simple instructional directions or commands (SD) improved across time during training ($F(2,10) = 18.36$, $p<.001$) . Specifically, Trainee's use of clear and simple SD's improved significantly from their pre-training videotape to their post-lecture videotape ($p < .05$) and again from post-lecture to post-practicum ($p < .05$). Trainee's knowledge of Autism and behavioural principles did not change significantly across time.

Conclusions: Trainees use of appropriate SD's improved throughout the course. Trainee's knowledge of Autism and Behavioural principles did not improve. To complete this study the data examining 10 other ABA skills will be analysed. Implications for designing effective ABA therapist training programs will be discussed.

P3B.2.6 **THE EFFECTS OF AN INTERDISCIPLINARY TREATMENT PROGRAM ON THE DEVELOPMENT OF YOUNG CHILDREN WITH AUTISM.** S. Freeman, T. Paparella, K. Stickles and A. Blazejko. UCLA, Child Psychiatry.

Early intervention maximizes outcomes and results in increased functioning for children with autism. However, it remains unclear which intervention approach embodies effective intervention.

Objective: To describe an interdisciplinary treatment program and provide initial outcome data.

Methods: The Early Childhood Partial Hospitalization Program is an interdisciplinary treatment program for children with autism ages 2 to 7. Treatment is intensive, comprehensive and individualized by curriculum and approach (adding more or less of a particular type of intervention given the child's characteristics). We implement an “informed eclectic” approach - varied techniques from child centered to adult centered, direct intervention in core areas of deficit, and varied behavioral and environmental modifications. Seventy-five participants previously enrolled in ECPHP were examined retrospectively on pre- and post-program skill-based achievement assessments (Psychoeducational Profile Revised or Woodcock Johnson III) to determine program effectiveness in developing children's skills. To identify predictors, upon admission, a cognitive assessment was administered to the participants and parent indexes were administered to their parents.

Results: Children attained statistically significant improvements ($p < .05$) on achievement measures from pre- to post-treatment. Lower functioning children showed an average increase of 7.15 months (PEP-R, in 8.52 weeks), higher functioning children gained an average of 13.48 standard score points across all subtests (WJIII, in 6.84 weeks). For lower functioning children, cognitive measures predicted only the admission assessments and parenting stress predicted improvement.

Conclusions: The data suggest good support for a comprehensive interdisciplinary program to improve children's functioning. This improvement seemed independent of parental variables and possibly of cognitive skills.

P3B.2.7 **TREATMENTS FOR SLEEP PROBLEMS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: PREVALENCE OF USE AND OUTCOME.** M. Polimeni. RMIT University.

Limited evidence is available regarding treatment of sleep problems in children with autism, with most research focusing on behavioural treatments. Drugs are commonly prescribed, and the use of herbal treatments has increased over recent years, but little data are available regarding the effectiveness of these treatments.

Objective: To examine prevalence of use and effectiveness of behavioural, drug and herbal treatments for sleep problems in children with autism, Asperger's Disorder (AD), ADHD, and typically developing (TD) children.

Method: Parents of 93 TD children, 66 children with autism, 57 children with AD, and 39 children with ADHD, completed a survey on children's sleep and treatments used for sleep problems.

Results: Behavioural treatment was most common in the autism and AD groups. Drug treatment was most

common in the TD and ADHD groups. Herbal treatment was commonly used across all groups, with highest use in children with ADHD and AD, and lowest use in children with autism. Success ratings of all treatments were low across all groups. The TD group experienced poorest success ratings for all treatments compared to the other groups. The highest success ratings were for drug treatment in the ADHD group. No significant differences on success ratings across treatments occurred for children with autism or AD.

Conclusions: Success ratings for all treatments including behavioural intervention, were low in this sample suggesting that treatment for sleep problems in children is largely ineffective. Herbal treatment is commonly used, therefore further research is required to evaluate the safety and efficacy of these products.

This study was funded by the Division of Psychology, RMIT University, Melbourne.

P3B.2.8 **IMPROVING SOCIAL SKILLS OF CHILDREN WITH AUTISM THROUGH PARENT ENGAGEMENT.** L. Ruble, K. Andrea, R. Abby and G. Trish. University of Louisville, Department of Pediatrics.

A problem is that many children lack access to specialized services and trained clinicians. The purpose of this study is to identify alternative and feasible solutions that may bridge the gap between research and practice and improve outcomes for children with autism. One feasible solution is training parents as intervention agents during natural home routines by targeting important behaviors associated with positive outcomes. One important skill identified in young children and predictive of successful outcomes in adulthood is ability to initiate social interactions.

Objectives: The purpose of this study is (a) to describe the Parent Engagement Scale (PES), a reliable observational rating tool that can be used to evaluate the global quality of parent interactions, and (b) to examine the relationship between the PES and child social behaviors.

Methods: The behaviors of 28 parents of young children with autism were videotaped and coded using the PES as they participated in a 10-minute free play activity with their child. Children were 27 males and 1 female with a mean age 5.0 years (SD 1.0 year) and a DSM-IV-TR diagnosis of autism based on the ADOS-G. Mean adaptive behavior standard scores using the Vineland Adaptive Behavior Scales were 54.8 (SD= 6.9) for Socialization and 48.3 (SD=9.3) for Communication. The mean cognitive standard score using the Differential Abilities Scale was 48.7 (SD=12.8). The psychometric properties of the PES were evaluated as well as key parent behaviors important for increasing child social skills described as predictive of positive adult outcomes.

Results: The interobserver reliability of the PES using Pearson correlation was .83. The internal consistency of the PES using Cronbach's alpha of .76. Using Spearman's Rho, a direct correlation was found between the PES (sum of the items) and parent report of child's ability to initiate with adults ($r = .55$, $p=.01$). When the variables of the PES were correlated individually with parent report of child social skills, parent responsiveness and affect were revealed as critical behaviors associated with initiating interactions with adults and accounted for about 32% of the variance on how well children initiated interactions with adults.

Conclusions: Parent responsiveness and affect during interactions were critical parent behaviors that resulted in an association with better initiation of interaction with adults. These findings shed new light on adult-directed (e.g., directiveness) vs. child-directed (e.g., responsiveness) teaching methods and the impact of methods on important developmental skills. The PES shows initial promise as a tool for evaluating parent-training intervention and child outcomes in real-world clinical srettings.

P3B.2.9 **VARIATION IN JOINT ACTION ROUTINES: EFFECTS ON SOCIAL COMMUNICATION SKILLS OF TODDLERS WITH ASD.** S. Shumway, N. Watt and A. Wetherby. Florida State University.

Objective: To investigate an intervention targeting early social communication skills of toddlers with ASD in the natural environment.

Method: A multiple probe design across routines (play with toys, social games, and books) and participants was used to investigate the effects of introducing variation within established routines. Two children at risk for ASD and their primary caregivers

participated. The intervention took place in the participants' homes, where parents were taught to implement components of a joint action routine within preferred activities. Once the routine was established, variations, new or unusual elements presented in the context of expectation, were introduced to the child. The social communication skills measured were communicative acts directed with eye gaze. Generalization was assessed during routines similar to but not used for instruction.

Results: Experimental effects were readily apparent across all three routines for both children when intervention was introduced. Slight increases in child communication were observed while joint action routines were being established. Subsequent to the introduction of variation, children showed greater and immediate increases in communication. Parents and children also demonstrated generalization to other routines.

Conclusions: Teaching caregivers to introduce variation within joint action routines resulted in increases in early social communication skills, a core deficit for children with ASD. These findings can help increase our ability to serve very young children at risk for ASD and their families more effectively within natural environments.

This research was supported by grants from the U.S. Department of Education, Office of Special Education Programs: Student-initiated Grant (H324B030069) and Model Demonstration Grant (H324M010071)

P3B.2.10 **EARLY INTENSIVE BEHAVIORAL INTERVENTION: REPLICATION OF THE UCLA MODEL IN A COMMUNITY AGENCY.** T. Smith, H. Cohen and M. Amerine-Dickens. University of Rochester Medical Center.

Although studies of early intensive behavioral intervention (EIBI) have yielded favorable results, it remains important to replicate these findings.

Objective: Implement the UCLA Model of EIBI in a community agency and evaluate outcomes.

Design/Methods: A 3-year prospective outcome study compared two groups: (1) 21 children who received 35-40 hours per week of EIBI from a community agency that replicated Lovaas' model of EIBI and (2) 21 age- and IQ-matched children in special education classes at local public schools. Assessments were conducted by independent examiners for IQ (Bayley Scales of Infant Development or Wechsler Preschool and Primary Scales of Intelligence), language (Reynell Developmental Language Scales), nonverbal skill (Merrill-Palmer Scale of Mental Tests), and adaptive behavior (Vineland Adaptive Behavior Scales).

Results: Analyses of covariance, with baseline scores as covariates and Year 1-3 assessments as repeated measures, revealed that, with treatment, the EIBI group obtained significantly higher IQ ($F=5.21$, $p=.03$) and adaptive behavior scores ($F=7.84$, $p=.01$) than the comparison group and showed a trend toward higher language scores ($F=3.82$, $p=.06$). No difference between groups was found in nonverbal skill. EIBI children were more likely than children in the comparison group to obtain test results in the average range (standard scores > 85).

Conclusions: EIBI children achieved outcomes consistent with reports from Lovaas and other investigators.

P3B.2.11 **EARLY INTERVENTION SERVICES AND EVIDENCE-BASED PRACTICE.** A. Stahmer. Children's Hospital and Health Center.

Although a few specific treatment methods have been established as efficacious for some children with autism in laboratory settings, research examining the translation of evidence-based treatments into service systems is virtually nonexistent.

Study Objectives: The current study examines the use of evidence-based interventions in community educational settings.

Method: One-hundred early intervention providers in Southern California completed a telephone survey that asked about specific techniques used in their programs, their understanding of evidence-based practices and their adaptation of techniques for their individual programs. Additionally, providers reported information about coordination of services with various agencies. Providers represent 80% of the eligible programs contacted for participation. Test/Retest reliability for the survey was 90%. Descriptive analysis comparing technique use across early intervention and

school-based programs was conducted.

Results and Conclusions: Ninety-one percent of providers report using at least one evidence-based technique in their programs; however the providers typically combine up to seven methods, and modify these techniques based on child, personal and external factors. Sixty-five percent use only parts of their main technique. A majority of providers also reported using techniques with no evidence-base as well. Most providers (55%) chose techniques based on the belief that it was effective; while only 9% chose a technique based on research evidence. All of the providers had concerns about limited training in the specific techniques. Educational providers report limited coordination with other agencies. The types of services reported in zero to three and three-to-five early intervention programs are compared. Implications for early intervention research are discussed.

This research was funded through an NIMH Career Development Award.

P3B.2.12 **TEACHER IMPLEMENTATION OF PIVOTAL RESPONSE TRAINING (PRT).** J. Suhrheinrich and L. Schreibman. Autism Research Program of Universiy of California, San Diego.

Treatment methodologies that lead to child gains within a controlled laboratory setting may not produce the same effects in classroom environments. PRT is a naturalistic behavioral intervention that has been empirically shown to produce child gains in the areas of language, social, and play skills. This study investigated how well teachers who indicate they use PRT are implementing the technique in school environments.

Objectives: (1) To assess the fidelity of implementation of PRT by 10 special education teachers of children with autism. (2) To determine how teachers are trained in treatment methodologies such as PRT, and (3) To determine the effectiveness of various types of training.

Methods: Teachers who were previously trained (per self-report) in PRT were videotaped interacting with their students during group and one-on-one sessions in their school setting. Videotaped sessions were scored for fidelity of implementation by research assistants blind to the types of training each teacher received.

Results: None of the participants met criterion for overall fidelity of implementation of PRT. However, teachers who reported receiving direct instruction, a manual and feedback from a professional as part of their training, met the criteria for more individual PRT skills that teachers who received less rigorous training.

Conclusions: These findings support the need for a data based protocol for training teachers to use PRT. A brief discussion of the pilot data on a teacher-training protocol that was developed from this study will also be included.

## Slide Session 7

### *Broader Phenotype & Families*

S7.1 **EMOTION PROCESSING IS ALTERED IN AUTISM FAMILIES: BEHAVIORAL AND ERP EVIDENCE.** G. Dawson, S. Faja and S. Webb. University of Washington.

Study Objectives: Research indicates that individuals with autism have difficulty processing and using emotions expressed in the face. Studies have shown that relatives of individuals with autism also show lower than expected performance on emotion perception tasks. This study used event-related brain potentials (ERP) to examine emotion processing in parents of children with autism, as compared to control adults. The face-sensitive ERP component, N170, was of particular interest. The two groups of adults were also compared on several tasks assessing face, object, and emotion perception.

Methods: Behavioral measures consisted of face and object memory tasks, and the Reading the Mind in the Eyes task, a measure of emotion labeling ability. ERPs were recorded to fearful, neutral, and happy facial expressions.

Results: Analysis of ERP data revealed that both groups showed greater amplitude N170 responses to fearful faces than neutral or happy faces and faster responses to neutral faces. However, unlike Controls who produced greater amplitude responses in the right (vs. left) hemisphere, the Family Group did not demonstrate lateralization of face processing. The Family and Control groups also demonstrated different patterns of hemispheric-based correlations with the

Reading the Mind in the Eyes.

Conclusions: These results suggest that adults who have two children with autism display different topographical brain responses to emotional faces than adults who do not have a child with autism. Further analyses will examine earlier ERP components known to assess emotion processing, the relation between topographical distribution of ERP responses, and behavioral assessments of face recognition.

Support: This research was supported by a grant from NICHD and NIDCD (U19 HD34565).

S7.2 **PERFORMANCE OF YOUNG CHILDREN WITH WILLIAMS SYNDROME ON THE AUTISM DIAGNOSTIC OBSERVATION SCHEDULE.** B. Klein-Tasman, S. Risi, C. Lord and K. Phillips. University of Wisconsin, Milwaukee.

Williams syndrome (WS) is a genetically-based neurodevelopmental disorder with a unique pattern of cognitive and personality characteristics. Although children with WS are sociable and may ultimately show a relative strength in their linguistic abilities, language acquisition and gestural development are typically delayed. Abnormality in the modulation of eye contact has also been demonstrated.

Study Objectives: To examine the extent of overlap in socio-communicative deficits of young children with WS with the autism spectrum.

Methods: ADOS Module 1 was administered to 26 2 ½ to 5 ½ year olds with WS. Children with WS were individually matched to children with autism (n = 24), PDD-NOS (n = 13), and nonspectrum developmental disabilities of mixed etiology (n =11) for gender, CA, and Mullen age equivalent.

Results: Two children with WS fell in the ADOS "Autism" range, 9 in the "Autism Spectrum" range, and 14 in the "Nonspectrum" range. 24 children with WS showed ASD or AUT-range abnormalities in the communication domain, and 13 in the reciprocal social interaction domain. T-tests comparing the children with WS to the other individually matched groups indicated that the WS group was significantly less impaired than the AUT group, significantly more impaired than the ME group, and most similar to the PDD-NOS group in their total algorithm score.

Conclusions: Some young children with WS with limited language abilities do appear to show abnormalities on communication and reciprocal interaction with similarity to children with PDD-NOS, rather than reflective of Autism. Implications will be discussed

Funding: This research was supported by grants NIMH RO1 MH066469 and 1 K05 MH01196-01 to Catherine Lord and a University of Wisconsin-Milwaukee Graduate School Research Award and grant 1R03MH069400-1A1 to Bonita Klein-Tasman.

S7.3 **SOCIAL-COGNITION AND THE BROADER AUTISM PHENOTYPE.** M. Losh and J. Piven. University of North Carolina, Chapel Hill.

Impaired social understanding is a hallmark of autism. Evidence suggests that first-degree relatives of individuals with autism may also experience trouble with this domain, suggesting that disordered social-cognition may reflect a genetic liability to autism.

Objective: To examine social-cognitive impairment as a potential endophenotype in autism and investigate how this deficit may co-segregate with hypothesized components of the milder behavioral phenotype thought to index a genetic liability to autism (i.e., the Broad Autism Phenotype; BAP).

Methods: Forty-one parents of children with autism and 16 age- and IQ-matched control parents participated in this study. Among autism parents, clinical assessment with the Modified Personality Assessment Schedule (MPAS) identified 12 autism parents exhibiting an aloof personality style. It was hypothesized that only this subgroup would display social-cognitive difficulties. Social-cognition was measured with the "Eyes Task" (Baron-Cohen, et al., 1997), which assesses the ability to infer complex psychological states from eye gaze, evident from photos of only the eye region of faces.

Results: As hypothesized, only those autism parents identified as "aloof" performed more poorly on the eyes task than either controls or non-aloof autism parents ($p < .005$). No differences were observed between non-aloof autism parents and controls.

Conclusions: Findings suggest that social-cognitive impairments co-segregate with a hypothesized component of the BAP and may represent a distinct

endophenotype that could inform molecular genetic studies of autism.

S7.4 **DEVELOPMENT OF A SELF REPORT SCREENING MEASURE OF AUTISTIC TRAITS IN ADULTS.** P. Magnusson, E. Saemundsen, S. Steinberg, G. Bjornsdottir, R. Fossdal, B. Lauth, S. Hreidarsson, O. Gudmundsson, J. Smari, M. Frigge, K. Stefansson, T. Thorgeirsson and K. Kristjansson. 1) Department of Child and Adolescent Psychiatry, Landspitali University Hospital; 2) deCODE Genetics Inc.

Developed in the context of a study of the genetics of autism, the Development, Social Interaction and Mood (DSIM) questionnaire is intended to assess symptoms of the broader autism phenotype and depression in adults.

Objective: Evaluate the reliability and construct validity of the subsection of the questionnaire designed to assess autistic traits.

Methods: This subsection of the DSIM contains 38 items scored on a 4 point Likert scale. The participants were 293 university students and 1010 relatives of probands with autism. Mean total scores and single-item scores were compared by group and gender. Regression of total and single-item scores on group, gender and age was also carried out. A summed kinship coefficient for a relative was defined as the total of pairwise kinship coefficients between that relative and all probands within eight meioses. Summed kinship coefficient was examined as a predictor of total score, using age and gender as covariates.

Results: The Cronbach's alphas ranged from .82 to .87. In both groups males had higher mean scores than females and mean scores in the group of relatives were higher than in the student group. In the relatives group multiple regression showed no clear relationship between total scores and summed kinship coefficients. However, when the sum of the subset of items that best discriminated between students and relatives was used instead of a total score, there emerged a significant ($p = .004$) linear relationship.

Conclusion: The results are in agreement with theoretical expectations and lend some support to the construct validity of the instrument.

The research is supported by the Simons Foundation

S7.5 **CHARACTERISTICS OF THE BROADER PHENOTYPE IN SIBLINGS AND PARENTS OF AFFECTED RELATIVE PAIRS WITH PDD.** J. Parr, S. Wallace, A. Le Couteur, M. de Jonge, M. Rutter, A. Bailey and IMGSAC. Department of Child and Adolescent Psychiatry, University of Oxford.

Aims: To develop an instrument to evaluate the characteristics of the autism broader phenotype in relatives in a sample of families multiplex for autism spectrum disorder (ASD).

Background and methods: Some relatives of individuals with ASD carry autism susceptibility genes, and may show the broader phenotype of autism. Families with two or more individuals with ASD were recruited as part of the IMGSA. First degree relatives were administered two interviews: one about themselves (Family History Interview Subject version, FHI-S) and the other completed by their partner or parent (Family History Interview Informant version, FHI-I). These semi-structured interviewer based schedules were designed to assess relatively mild behavioural traits related to the autism phenotype. Further data were collected with the Family History Interview Impression of Interviewee (FHI-IoI) schedule, which records the interviewer's observations of the relative. Anonymised summaries were generated and consensus scores reached at regular cross-site meetings.

Results: Consensus data on 312 FHI-S (168 females and 144 males, age range 11-66 years), 264 FHI-I (133 females and 131 males, age range 4-67 years) and 264 FHI-IoI (142 females and 122 males, age range 11-66) have been derived to date. Significant correlations between the adult FHI-S and FHI-I and the children's FHI-S and FHI-I interviews were found. Whilst the IoI correlated significantly with both the FHI-I and FHI-S, the stronger correlation was observed with the FHI-S.

Conclusions: The autism broader phenotype can be dimensionalized by the combining of three separate data sources which independently identify phenotypic traits in this genetically related sample.

Funding: Medical Research Council, Wellcome Trust, European Commission.

S7.6 **THE BROADER AUTISM PHENOTYPE IN FIRST-DEGREE RELATIVES: LINKS BETWEEN COGNITION AND BEHAVIOUR.** E. Pellicano, L. Heavey, S. Wallace, A. Bailey and M. Rutter. University of Oxford.

Objective: This study investigated the broader cognitive phenotype in first-degree relatives of individuals with autism. Relatives' cognitive functioning was assessed in three core cognitive domains (theory of mind (ToM), executive functioning (EF), and central coherence (CC)), and the relationship between cognitive functioning and behavioural features of the broader autism phenotype was explored.

Method: Thirty-six parents and siblings of children with autism (18 males, 18 females, M age = 32.6 years) were administered a battery of cognitive measures, which measured ToM, EF, CC, and general intellectual functioning. The behavioural features of the broader autism phenotype (i.e., behaviours in the domains of socialization, communication, and repetitive behaviours/stereotyped interests) were measured using a Family History Interview (FHI).

Results: Relatives were grouped according to low (unaffected) or high (affected) scores on the FHI. Significant group differences emerged on ToM measures with affected relatives showing greater difficulty on tasks requiring higher-order mentalising abilities, compared with unaffected relatives. Furthermore, correlational analyses across groups revealed that poor performance on ToM tasks was associated with difficulties in everyday social interactions, as tapped by the FHI. Significant group differences were found on some EF or CC measures, although these differences were not in the expected direction. Also, performance on these measures was unrelated to scores in any behavioural domain of the FHI.

Conclusion: These results confirm that sociocognitive difficulties characterise the broader cognitive phenotype of autism, and further highlight the possibility that sociocognitive ability might be a useful cognitive marker for identifying relatives with the broader autism phenotype.

S7.7 **THE OCCURRENCE OF MACROCEPHALY IN AUTISTIC AND NON-AUTISTIC INDIVIDUALS FROM A LARGE FAMILIAL IDIOPATHIC AUTISM SAMPLE (AGRE).** S. Spence, D. Black, J. Miyamoto and D. Geschwind. UCLA Center for Austism Research and Treatment.

Macrocephaly is a common finding in individuals with ASD. It is also a highly heritable trait in the general population.

Objective: To further investigate the occurrence of macrocephaly in autism, we examined head circumferences in a large familial autism sample with regard to diagnosis, age of individual, and familiality of the trait.

Design/Methods: Head circumferences from 545 individuals (356 ASD, 69 unaffected siblings, 120 parents) from 203 multiplex families from the Autism Genetic Resource Exchange (AGRE) sample were analyzed. All measurements were performed by a neurologist and percentages assigned according to age and sex based norms.

Results: No significant difference was found in the occurrence of macrocephaly (defined as head circumferences measuring > 95%) between ASD individuals (26%) and their non-ASD family members (24%) (chi-square=.46, p=.98). Within the ASD group, the occurrence of macrocephaly was present in all age groups, but most common in the 7-12 year olds (chi-square=10.5, p=.015). If either parent was macrocephalic their children were almost twice as likely to be macrocephalic compared to children of parents with normal head size (44% vs. 24%) and this effect was more robust for fathers (56% vs. 24%).

Conclusions: Macrocephaly (head circumference >95%) is observed in a quarter of ASD individuals and their non-autistic siblings. Heritability is demonstrated by the high percentage of macrocephaly found in parents and siblings of ASD individuals and also by the higher percentage of macrocephalic children coming from macrocephalic parents. Macrocephaly is a familial feature that may be part of the broader ASD phenotype.

S7.8 **MATERNAL RECURRENT MOOD DISORDERS AND HIGH-FUNCTIONING AUTISM.** I. Cohen and J. Tsiouris. NYS Institute for Basic Research in DD.

Abstract. Familial mood and anxiety disorders have been consistently associated with autism. However, there has been limited quantitative information on the precise relation between mood disorders in family members and the phenotypic expression of autism.

Objective: To examine quantitatively the association of parental mood and anxiety disorders with severity of disability within a large sample of young children with Pervasive Developmental Disorder (PDD).

Methods: We performed IQ, adaptive behavior, and maladaptive behavior assessments in 122 children with PDD using a variety of assessment methods. Parents were assessed for depression and anxiety using a structured clinical interview.

Results: We found that lifetime histories of recurrent mood disorders in mothers were associated with relatively elevated cognitive and adaptive functioning in their affected children while lifetime histories of anxiety disorders in mothers were unrelated to levels of cognitive or adaptive skills. Maternal recurrent mood disorders were also associated with increased behavior problems in the children based on parent reports and an internalizing behavioral style in the children based on teacher reports. All of the mothers with recurrent mood disorders had their first episode prior to the birth of their affected child. Paternal depression or anxiety disorders were not associated with levels of adaptive/cognitive functioning or levels of maladaptive behaviors in the children.

Conclusion: These results imply that children with PDD who have mothers with a lifetime history of early onset recurrent mood disorders represent a unique sub-group within the autism spectrum. We hypothesize that genes associated with recurrent depression in women may exert a “protective” effect on cognition and adaptive functioning in children with PDD.

Source of Funding: March of Dimes.

S7.9 **FEELINGS OF GUILT AMONG PARENTS OF CHILDREN WITH AN AUTISM SPECTRUM DISORDER.** J. Kuhn and A. Carter. University of Massachusetts Boston.

Although autism is recognized as a neurological disorder, the legacy of blaming mothers for their children's impairment lingers and may contribute to guilty feelings among parents. Parents also report guilt about genetic transmission. Few autism studies have examined parental guilt.

Objective: To investigate two kinds of parental guilt: 1) guilt associated with beliefs about causing the child to have autism (Diagnostic), and 2) guilt associated with beliefs about insufficient promotion of child development (General). Rates of parental endorsement of guilt, whether guilt is believed to interfere with parenting, and the frequency with which and contexts in which parents experience guilt were examined.

Methods: Participants included 172 mothers of a child with an autism spectrum disorder who completed a survey. Approximately 75% of children (mean age = 6.7, range = 2.5-11) were boys and 13% non-white.

Results: Mothers endorsed guilty feelings (75% General/50% Diagnostic). Of mothers reporting guilt, 22%/9% thought that guilt sometimes interfered with parenting. On average, mothers experienced both kinds of guilt monthly. Highly endorsed contexts were: 1) alone (31%/18%) 2) family gatherings (25%/9%) 3) around typical children (36%/12%) 4) feeling down and blue (42%/18%) 5) thinking about genes (29% Diagnostic), and 6) thinking about vaccines (27% Diagnostic). Open-ended questions elicited guilt-related thoughts: 1) fears for child's future 2) negative impact on siblings 3) missed opportunities for earlier intervention or diagnosis, and 4) frustration with school systems. Conclusion: Guilt about children's autism is highly prevalent among mothers. Providing parents with a normative framework for guilty feelings may be therapeutic. Supported by NAAR

S7.10 **SERVICE USE BY FAMILIES WITH YOUNG CHILDREN: THE MIX OF SCHOOL AND OUTSIDE SERVICES.** K. Thomas, J. Morrissey and C. McLaurin. Cecil G. Sheps Center for Health Services Research.

The IDEA invests schools with the responsibility of providing appropriate special education services to children with autism, but the literature provides little guidance on service use patterns that might serve as a benchmark for standard practice.

Objective: This study describes use of school

services by children with autism.

Method: A convenience sample of 301 families with a child with autism, aged 8 years or younger in North Carolina, participated in a survey fielded during the winter of 2003-2004. The survey contains phone and self-administered segments. It covers self-reported child diagnosis and family demographics. It assesses a broad array of 48 autism-specific services, including those provided by schools and families. The study presents descriptive statistics of school service types, frequency of use and family satisfaction. It also describes school provision of services off-site and the nature and extent to which families augment school services with services outside school.

Results: Families and their child with autism use 5 services on average, 2 of these provided at school. Satisfaction ratings of school services are very high, with over 80% of families finding each service useful. School-provided speech/language therapy and occupational therapy are among the top 3 services used and identified as best services by families. 74% of families augment school services with non-medical therapies.

Conclusions: Schools play a major role in the provision of autism-specific services for young children. Families find school services useful and rate them highly. Schools provide a core of services around which a wide array of additional utilization occurs.

## Slide Session 8

### *Cognition & Neuropsychology*

S8.1 **A FAILURE OF CUE BASED PERCEPTION IN ASPERGER'S SYNDROME.** Y. Bonneh, Y. Adini, R. Yoran-Hegesh and D. Sagi. The Weizmann Institute of Science.

Prior knowledge and expectations modify neuronal and behavioral response to stimuli and have a major role in visual processing.

Objective: Test whether individuals with Aspreger's syndrome (AS) can use prior knowledge to resolve a visual recognition task with missing visual information.

Methods: we used a well-known two-tone image (Porter's (1954) hidden portrait), which is meaningless when looked at for the first time, and become easily recognizable when a cue (the original) is shown. Observers were shown the test image, then the cue image and then the test image again, and were instructed to report what they perceived at each step. Fifteen individuals with AS (ages 15-22) and fifteen controls (ten aged 10-11, five aged 15-50) were tested.

Results: All observers could not perceive at first the hidden figure in the test image and correctly perceived the cue image. However, while all the controls recognized the hidden figure following the presentation of the cue, none of the AS observes but one could do so. When instructed to find the cue figure in the test image, only three more of the AS observers succeeded.

Conclusions: The failure of the AS observers to rely on the cue in order to perceive the hidden figure is a striking demonstration of a failure to use prior knowledge in resolving ambiguities during the visual integration process. This finding is consistent with the recent suggestion for abnormal feedback (top-down) projections in Autism (Frith C. 2003), and may further suggest unbalanced integration of stimulus-driven and knowledge-driven processes.

S8.2 **MEASURING CENTRAL COHERENCE ACROSS DOMAINS: NAVON SIMILARITY-JUDGMENT IS RELATED TO HOMOGRAPH READING.** R. Booth and F. Happé . Social, Genetic, and Developmental Psychiatry Centre, Institute of Psychiatry, King's College London.

Objectives: To study individual differences in weak coherence (i.e., detail-focused processing style) across different processing domains in typical development and autism spectrum disorders (ASD).

Methods: The LINCS study examined cognitive style in a typically developing sample (aged 8-25, N = 200), participants with ASD, and age- and IQ-matched Controls (N = 62). Findings from two coherence measures that cross processing domains are presented. A similarity-judgment task using hierarchical (Navon) figures assessed preference for local features over global form. Processing style on this task was compared to a verbal-semantic measure of coherence (reading homographs in context).

Results: Typically developing participants showed a clear bias towards global matching on the similarity-judgment task, which increased with age and ability.

ASD participants did not show a response bias and were not sensitive to changes in stimulus density. Cognitive style was pervasive across two processing domains: global bias on the Navon task related to the use of sentence context to guide the correct pronunciation of homographs, even when age and IQ level were taken into consideration. This finding was apparent in both the typically developing and ASD group.

Conclusions: The study provides preliminary evidence that individual differences in coherence operate across different processing domains in typical development and autism.

This project was funded by the Medical Research Council (UK).

S8.3 **FREE RECALL LEARNING IN ASPERGER'S SYNDROME: ADDITIONAL EVIDENCE FOR IMPAIRED RELATIONAL ENCODING.** D. Bowler, J. Gardiner and S. Gaigg. City University, London.

Objective: Adults with Asperger's syndrome are impaired in encoding relations amongst studied items but not in their encoding of item-specific information (Gaigg, Bowler & Gardiner, 2004). The present investigation presented hierarchically related words that were displayed in either a random or a hierarchical layout, to test the hypothesis that Asperger adults would be more impaired than controls in recalling obviously organized than less obviously organised words.

Methods/Design: Sixteen individuals with Asperger's syndrome and sixteen matched typical participants took part in this study. Sets of categories that could be arranged into 4 hierarchical levels (e.g. Plants - Trees - Conifer - Pine) were generated. Items from half of these sets were arranged randomly on one slide with the other half being arranged hierarchically on a different slide. Participants were asked to study the words on the slides for 3 minutes on each of four successive trials. Oral free recall was tested at the end of each trial.

Results: Individuals with AS recalled fewer items than controls, both for organized and random displays. Both groups showed enhanced memory for hierarchically organised material. Individuals with AS did not recall whole categories of items. However, mean numbers of items recalled per category, which reflects item-specific information, did not differ between groups nor did the rate of acquisition of items across trials.

Conclusions: The findings on impaired category learning are in line with the earlier research referred to above and suggest that individuals with Asperger's syndrome are less likely to employ relational strategies when learning semantically structured material.

S8.4 **CONCEPT FORMATION AND CONCEPT IDENTIFICATION IN HIGH FUNCTIONING CHILDREN WITH AUTISM SPECTRUM DISORDERS.** J. Brown, M. Solomon, N. Bauminger and S. Rogers. UC Davis M.I.N.D. Institute.

Studies have demonstrated an uneven profile of cognitive abilities that includes impaired performance on abstract reasoning tasks, but spared abilities in visual-spatial processing, attention to detail, and rote memory.

Study Objectives: To investigate abstract reasoning in children with autism spectrumdisorders through an examination of concept formation and concept identification in a sample of 35 children with autism spectrum disorders versus 35 typically developing subjects.

Design Methods: All subjects were part of a larger bi-national research study of friendship and attachment in high functioning children with autism conducted in Israel and the United States. The Sorting Task from the Delis Kaplan Executive Function System (D-KEFS) was administered to all subjects. In this task, the subject is asked to sort cards along multiple dimensions and to identify sorts made by the examiner.

Results: One-way ANCOVAs with Verbal IQ as the covariate revealed significant differences between children with autism and typically developing children in the number of correct sorts they generated. There were no significant differences in the number of sorts they were able to identify.

Conclusions: Children with autism were less able that typically developing children to form concepts as assessed by the number of free sorts they were able to make on the D-KEFS. They were not impaired relative to controls in their ability to identify sorts made by the examiner. This supports prior research suggesting that

autism involves impairment in more complex forms of reasoning, but a sparing of simpler cognitive processes.

S8.5 **MINDREADING IN NATURALISTIC CONTEXTS: PREFERRED DECODING OF LANGUAGE, NOT FACES, IN ASPERGER SYNDROME.** I. Dziobek, S. Fleck, K. Rogers, J. Hassenstab, E. Kalbe, J. Kessler, O. Wolf and A. Convit. New York University School of Medicine, Center for Brain Health.

Objective: To elucidate if in a naturalistic context, individuals with Asperger syndrome (AS) decode different types of information to make mental state inferences than neurotypical individuals (NT).

Methods: Nineteen adults with AS and 20 well-matched controls completed the MASC, a new naturalistic test of social cognition, which involves watching a 15 minute film and answering questions about the featured characters' mental states. The MASC allows separate quantification of the extent to which “visual-perceptual” (facial expressions) or “verbal” (language) information is decoded when making mental state inferences and thus represents a first step towards the multidimensional assessment of social cognition within one single test. Subjects also received unidimensional measures of social cognition: the Strange Stories Task (Stories) as a more language based test and a facial emotion recognition test (Faces) as a more visual-perception based measure.

Results: The MASC discriminated more sensitively between diagnostic groups than the Stories or Faces. Intercorrelations of the social cognition tests showed that in individuals with AS, social cognitive performance in the MASC was associated with performance in the Stories, whereas among NT individuals it was associated with performance in the Faces. An analysis of the MASC's sub-dimensions further corroborated a preference of verbal over visual-perceptual stimuli in AS.

Conclusions: The MASC and it's multidimensional features were shown to be valid and sensitive. When inferring mental states in naturalistic contexts, individuals with AS tend to preferentially decode verbal information, whereas NT individuals rely more on the decoding of facial expressions.

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S8.6 **USING SENTENCE COMPLETION TO ASSESS CENTRAL COHERENCE IN AUTISM SPECTRUM DISORDERS, TYPICAL DEVELOPMENT AND ADHD.** F. Happe and R. Booth. SGDP, Institute of Psychiatry, King's College London.

Objectives: To examine the cognitive style of weak coherence (i.e. detail-focus processing bias) in typical development and autism spectrum disorders (ASD), and its relation to executive function.

Methods: The LINCS study investigates cognitive style in typically developing young people (aged 8-25, N=200), participants with ASD, and age- and IQ-matched Controls (N=62). The Sentence Completion test requires participants to complete a spoken stem, such as 'The sea tastes of salt and...'. A local completion, such as 'pepper', is taken as evidence of weak coherence, in contrast to a globally coherent answer such as 'and you can swim in it'. To investigate the possible role of disinhibition in local completions, ASD and ADHD groups were also compared, and given a Go-NoGo test.

Results: Results from the typically developing sample suggest the Sentence Completion test is sensitive to individual differences in cognitive style, over and above effects of age or intelligence. Sex differences were found, with males making more local completions, indicative of weak coherence. The ASD group made more local completions than their matched comparison group. Comparison of ASD and ADHD groups gave no indication that local completions were the result of inhibitory failure; the ADHD group made more errors of commission on the Go-NoGo task, but fewer local completions than the ASD group, and performance on the two tasks did not correlate.

Conclusions: The results provide evidence for the existence of individual, gender and clinical differences in cognitive style (detail-focused processing bias), independent of IQ and executive function.

S8.7 **DECISION MAKING IN CHILDREN WITH HIGH FUNCTIONING AUTISM.** K. Isaacson, E. Crone and M. Solomon. U.C. Davis M.I.N.D. Institute.

Typically developing individuals learn to adopt an advantageous response strategy during the course of gambling tasks. Patients with orbitofrontal and ventromedial prefrontal cortical damage have shown deficits in strategy formation on gambling tasks. Children with autism have similar frontal lobe atypicalities and noted deficits in executive function. It is not known whether strategy formation in children with HFA is also impaired.

Objective: To assess the ability of children with HFA to form an advantageous strategy on a gambling task, specifically: response to gain and loss outcomes, change in performance strategy, and change in long-term strategy across trials.

Design/Methods: We used a developmentally appropriate analogue of the Iowa Gambling Task called the Hungry Donkey Task (Crone, 2003). We assessed eleven children with HFA (confirmed using the ADOS and ADI-R) between 7 and 14 years of age (mean: 9.5), and 60 typically developing children between 6 and 15 years of age (mean: 11.07). Subjects were compared on overall ability to make advantageous choices, and ability to adjust performance strategy over the course of the task.

Results: Children with HFA preferred disadvantageous choices. They did not improve over the course of the task. They showed increased switching following punishment for disadvantageous choices, but no significant change for advantageous choices. Children with autism switched more from turn to turn than controls, indicating a possible lack of, or disorganized, strategy formation.

Conclusions: Like individuals with frontal lobe damage, children with autism display atypical strategies and learning response patterns in an adapted gambling task.

S8.8 **MEMORY FOR RELEVANT VERSUS IRRELEVANT ASPECTS OF THE ENVIRONMENT: PRELIMINARY EVIDENCE FOR REDUCED TOP-DOWN MODULATION IN AUTISM.** E. Loth and F. Happe. Institute of Psychiatry, King's College London.

Objectives: It is known that people with an autism spectrum disorder do not preferentially attend to relevant social versus non-social aspects of the environment. However, what is relevant or not differs, depending on different contexts. The aim of this study was to test the role of perspective on memory for context relevant or irrelevant features in the environment.

Method: 28 boys with Asperger Syndrome (aged 8 to 15 years) with IQ in the normal range and who passed theory of mind tasks were individually matched to a group of typically developing (TD) boys of similar age and IQ. First, participants read stories manipulating perspective (e.g. someone was to burgle a house, or was invited for a party). They were then shown a picture (e.g. a living room) for 20 seconds, which contained an equal number of objects related to context 1 (e.g. money, pearls) and context 2 (e.g. cake). Participants were asked to name everything they saw.

Results: While the TD boys named significantly more context relevant than irrelevant items, there was no difference between item types in the AS group, although the two groups did not differ in terms of total item numbers recalled. These results will be discussed in relation to individual differences in the severity of social understanding in real life, as assessed on the basis of the Autism Screening Questionnaire.

Conclusion: Our findings provide preliminary evidence of reduced ‘top-down' modulation: Cognition in ASD may be in the service of accuracy instead of context-sensitive social adaptation.

Funded by the ESRC

S8.9 **DIRECTED FORGETTING TASKS REVEAL IMPAIRED MEMORY IN ADULTS WITH ASPERGERS SYNDROME FOR TO-BE-LEARNED, BUT NOT TO-BE FORGOTTEN WORDS.** B. Smith, J. Gardiner and D. Bowler. University of Sussex.

Adults with AS display a deficit in “Remember” (R) recognition responses in comparison to controls, but not in “Know” (K) responses (Bowler, Gardiner & Grice, 2000). Individuals with autism fail to show the usual advantage in the free recall of concrete, over abstract, nouns (Toichi & Kamio, 2003). One explanation of these findings is that individuals on the autistic spectrum naturally engage in less elaborative encoding

than individuals from a non-autistic population.

Objective: To compare the recall and recognition of highly imaginable concrete nouns by adults with and without AS using the directed forgetting paradigm, which is known to manipulate elaborative or maintenance encoding.

Design/Methods: Free recall and R/K recognition responses were compared between 16 adults with AS and 16 matched control participants. The main independent variable was the instructions either to learn or to forget, which were given directly after each study word was presented.

Results: AS adults showed a slight deficit in comparison to controls in the free-recall of words when instructed to learn them, but not when instructed to forget. The recognition task also revealed poorer recognition of to-be-learned words, but not of to-be-forgotten words and this was reflected in R responses, rather than K. A mixed ANOVA revealed a significant interaction between the type of instruction, type of recognition and group ($F = 5.87$, $p<0.05$).

Conclusions: As both the instruction to learn and R responses are thought to implicate elaborative encoding, these findings are consistent with the hypothesis of reduced elaborative encoding in adults with AS.

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S8.10 **CATEGORY LEARNING IN HIGH-FUNCTIONING INDIVIDUALS WITH AUTISM.** I. Soulières, S. Larochelle, G. Giguère and L. Mottron. Isabelle Soulières.

Enhanced Perceptual Functioning model (Mottron & Burack, 2001) proposes a superior reliance of perceptual processes in autism. Superior or more autonomous low-level perceptual processes would be associated to a diminished top-down influence of higher-level cognition (Frith, 2003). This predicts atypical categorization processes in autistic individuals.

Objectives: Investigate category learning in high-functioning autistic and individually matched non-autistic participants, using a category induction task.

Design/Methods: A set of eight imaginary animals varying on five binary attributes was used for the three tasks. First, discrimination abilities were assessed with a same-different task followed by an ABX task (which requires maintaining a target stimulus in working memory in order to compare it to two new stimuli). In a third task, participants had to categorize the stimuli in one of two categories, with feedback on accuracy provided after every trial.

Results: Non-autistic participants performed equally in both discrimination tasks, whereas autistic participants performed better in the same-different than in the ABX task. In the categorization task, non-autistic participants were more accurate than autistic participants after five blocks of training. However, after 20 blocks, both groups classified equally well the stimuli.

Conclusions: Participants with autism appear selectively affected by the memory component in the perceptual discrimination tasks. Moreover, in the categorization task, they need additional training to find a rule to categorize the stimuli and/or to acquire a memory of the exemplars. Difference observed between the two groups in the early learning of categories could result from autistic participants using spontaneously a different perceptual categorization strategy.

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## Slide Session 9

### *Cognitive Neuroscience & Functional Neuroimaging*

S9.1 **COMPARING AND CONTRASTING NEUROPSYCHOLOGICAL FUNCTIONING IN CHILDREN WITH ADHD AND AUTISM.** B. Corbett and L. Constantine. University of California, Davis.

Attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) have both been associated with deficits in attention, executive functioning, emotion processing, and social skills.

Objective: The objective of this study was to identify patterns of similarities and differences between these diagnostic groups.

Design/Methods: The preliminary investigation included three groups of 10 children each diagnosed with ADHD or ASD or were typically developing between 6- to 12-years of age matched on age and gender. Diagnoses were confirmed using DSM-IV (APA, 1994) criteria and corroborated with additional diagnostic tools (e.g., Autism Diagnostic Observation Schedule). The participants were evaluated on a wide variety of neuropsychological measures across three major domains of functioning including attention, executive functioning and emotion processing.

Results: The two diagnostic groups showed poorer performance across all areas measured as compared to typically developing children. However, some distinct patterns of impairment were noted. In general, ASD was associated with more deficits in attention and ADHD was associated with greater impulsivity. Executive functioning and emotional processing were impaired in both groups with a profile of more generalized and profound deficits observed in the children with ASD.

Conclusions: Although there is significant overlap of impairment in ADHD and ASD, some distinct patterns of functioning can distinguish these groups. Specific profiles across the measures will be presented.

Funded by the Debber Family Foundation.

S9.2 **GAZE-FIXATION AND BRAIN ACTIVATION IN UNAFFECTED SIBLINGS OF INDIVIDUALS WITH AUTISM DURING A FACIAL IDENTIFICATION TASK.** K. Dalton, B. Nacewicz, E. McAuliff, M. Nersesian, A. Alexander and R. Davidson. University of Wisconsin, Madison.

Diminished gaze-fixation in individuals with autism has been found to be associated with hypoactivation in the fusiform when processing faces. Furthermore, gaze-fixation has been associated with hyperactivation in the amygdala in autism.

Objective: It is the goal of this study to investigate gaze-fixation and brain activation during face processing in a group of unaffected siblings of individuals with autism.

Design/Method: Twelve individuals with autism (8 males, 4 females), 10 unaffected siblings of individuals with autism (7 males, 3 females) and 12 neurotypical controls (10 males, 2 females) participated in the study. All three groups were matched on age and IQ. Structural and functional (BOLD gradient echo) brain MRI images were acquired on a GE 3T scanner along with eye tracking. Participants were presented with 40 images of human faces and objects, half familiar, half unfamiliar.

Results: Both the autism and sibling groups spent less time fixating on the eyes than the control group. No group differences were found for mouth, face or object fixation time. Furthermore, greater BOLD signal was seen in the control versus both the autism and sibling groups in the right fusiform gyrus. Greater activation was found in the right amygdala for the autism group only compared to both the control and sibling groups.

Conclusions: The unaffected siblings show a pattern similar to the autism group of diminished gaze-fixation along with hypoactivation in the fusiform compared to the controls. However, they do not show hyperactivation in the amygdala in response to faces as seen in autism.

S9.3 **NEURAL CORRELATES OF FACIAL AFFECT IMITATION IN CHILDREN WITH AUTISM.** M. Davies, M. Iacoboni, J. Pfeifer, S. Bookheimer, M. Sigman and M. Dapretto. UCLA Department of Psychology.

Objective: To explore the hypothesis that in autism there is a deficit in the mirror neuron system (MNS), and its functional connection to the limbic system via the insula.

Method: While undergoing two event-related fMRI runs, high-functioning children with autism spectrum disorder (ASD) and typically-developing (TD) children viewed sequences of photos of faces displaying angry, fearful, happy, neutral, or sad expressions. In one run, children were instructed to just look at each face; in the other run, children were instructed to imitate each facial expression.

Results: During imitation, both groups showed increased signal in motor, visual and limbic areas. While motor and premotor activity was bilateral in both groups, we observed a right-hemisphere bias in TD children, and a left-hemisphere bias in ASD children. Relative to the TD group, ASD children also showed absent or attenuated activity in right inferior frontal gyrus and right insula. These regions belong to a large-

scale network comprising the MNS and the limbic system which together are thought to be critical for understanding others' emotions. Additionally, ASD children showed significantly less activity in ventral striatum, a reward-associated area.

Conclusion: The observed between-group differences support the hypothesis of deficits in autism in the MNS and its connection to the limbic system via the insula. Furthermore, imitation in ASD children may not engage reward-associated activity to the same extent as in TD children. Disruption in these systems could lie at the core of the deficits in understanding others' feelings and intentions that characterize autism spectrum disorders.

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S9.4 **IMPLICIT PROCESSING OF FACIAL EMOTION IN ADULTS WITH ASPERGER SYNDROME, AND THE ROLE OF SEROTONIN: AN EVENT-RELATED FMRI STUDY.** Q. Deeley, B. Hallahan, E. Daly, M. Brammer, E. Loth, S. Curran, M. Phillips, S. Surgladze and D. Murphy. Institute of Psychiatry.

Background: In humans processing different facial emotions, and at different intensities, is a key aspect of social communication. Also there is increasing evidence that the serotonergic system modulates social behaviour. However, nobody has examined brain function in people with Asperger syndrome (AS) when implicitly processing four primary emotions at varying intensities. Further nobody has examined how acute tryptophan depletion (ATD, which reduces brain serotonin) modifies brain activity when humans process facial emotion.

Method: We carried out two experiments. In the first we included nine right-handed adults with Asperger Syndrome (AS) and 9 matched healthy controls. We used event-related fMRI to examine neural responses when implicitly processing mild (25%) and intense (100%) expressions of fear, disgust, happiness, and sadness. In the second experiment we employed the same design but used a mild intensity of 50% pre-and-post ATD in healthy controls.

Results: Both people with AS and controls activated 'face perception' areas. Further, as emotional intensity of the faces increased both groups significantly increased activation of core visual processing regions (including the fusiform gyrus). However, controls had significantly greater activation of core visual analysis areas across all four emotion conditions than individuals with AS. By contrast, those with AS had significantly greater insula and prefrontal activations. Further, ATD significantly modulated the function of face processing regions.

Conclusion: Early sensory cortices are functionally intact (but are activated less) in people with AS. However, greater insula activation in AS suggests hyper-responsiveness to facial emotion. Further, in humans the function of cortical emotion processing areas is modulated by 5-HT.

S9.5 **A DISTRIBUTED NEURAL SYSTEM FOR THE PERCEPTION, EXECUTION, AND IMITATION OF SOCIAL AND INSTRUMENTAL GESTURE IN AUTISM.** N. Isenberg, K. Montgomery, I. Neuberger and J. Haxby. Princeton University.

During development, imitation lays the groundwork for peer interactions and learning of social and communication skills. Imitation is impaired in individuals along the autism spectrum. Mirror neurons, which respond to the observation and execution of actions, initially described in primates, are likely the neural basis for imitation. Previous neuroimaging experiments suggest a mirror neuron network (MNN) in the human brain, encompassing the right superior temporal sulcus (rSTS), inferior parietal lobule, and frontal operculum. Perspective taking tasks, on the other hand, engage a perspective taking network (PTN) involving the anterior paracingulate, precuneus, rSTS, and temporal poles.

We investigated the hypotheses that the perception, execution and imitation of gesture would produce activation along the MNN in controls, but not in autistics, whereas social gestures would be associated with activity along the PTN in controls, but not in autistics. Seven healthy, right handed control subjects and one subject with Asperger Sydrome (AS) were scanned. Activity along the MNN was found during the imitation, observation and execution in normal controls. During social as compared to instrumental gesture, significant activity was found along the PTN in controls. In AS, no activity in either the MNN or PTN was found. These results support the hypothesis that human social gesture is an embodiment of our intersubjectivity, and

hence engages the PTN, a network shown to be important for human social interaction; whereas this pattern is not seen in individuals with social relatedness challenges namely those along the autism spectrum.

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S9.6 **ATYPICAL FUNCTIONAL LATERALIZATION OF LANGUAGE IN AUTISM SPECTRUM DISORDERS.** N. Kleinhans, D. Cohen and E. Courchesne. SDSU/UCSD Joint Doctoral Program in Clinical Psychology.

Atypical language development is a prominent behavioral marker of autism spectrum disorders (ASD), but its neurobiological underpinnings are incompletely understood.

Objective: Investigate the relationship between complex language and brain function in ASD.

Design/Methods: We conducted an FMRI study of letter fluency in 14 high functioning ASD individuals and 14 age-matched controls. Overt verbal fluency performance (B,H,R,F) was compared to self-paced repetition of the word "nothing". Responses were scored for accuracy.

Results: The ASD participants generated fewer words per fluency block (45s) than controls (10.4 vs.14.8, p= .001). No group differences were found in errors per block (0.35 vs. 0.61, p> .05) or head motion. The ASD group had significantly greater activity than controls in right frontal (BA 13,44,45,insula) and right temporal (BA 20,21,22,37) regions at p < .05, corrected. Between group differences were not observed in left prefrontal cortex. A follow-up analysis was conducted to further characterize the abnormal functional lateralization. Significant clusters of positive activity in right and left prefrontal cortex were identified in each participant (p< .05, one-tailed, corrected) and an asymmetry index was computed: (L-R)/(0.5(L+R)). Significantly greater leftward asymmetry was observed in controls than in the ASD group (1.62 vs. 0.38 respectively, p < .001). In fact, all controls showed leftward asymmetry whereas 12 of 14 ASD individuals evidenced right, bilateral, absent, or weak left lateralized activation patterns.

Conclusions: These data indicate reduced hemispheric differential for complex language in ASD. Abnormal functional organization may be related to early, rapid overgrowth of frontal and temporal lobes and subsequent arrested brain development recently reported in autism. Such growth dysregulation may disrupt the protracted developmental progression by which the left hemisphere become dominant for language, and in turn contribute to the language impairment seen in autism.

S9.7 **NEUROPSYCHOLOGIC FUNCTIONING IN CHILDREN WITH AUTISM.** N. Minshew, G. Goldstein and D. Williams. University of Pittsburgh.

Objective: We previously reported that autism in adults is a selective impairment in complex information processing across domains and modalities. However, it is unknown if this neuropsychological profile is present throughout development or the outcome of developmental processes. This study investigated the neuropsychological profile in children with high-functioning autism.

Methods: Participants were 58 children with autism and 58 age and cognitive-matched controls. A battery of formal measures of the same domains and modalities at varying levels of complexity as for the adults was administered. The major statistical method was stepwise discriminant analysis with univariate comparisons. Degree of accuracy in predicted compared to actual classification matrices was evaluated with Kappa.

Results: The discriminant analyses produced good discrimination between groups in the sensory-perceptual, motor, complex language, complex memory and reasoning domains; however, there was a lower level of agreement for complex memory and reasoning than in the adult study. Tests of simple language, attention, simple memory domains, and the visual-spatial domain did not discriminate well between the autism and control groups.

Conclusions: While these findings are consistent with the complex information processing theory, they suggest the influence of normative expectations on what differentiates between children or adults with autism and normal individuals. In the case of some complex abilities, children with autism may do as well as their peers until a later age when there is a divergence resulting from a failure of the development

of more complex abilities in individuals with autism to occur.

S9.8 **CORTICAL 5-HT2A RECEPTOR BINDING AND SOCIAL COMMUNICATION IN ADULTS WITH ASPERGER SYNDROME; AN IN VIVO SPET STUDY.** D. Murphy, N. Schmitz, F. Toal, B. Hallahan, E. Loth, E. Daly, S. Curran, K. Erlandsson, P. Ell and M. Travis. Institute of Psychiatry, King's College London.

Objective: The cause of Autistic spectrum disorder (i.e. autism and Asperger syndrome) is unknown. The serotonergic (5-HT) system may be especially implicated. However nobody has examined cortical 5-HT2A receptor density of otherwise healthy adults with the disorder. The 5-HT2A receptor is post synaptic, and an increase in synaptic serotonin concentration is associated with a down-regulation in the receptor.

Method: We investigated cortical 5-HT2A receptor binding of 8 normal IQ adults with Asperger syndrome, and 10 healthy controls, using single photon emission tomography (SPET) and the selective 5-HT2A receptor ligand, 123I iodinated 4-amino-N-1-[3-(4-fluorophenoxy) propyl] 5-iodo-2-methoxybenzamide (123I-5-I-R91150).

Results: People with Asperger syndrome had a significant reduction in cortical 5-HT2A cortical receptor binding in total, anterior and posterior cingulate cortex; bilaterally in frontal and superior temporal cortex; and in left parietal cortex. Also, reduced receptor binding was significantly related to abnormal social communication.

Conclusion: Our findings suggest that adults with Asperger syndrome have an up-regulation in central serotonergic function, with a subsequent down-regulation in 5-HT2A receptor density. This may be related to some clinical symptoms.

Acknowledgements: This work was made possible by support from The South London and Maudsley NHS Trust, and grants from The Psychiatry Research Trust, and the Medical Research Council (UK).

S9.9 **AMYGDALA ACTIVITY DURING IMITATION IN AUTISM.** G. Waiter, J. Williams, A. Murray, A. Gilchrist, A. Whiten and D. Perrett. University of Aberdeen.

Background. The amygdala has been postulated to have an important role in the functioning of the social brain and it also shows abnormalities of development in autistic spectrum disorder (ASD). Imitative ability is well recognised to show impaired development in ASD.

Method. We used functional magnetic resonance imaging (fMRI) to investigate imitation of a very simple finger movement in a group of 16 adolescents with autistic spectrum disorder compared with a group of 16 age-matched controls.

Results. In whole brain comparisons, the ASD group showed greater activity of the left amygdala during imitation. On a region of interest analysis this could be seen to result from marked fluctuation of the BOLD signal in the region of the left amygdala in the control group, that was most marked during the imitation condition. In contrast, fluctuation of amygdala activity during imitation and control conditions was minimal among the ASD group.

Conclusions. Even very simple imitation of an apparently non-emotive action is associated with changes in amygdala activity, and this is absent among individuals with ASD. If the absence of amygdala involvement characterises imitative development in autism, this could have important consequences for the contribution of imitation to the development social cognition in autistic spectrum disorder.

S9.10 **AN FMRI STUDY OF SENSORIMOTOR INTEGRATION IN CHILDREN WITH AUTISM.** T. Zeffiro, S. Warburton, J. VanMeter, L. Girton, A. Hailu, P. Daniolos and W. Gaillard. Center for Functional and Molecular Imaging, Georgetown University.

Although differences in manual dexterity are commonly observed in individuals with autism, their neural mechanisms are poorly understood. We explored this question by comparing children with autism to a typically-developing (TD) matched comparison group using a combination of detailed behavioral motor assessment and functional brain imaging.

Experimental Design: Children with autism, ages 7-12, and a TD comparison group matched for age, gender and IQ first underwent motor testing and then participated in an fMRI session involving finger movements made in response to a discriminative visual stimulus. The behavioral motor assessment consisted of estimation of hand preference by self-report and

observation, the Purdue Pegboard Test (PPT) , The Annett Peg Moving Task, and the Bruininks-Oseretsky Test of Motor Proficiency (BOT).

Results and Conclusion: In addition to reduced asymmetry for manual preference, the autistic group exhibited slower performance on the PPT with the non-dominant hand. Performance differences were also seen on the subtests of the BOT measuring upper extremity speed, coordination and dexterity, but not those measuring posture, response speed, gait or strength. In the fMRI experiment, although response time and accuracy did not differ between the autistic and TD groups, greater task-related activity was observed in a cortico-cerebellar circuit in the autistic group, including primary motor cortex, the intermediate zone of the anterior lobe of the cerebellum. These findings demonstrate that autistic children, not selected on the basis of their motor capabilities, demonstrate subtle differences in the dexterity of voluntary movement that is reflected in differential activation of a cortico-cerebellar circuit that may represent a compensatory neural mechanism.

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## Slide Session 10 *Early Development*

S10.1 **DEVELOPMENTAL COURSE OF RESTRICTED AND REPETITIVE BEHAVIORS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.**
S. Bishop, M. Huerta, J. Richler, S. Qiu and C. Lord. University of Michigan.

Objectives: Research indicates that children with Autism Spectrum Disorders (ASD) show an increase over time in their scores on the restricted and repetitive behavior (RRB) domain on the Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter, & LeCouteur, 1994) (e.g. Moore & Goodson, 2003). We sought to replicate and further this work by investigating if the increase is due to increases in the severity of behaviors or to the acquisition of new behaviors.

Methods: This work was part of a larger longitudinal study of ASD funded by grants from NIMH and NICHD. The RRBs of 128 children with ASD were assessed with the ADI-R (Lord, Rutter, & LeCouteur, 1994) at ages 2 and 9.

Results: Children received significantly higher RRB total scores at age 9 (M=5.98, SD=2.70) than at age 2 (M=3.76, SD=1.79); t(127)=-9.88, p<.001. Based on McNemar tests of symmetry, “Compulsions/Rituals” and “Resistance to Trivial Changes in the Environment” were endorsed at significantly higher rates at age 9 than at age 2. Conversely, “Unusual Sensory Interests” and “Repetitive Use of Objects or Interests in Parts of Objects” were endorsed with significantly less frequency age 9. No other items changed significantly. Results also indicate a significant increase in score severity for “Compulsions/Rituals”, while a significant decrease occurred for “Unusual Sensory Interests”.

Conclusions: Our findings suggest that RRB total scores increase over time both because children acquire new behaviors and because the severity of behaviors increases. The results also indicate that different RRBs follow different developmental courses.

Funding Sources: NIMH early diagnosis of autism MH46865; NICHD Neurobiology and Genetics of Autism U19 HD35482; NIAAA T32 Training Grant.

S10.2 **SLEEP AND BEHAVIOR IN YOUNG CHILDREN WITH AUTISM.**
B. Goodlin-Jones, T. Anders, A. Wu, K. Tang and S. Burton. M.I.N.D. Institute & Dept of Psychiatry.

Objective: This study examines the nature and severity of sleep disorders in children with autism and assesses how sleep disruption relates to daytime functioning.

Method: This is the first report from a large multiyear project that employs objective sleep measures (actiwatch and videosomnography) as well as parental report (questionnaires, daily diaries) and direct observation of the children (PEP-R and other measures) to clarify the prevalence and nature of sleep difficulties in preschool age children with neurodevelopmental problems and their impact on daily functioning.

Results: Preliminary results include 31 children (X age= 3.5 yrs) in three diagnostic groups (16 with autism, 6 with developmental delay/no autism, 9 with typical development) during the first wave (one week duration) of a three wave repeated measures study across six months. Initial results suggest no significant

differences of sleep problems by parent report between the diagnostic groups. The actiwatch results (7 nights continuous recording) suggest no significant difference among groups in the duration of sleep latency or number of parental reunions at the beginning of the night. However, there is an initial difference among the diagnostic groups in the number of night waking (ANOVA, p=.10) and the level of sleep efficiency (ANOVA, p<.01).

Conclusion: Preliminarily, children with autism had the lowest frequency of night waking and highest level of sleep efficiency. Initial results do not suggest an impact of sleep quality on daytime functioning in children with autism. Additional data will be analyzed and presented.

Reesearch supported by NIMH RO1(TFA)

S10.3 **COMPARING MOTHER AND TEACHER REPORTS OF EARLY LANGUAGE SKILLS TO AN OBSERVATIONAL MEASURE.** T. Hutman, E. Jimenez, M. Siller and M. Sigman. University of California, Los Angeles.

Measuring receptive language skill is an essential but problematic aspect of researching Autism in children with limited expressive language. Reliance upon performance renders observational measures vulnerable to under-representing children's capabilities. Parent and teacher reports of child language skill may provide richer data.

Objective: To cross-validate parent and teacher reports of early language with an observational measure in a sample of low-functioning children with Autism.

Method/Design: 25 children with Autism (CA: 2,6 - 6,10; ELA: < 18 months) were recruited on the basis of limited spoken language. The Mullen Scales of Early Learning (receptive and expressive language scales) were administered in the lab. Mothers and teachers independently completed The MacArthur Communicative Development Inventory: Words and Gestures.

Results: Mothers reported more words understood than teachers ($t(24) = 2.5$, $p < 0.05$). Mothers' and teachers' reports of number of words understood were strongly correlated ($r = 0.75$, $p < 0.01$). Both were strongly correlated with Mullens' receptive language raw scores ($r > 0.7$, $p < 0.01$). Mothers' and teachers' reports of number of words spoken were not correlated. Mothers' but not teachers' ratings were correlated with Mullens' expressive language raw scores ($r = 0.6$, $p < 0.05$).

Conclusion: Parent and teacher CDI reports and the Mullen Scales appear to be reliable with each other in the measurement of young children's receptive language skills. Parent and teacher reports using the CDI richly complement observational measurement of receptive language skills in non-verbal children at a relatively low cost.

S10.4 **PREDICTING OUTCOMES OF CHILDREN REFERRED FOR AUTISM USING THE MACARTHUR COMMUNICATIVE DEVELOPMENT INVENTORY (CDI).** R. Luyster, S. Qiu, K. Lopez and C. Lord. University of Michigan Autism and Communication Disorders Center.

Objective: To use a longitudinal dataset to explore the predictive value of early social-communication and language on IQ and autism severity in late childhood.

Design/Methods: The parents of 91 children referred for possible autism at age 2 completed the MacArthur Communicative Development Inventory (CDI). Autism Diagnostic Observation Schedule (ADOS) scores and IQ scores were used as measures of outcome. At the most recent assessment, 50 children were diagnosed as having autism, 18 with PDD-NOS and 23 with a non-spectrum disorder.

Results: Linear regressions were run separately for each diagnostic group, each using 7 sub-totals from the CDI as predictors of three outcome measures: verbal IQ, nonverbal IQ and the social and communication algorithm subtotal from the ADOS. Only the regressions for the autism group were significant, accounting for 49% [$F(9, 40) = 6.27$, $p<.001$], 19% [$F(9, 40) = 2.26$, $p<.05$] and 20% [$F(9, 39) = 2.32$, $p<.05$] of the variance in verbal IQ, nonverbal IQ and ADOS subtotal, respectively. Number of phrases understood and number of words understood emerged as significant predictors (both $p<.003$) of verbal IQ and number of actions with objects emerged as the sole significant predictor ($p<.05$) of both nonverbal IQ and ADOS subtotal.

Conclusions: The CDI may be a useful tool in

understanding the trajectories of development in autism, revealing areas of deficit are predictive of outcome.

This study was funded by the National Institutes of Mental Health (R01 MH066469) and the National Institute of Child Health and Human Development (U19 HD35482-01).

S10.5 **ATYPICAL VISUAL EXPLORATORY BEHAVIOURS FOR INANIMATE OBJECTS IN AUTISTIC TODDLERS: CHARACTERIZATION, RELIABILITY AND INTERPRETATION.** L. Mottron, S. Mineau, G. Martel, C. Saint-Charles, T. Charman and J. Faubert. Clinique Spécialisée de L'Autisme, Université de Montréal.

Atypical visual exploratory behaviours for inanimate objects or AVEBIO (e.g.: prolonged inspection of moving objects) are clinically relevant, but research on their characterization is scarce, there are no reliable instruments to measure them, and their incidence/specificity are unknown.

Objective: Characterize AVEBIOs with a reliable instrument, compare their frequency among autistic and non autistic toddlers, and provide an interpretation in relation to perceptual atypicalities evident in adult autism.

Design/Methods: a rating grid for AVEBIO was constructed from 40 ADOS assessments of autistic children (mean CA = 43 months, 8 - 77; mean VMA = months, 9 - 48). Inter-rater reliability of this grid was assessed in a second sample. Then this grid was used to compare the incidence of AVEBIO in a third, randomly assigned sample (Autistics: 15; controls:13).

Results: reliability on AVEBIO grid is high (ICC > .90). One AVEBIO, lateral glance, is more frequent in autistic than in comparison children. Lateral glance is most frequent when triggered by a moving object and is associated with markers of positive emotions and hand-flapping.

Conclusions: AVEBIOS may be reliably scored and are dramatically more frequent in autistic toddlers that in MA matched children. This demonstrates that visual perception for non-social material is atypical in autistic toddlers. An interpretation of these behaviours would be that autistics develop visual behaviours allowing a filtration of excessive amounts of information in foveal vision, consistent with reduced discrimination threshold for complex low-level visual information evident in autistic adults (Bertone et al, 2003).

S10.6 **INFANTS WITH AUTISM: OBJECT-DIRECTED BEHAVIOR AT 9-12 MONTHS.** S. Macari, S. Rogers, S. Ozonoff, G. Young, B. Goodlin-Jones, S. Goldring and M. Lombardo. M.I.N.D. Institute, UC Davis Medical Center.

Studies using home video methodology have shown behavioral differences in infants who develop autism compared to typically developing infants. One empirical report and two case studies suggest that infants who later develop autism engage with objects differently than infants developing typically.

Objective: To examine differences between infants who developed autism and typical infants in object directed behavior.

Design/Methods: Home videos of infants between 9 and 12 months of age were coded for a variety of common object-directed behaviors (e.g., shaking, banging, mouthing, holding). Behavior in 8 infants who later developed autism and 8 infants with typical development were compared using 10 minutes of home video in which the babies had access to toys and objects.

Results and Conclusions: There were several significant differences between the autism and typical groups. Compared with the typical infants, infants who later developed autism engaged in significantly longer mean bouts of activity with objects overall (ANOVA, F test; $p<.005$); they held or touched objects for longer periods of time (F test; $p<.005$); they were visually engaged with the objects they manipulated for longer periods of time (F test; $p<.01$); and they mouthed objects longer, both in terms of mean length of bouts (F test; $p<.05$) and total duration (F test; $p<.01$). The infants who later developed autism appeared to interrupt their play less often to attend to other events or people in their environment.

Acknowledgement: This research was funded by NICHD Grant # U19 HD35468.

S10.7 **PSYCHOPHYSICAL EVIDENCE FOR ABNORMAL MAGNOCELLULAR PROCESSING IN 6-MONTH OLD INFANTS WITH AUTISM IN THEIR FAMILY.** J. McCleery, E. Allman, K. Burner, L. Carver and K. Dobkins. University of California, San Diego.

Previous psychophysical studies have shown impairments in motion processing, a dorsal visual stream function, in children with autism. Since the dorsal stream receives input mainly from the magnocellular, and little from the parvocellular, pathway, these findings may reflect abnormal magnocellular processing in autism. To test this hypothesis, and to determine whether such abnormalities are present early in life, we compared magnocellular and parvocellular pathway functioning in infants with a sibling with autism (i.e., "at risk" infants) with typical infants. Magnocellular and parvocellular functioning was assessed by obtaining luminance and chromatic contrast sensitivities, respectively. Luminance and chromatic sensitivities were determined in 88 typical and 11 at-risk 6-month olds, using forced-choice preferential looking. A conservative two-factor ANOVA (at-risk vs typical; luminance vs chromatic) yielded a significant interaction ($(F(1,97) = 5.4, p<0.05)$. These results suggest abnormalities in the relative integrity of magnocellular versus parvocellular pathways in at-risk infants. Specifically, differences were observed for luminance sensitivity (at-risk: mean log = 1.53, se = 0.07; typical: mean log = 1.38, se = 0.04), but not chromatic sensitivity (at-risk: mean log = 1.51, se = 0.08; typical: mean log = 1.54, se = 0.03). Although luminance sensitivity in at-risk infants was actually enhanced, this nonetheless suggests abnormalities in magnocellular pathway processing, which could potentially serve as a phenotypic marker for autism, and may explain some of the cognitive and behavioral patterns associated with the disorder. Preliminary data investigating correlations betwen these visual data, social-communicative behaviors at 10-months, and diagnostics outcomes at 24-months will also be presented.

S10.8 **TEMPORAL COORDINATION OF JOINT ATTENTION BEHAVIOUR IN PRESCHOOLERS WITH AUTISM SPECTRUM DISORDER.** H. Roeyers and P. Warreyn. Ghent University.

Introduction: Although is it commonly accepted that young children with autism spectrum disorder (ASD) show deficits in joint attention, this impairment does not seem to be absolute. The aim of the presented study was to explore the joint attention of preschoolers with ASD more in-depth, with a special focus on temporal coordination.

Method: Therefore, we investigated initiating requesting joint attention, and following and initiating declarative joint attention behavior of 18 preschoolers with ASD, compared to 18 control children matched on chronological and mental age. The children were observed in interaction with their mother. To gain insight into the temporal coordination of the children's joint attention behavior, we worked with three different levels of coding, implying successive degrees of behavioral coordination.

Results and discussion: Children with ASD seemed to be largely capable of using joint attention for the purpose of requesting. The groups could only be discriminated on the level of behavioral patterns. Considering following declarative joint attention, the groups could be discriminated at all three levels. The difference between the groups was most obvious on the measures of initiating declarative joint attention, where children with ASD clearly showed different behavior on all three coding levels. The advantage of adding a third coding level, including the use of specialized software (Theme, Noldus, 2002) was twofold: Firstly, this level of behavioral patterns and sequences discriminated most clearly between the two groups. Secondly, alternative patterns in the ASD group were found, showing what the children with ASD were doing when they were not engaged in joint attention behavior.

S10.9 **FACE AND OBJECT MEMORY IN TODDLERS WITH AUTISM, SIBLINGS OF CHILDREN WITH AUTISM, AND CONTROLS.** S. Webb, G. Dawson, K. Toth and M. Carlberg. University of Washington.

Many of the early social impairments in autism involve the ability to attend to and process information from the face. Impairments in face processing may play a fundamental role in the neural dysfunction underlying the impairments in social cognition in autism.

Objective: To examine face and object processing and memory in toddlers with ASD, younger siblings of children with autism, and control groups.

Design/Methods: We compared face and object processing and memory using a habituation protocol

with 18 to 27 month old toddlers with ASD, younger sibs of children with autism, and control children with typical or delayed development. Toddlers participated in 4 habituation experiments, in a 2 stimulus (face versus object) by 2 delay (5 sec versus 5 minute) design. Variables of interest included time to habituate and novelty preference at test.

Results: Preliminary evidence suggests the ASD group took significantly longer to habituate compared to the sibling group, but did not differ in the total number of looks. At test, children in the sibling group were more likely to show a novelty preference compared to the ASD group.

Conclusion: This pattern is suggestive of a general information processing delay in toddlers with ASD. Further analyses will examine the relation between habituation time, novelty preference, and mental age, and will include controls of typical and delayed children without family histories of autism.

Support: This research was supported by a grant from NICHD and NIDCD (U19HD34565)

S10.10 **ARE CONGENITAL ANOMALIES ASSOCIATED WITH AUTISM SPECTRUM DISORDERS?.** M. Wier, C. Yoshida, R. Odouli, J. Grether and L. Croen. Kaiser Permanente, Division of Research.

Research findings addressing the association between autism spectrum disorders (ASD) and congenital anomalies have been inconsistent.

Objective: To evaluate whether major congenital structural anomalies as a group and by organ-system occur more often among children later diagnosed with ASD compared to control children.

Methods: Participants were sampled from the 1995-1999 cohort of infants born at Kaiser Permanente (KP) Northern California facilities who remained health plan members for at least two years. Cases (n=417) were children with an ASD diagnosis recorded in KP outpatient databases. Controls (n=2067) were children without an ASD diagnosis, frequency-matched to cases on sex, birth year, and birth hospital. Data on congenital anomalies diagnosed in the first year of life were obtained from KP inpatient and outpatient databases.

Results: Congenital anomalies were diagnosed in 10.8% of children with ASD and 6.2% of controls (ORc=1.8, 95% CI 1.3-2.6). This association remained significant after adjustment for gestational age, plurality, birth order, and maternal age, race/ethnicity, and education (ORa=1.7, 95% CI 1.1-2.4). Virtually all organ-system anomaly categories were more prevalent in children with ASD, however only gastro-intestinal anomalies were significantly associated with ASD in adjusted analyses (1.9% vs. 0.4%, ORa=5.1, 95% CI 1.8-14.1).

Conclusion: Population-based studies utilizing existing ASD surveillance systems and birth defects registries may contribute to an improved understanding of the co-occurrence of congenital anomalies and ASD and its etiologic implications.

Funding Sources: Centers for Disease Control and Prevention, Cooperative Agreement U10/CCU920392; Kaiser Foundation Research Institute

## Slide Session 11

### *Verbal & Nonverbal Communication*

S11.1 **PHONOLOGICAL PROCESSING IN CHILDREN WITH AUTISM AND CHILDREN WITH SPECIFIC LANGUAGE IMPAIRMENT.** K. Condouris, R. Bemis, L. Evancie, L. McGrath, C. Connolly and H. Tager-Flusberg. Department of Anatomy and Neurobiology, Boston University School of Medicine.

Several studies have indicated that there is a subgroup of children with autism whose language impairments resemble those of children with another heritable developmental disorder, SLI.

Objective: Investigate the similarities between the language profiles of children with autism with language impairment (ALI) and children with SLI at the level of phonological processing using nonword discrimination and repetition.

Design/Methods: Participants included 19 high-functioning children with ALI aged 7-14; 16 language, age and nonverbal IQ matched children with SLI; 17 age matched children with autism without language impairment, and 20 age matched typically developing children. Three sets of 2 -5 syllable nonwords were created and their presentation was counterbalanced across groups and tasks. For the discrimination task, children heard 24 pairs of nonwords and were asked to

indicate whether they were the same or different using a button box. For the repetition task, 12 nonwords were presented. Repetitions were recorded and coded for total words correct, syllables maintained, phonemes correct, and error types.

Results: All groups discriminated nonwords equally well, F (3,67) =. 92, p= ns. On the repetition task, children with language impairment (ALI and SLI) repeated fewer nonwords and made more substitution and omission errors than children without language impairment, F(3,69) = 4.5,p<.01 , and Mann-Whitney U = 338.5, p<.001.

Conclusions: Children with language impairment (ALI and SLI) could discriminate nonwords, but could not repeat them. These results suggest a similar pattern of phonological processing impairment at later processing stages involving maintaining phonological representations in short term memory, retrieving them, and assembling speech output.

This research was funded by NIDCD (U19 DC 03610; Helen Tager-Flusberg, PI) and conducted as part of the NICHD/NIDCD Collaborative Programs of Excellence in Autism.

S11.2 **RECEPTIVE AND EXPRESSIVE PROSODY AND LANGUAGE SKILLS IN CHILDREN WITH HIGH-FUNCTIONING AUTISM.** S. Peppe, J. McCann, F. Gibbon, A. O'Hare and R. Marion. Queen Margaret University College, Edinburgh UK.

Atypical expressive prosody is widely recognised as a frequently-occurring feature of autism, but few studies have addressed it; receptive prosody skills in autism have been researched even less. There has been no established means of assessing prosodic ability.

Objectives: to compare receptive and expressive prosodic abilities in children with high-functioning autism (but not Asperger's syndrome) and typically-developing controls, and to establish whether differences were ones of deviance or delay.

Design/Methods: 31 children with high-functioning autism (HFA) aged 6-13 (24 boys, 7 girls) and 72 typically-developing controls (matched for sex and language ability with the experimental group) were assessed using a new prosody assessment procedure (PEPS-C).

Results: Children with HFA performed significantly less well (t-tests, p <0.01) than controls on seven out of twelve aspects of prosody, with a trend towards lower performance than controls in the other tasks. Receptive prosodic skills in particular showed strong correlation (Pearson's, p<.001) with verbal mental age. Error-patterns in some tasks suggested deviance on the part of the children with HFA. Most tasks, especially auditory prosodic discrimination, showed delay.

Conclusions: Prosodic ability appears to be impaired in this population and implicated in levels of language ability. Further exploration of prosody intervention strategies, especially targeting receptive skills, is warranted, as well as the relationship between prosody, the development of language and Theory of Mind skills.

This project was funded by the Scottish Health Executive's Chief Scientist Office.

S11.3 **THE ROLE OF PRAGMATIC AND SYNTACTIC CUES IN LANGUAGE ACQUISITION IN YOUNG CHILDREN WITH AUTISM.** C. Shulman and A. Guberman. The Hebrew University of Jerusalem.

Deviant patterns of language are recognized as one of the hallmarks of autism.

Objective: This research attempts to study the manner is which young children with autism acquire new words.

Design/ Methods: Children with autism and children with typical development were taught nonsense words through the use of syntactic and pragmatic cues. Sixteen children with autism were matched on language level with sixteen typically developing children. The syntactic paradigm was adapted from Naigles (1992), who investigated the comprehension of transitive and intransitive verbs. The pragmatic paradigm was adapted from Tomasello and Barton (1994), who investigated the understanding of intentionality as a social basis for verb comprehension.

Results: The between-groups analyses revealed that children with autism relied on syntactic cues in order to determine the meaning of the made-up verb significantly more than children with typical language development. Within-groups comparisons revealed that children with autism learned novel words using syntactic cues significantly above the level of chance

while they used pragmatic cues at chance level only. Children with typical development used both strategies equally.

Conclusions: This research provides evidence that children with autism take advantage of syntactic cues in order to acquire words, more than language matched typically developing children. Such information may assist in developing effective ways of teaching word meaning to children with autism.

S11.4 **DIFFICULTIES IN THE PROGRESSION OF LANGUAGE IN CHILDEN WITH AUTISM.** L. Swensen, E. Kelley, D. Fein and L. Naigles. University of Connecticut.

Our prior research has demonstrated similarities in the language acquisition processes of ASD and typical children, specifically, that ASD children with a mean length of utterance of 1.4 understand subject-verb-object word order and demonstrate a normal noun bias in word learning.

Objective: The present study investigated more complex biases and language-specific properties in the same children at later ages, again using preferential looking (IPL). Syntactic bootstrapping (the use of syntactic properties to understand a word's meaning) and tense/aspect inflections (distinguishing -ed vs. -ing) were assessed.

Design/Method: Participants were 10 children with autism (CA=41 months) and 10 normal children (CA=25 months). Side-by-side videos were presented with a linguistic stimulus that matched one of the videos. Eye movements were coded for percent time looking to the matching video. Syntactic bootstrapping was tested by showing animal characters engaged in two actions (synchronous and causal) paired with novel verbs in the transitive frame. Correct performance matched the verbs with the causal actions. Tense/aspect inflections were tested by comparing ongoing (girl picking flowers) to completed (girl having completed picking flowers) actions.

Results: The typical children performed above chance with both syntactic bootstrapping and tense/aspect inflections videos ($p<.05$), while the ASD children at 41 months did not. This divergence is unexpected, given that both groups had similar vocabularies (approximately 307 words).

Conclusions: Children with ASD apparently start out with similar language development biases and strategies to typical children, but their progress with more complex aspects of language development appears slower.

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S11.5 **RELATIVE FREQUENCY OF DECLARATIVE AND IMPERATIVE COMMUNICATION VARIES BY STRUCTURE OF MEASUREMENT CONTEXT.** C. Taylor and P. Yoder. Vanderbilt University.

Introduction: We hypothesize that the frequency of the two major pragmatic functions varies by structure of measurement context. Specifically, initiations of behavior regulation (IBR) may be more frequent in structured contexts (Early Social Communication Scales; ESCS). In contrast, initiations of joint attention (IJA) may be more frequent in unstructured contexts (Experimenter Child Interaction; ECX).

Methods: Thirty-nine 2- to 5- year-olds with autism or PDD-NOS were included in the current analysis. All children were administered both the structured and unstructured social communication assessments. A two-way repeated measures ANOVA was used to test the interaction between structure (ESCS, ECX), and pragmatic function (IJA, IBR). Results show a significant interaction between structure and pragmatic function ($F(1, 37)= 54.23$; $p < .01$). IBR was recorded more during the ESCS ($M = 17.21$; $SD = 10.36$) than the ECX ($M = 4.51$; $SD = 5.73$; paired -$t(38) = 8.39$; $p < .01$). IJA was recorded more during the ECX ($M = 7.46$; $SD = 8.83$) than the ESCS ($M = 4.56$; $SD = 4.64$; paired -$t(38) = 2.67$; $p < .01$). These results suggest that children with autism will produce more social language in an unstructured context and will produce more requests during a structured measurement context.

S11.6 **VARYING LANGUAGE STYLE BASED ON LISTENER NEEDS.** J. Volden, J. Magill-Evans, K. Goulden and M. Clarke. SPA, University of Alberta, Edmonton, AB, Canada.

Typically developing 4-year-olds simplify their language (e.g. use shorter sentences, simpler words) when speaking to listeners who are less competent

linguistically (e.g. younger children). Theoretical accounts of ASD suggesting fundamental deficits in the ability to assess others' perspectives would predict substantial difficulty in this skill for speakers with ASD.

Objective: To evaluate whether high-functioning children diagnosed with ASD spontaneously simplify their language to less linguistically competent listeners.

Design/Methods: 38 school-aged children with ASD were compared to children in two matched control groups (one based on non-verbal mental age; one on language age). Participants explained how to take part in a common activity (e.g. going to a restaurant) to puppets representing listeners with different levels of linguistic competence (e.g. adult, peer, baby). Explanations were videotaped and transcripts were coded for indices of stylistic adjustment.

Results: Significant main effects were found for different listeners on the number of different acts included in an explanation (Repeated measures ANOVA, $F(3,112) = 6.009$. $p<.001$). Significant group differences were found for the number of inappropriate acts ($F(2, 114) = 3.890$; $p<.023$), the number of acts that were "prototypical" ($F(2,114) = 9.679$, $p<.0001$) and for the average length of utterance ($F(2,114) = 4.412$, $p <.01$).

Conclusions: Results indicate that high-functioning speakers with ASD spontaneously adjust their language to accommodate listener needs (e.g. simpler explanations with fewer components). Thus, they were not wholly insensitive to listeners' perspectives. They were however less adept in that adjustment than matched controls (more "inappropriate" acts, fewer "prototypical" acts).

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S11.7 **SPONTANEOUS GESTURE USE IN HIGH-FUNCTIONING AUTISM.** L. Bennetto, L. Silverman and R. Webb. University of Rochester.

One of the diagnostic criteria for autism includes a qualitative impairment in the use of gestures, but very little research has addressed the nature of this impairment.

Objectives: To conduct a comprehensive analysis of spontaneous gesture use in high-functioning autism.

Methods: Participants were 21 children with high-functioning autism and 22 typically-developing controls matched on age, gender, handedness, VIQ, and FSIQ. Gestures were observed during a narrative task. Participants watched a Tweety and Sylvester cartoon and retold the story to a naïve listener. Blind raters coded gestures from videotapes using a modified version of McNeill's (1992) gesture coding system.

Results: Overall, children with autism produced fewer gestures per clause than controls ($p=.04$). Compared to controls, their gestures were less well-formed and thus more difficult to identify as gestures ($p=.02$). It was also more difficult to decode the meaning of their gestures ($p=.03$). Additional analyses uncovered differences in the use of different gesture types and viewpoints. For example, when children with autism produced representational, iconic gestures, they were less likely than controls to take the viewpoint of an observer and more likely to take the viewpoint of a character in the story ($p=.04$). These findings have developmental relevance since observer viewpoint gestures develop later in childhood than character viewpoint gestures.

Conclusions: These data suggest that individuals with autism produce gestures that differ both quantitatively and qualitatively from those produced by typically-developing individuals. Hence, this study supports the diagnostic relevance of gestures in autism.

S11.8 **DO THE FREQUENCY, FORM AND FUNCTION OF NON-VERBAL COMMUNICATION IN TODDLERS WITH AUTISM PREDICT LANGUAGE OUTCOMES?.** T. Charman, A. Drew, E. Taylor, E. Milne and G. Baird. Institute of Child Health, University College London.

Objective: To develop a play-based interaction measure of very early and atypical non-verbal communication: The Social Communication Assessment for Toddlers with Autism (SCATA).

Methods: The SCATA was administered to two samples of children with ASD. Sample 1 comprised 17 children who completed the SCATA at age 21 months and age 43 months. Sample 2 comprised 23 children who completed the SCATA at age 25 months and age 37 months. The SCATA comprised a series of activities involving play, turn taking games, use of wind-ups and

bubbles. The degree of scaffolding provided by the adult varied in order to elicit interactions from even the most withdrawn children. Each communicative act the child produces is scored according to its form, function, role and complexity.

Results: Inter-rater reliability was good or excellent for the majority of variables. In both samples the overall frequency of non-verbal communicative acts did not change between the two assessments. However, the form and complexity, the function and the role the child took in the interaction did change with time. The frequency of non-verbal communicative acts in toddlerhood was positively associated with later receptive language ability in both samples, and with later expressive language in one sample. The function of communication and the child's role in the communicative exchange were also related to later language ability. Social acts and initiations showed greater predictive association than requests and responses.

Conclusions: The SCATA may be a useful research instrument to measure early emerging communication abilities in toddlers with autism.

Funding: Cure Autism Now, Guy's and St. Thomas Charitable Foundation, Medical Research Council (UK).

S11.9 **REQUESTING BEHAVIORS IN CHILDREN WITH AUTISM: STABILITY AND CHANGE DURING THE PRESCHOOL YEARS.** M. Siller and M. Sigman. UCLA.

As children's non-verbal communication skills develop, behaviors used to request objects or help change, both in terms of complexity and frequency.

Objective: To evaluate patterns of longitudinal change in the nonverbal requesting behaviors of 28 children with autism between early and middle childhood.

Methods: Preschoolers (CA = 45 months) with limited language skills were recruited and followed over a period of 3-4 years. Children's requesting behaviors were evaluated annually using the Early Social Communication Scale (ESCS). The ESCS distinguishes requesting behaviors at three levels of complexity: 1) non-integrated reaching behaviors or eye-contact; 2) reaching behaviors accompanied by eye-contact; 3) pointing gestures. To examine longitudinal change we fit a series of growth models using SAS Proc Mixed.

Results: Preliminary results showed different patterns of longitudinal change across the three levels of requesting behaviors. The frequency of children's pointing behaviors increased significantly over time ($t = 2.4$; $p<.05$). In contrast, reaching behaviors that were accompanied by eye-contact decreased in frequency ($t = -2.5$; $p<.05$). Finally, we did not find significant longitudinal change in low level behaviors such as non-integrated reaching or eye-contact.

Conclusions: As interventions increasingly target nonverbal communication behaviors, our ability to measure children's improvements become critical. Results from this study highlight the complexities involved. That is, developmental gain may be reflected in both, (1) increases in the frequency of higher level requesting behaviors, and (2) decreases in the frequency of lower level requesting behaviors.

This research was supported by Program Project Grant HD-DCD35470, and the M.I.N.D. Institute Research Program.

S11.10 **POINTING AS DISPLAY OF INTERACTIONAL CO-PRESENCE BY CHILDREN FUNCTIONING AT THE EXTREMES OF AUTISM SPECTRUM.** O. Solomon. University of California, Los Angeles, Department of Anthropology.

Objective: This ethnographic study examined the use of pointing as display of interactional co-presence by children functioning at the extremes of autism spectrum. Two kinds of pointing were considered: 1) to indicate an object of interest at a distance, and 2) to indicate alphabetic and numerical symbols in close proximity.

Methods: Two video-corpora were examined: 1) school interactions of nine severely-affected children with an instructor who uses “Rapid Prompting”, which involves tactile, visual and linguistic stimuli that focus the child's attention on written alphabetic and numerical symbols (70 hours; part of Cure Autism Now Foundations' archive); 2) school and home interactions of sixteen high-functioning children with family members, peers and teachers (320 hours; Ethnography of Autism archive). Relevant data segments were transcribed with the use of vPrism software to conduct

frame-by-frame analysis. Conversation analytic framework was used to examine whether 1) pointing was a component of a first or second pair-part within turn-taking organization; and 2) whether it was accompanied by visual orientation.

Results: High-functioning children rarely checked with their addressees' focus of attention in a face-to-face interaction when pointing to an object of interest, however, their pointing often accompanied first pair-part utterances. Organization of participation in Rapid Prompting interactions was characterized by a side-to-side corporeal orientation where pointing to symbols was a second pair-part action and a primary resource for display of interactional co-presence.

Conclusions: The study contributes to understanding of multi-modality within social interaction, and to a more unified picture of impairments affecting children across autism spectrum.

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## Slide Session 12 ***Social Behavior & Play***

S12.1 **JEALOUSY AND EMOTIONAL EXPRESIVENESS IN LOW- AND HIGH-FUNCTIONING CHILDREN WITH AUTISM.** N. Bauminger, L. Smolkin and E. Orbach-Caspi. Bar Ilan UNiversity, School of Education.

Expressions of jealousy and prosocial behaviors both require children to intersubjectively share with others. A major difficulty in autism comprises the lack of intersubjective sharing, which seriously disrupts children's ability to experience, be sensitive to, or react emotionally within social contexts. Thus, investigation of jealousy and prosocial behavior may expand understanding of these children's emotion deficit.

Objective: Examining children's jealousy and their emotional responsiveness (ER) in a situation eliciting prosocial responses, among three MA-matched groups (2-5 years): low-functioning (LF) (n = 18) and high-functioning (HF) (n = 17) children with autism and typically developing children (n = 21).

Design/Method: Children's behaviors, verbalizations, gazes, and affect were coded during the following two scenarios. To examine jealousy expressions, the child's main caregiver placed a familiar child on her/his lap, embraced the “rival” child, and read a story aloud to that child, while ignoring the caregiver's own child. To investigate ER, the child's main caregiver pretended to hurt his/her knee.

Results: Over half of the LF group demonstrated explicit indices of jealousy; however, these children exhibited fewer instances of such jealousy than did either the typical or HF group. Group differences in ER were mixed; however, in several behaviors, e.g., gaze at parent, LF children again revealed the lowest functioning. Most correlations between ER and jealousy appeared in the typical group, fewer in the LF group, and none in the HF group.

Conclusion: Discussion focuses on the meaning of these group differences in understanding the emotion deficit in autism.

S12.2 **UNDERSTANDING INTENTIONS ON OBJECTS, IMITATION, AND SOCIAL ENGAGEMENT IN CHILDREN WITH AUTISM.** C. Colombi, S. Rogers and G. Young. The M.I.N.D. Institute, University of California, Davis.

Research has shown no autism-specific deficit in understanding of intentions on objects However, children with autism present difficulties in imitation. We suggest that imitating successful acts and completing failed acts differ in the social connectedness involved.

Objectives: (1) To confirm that children with autism show no specific impairment in understanding others'intentions on objects. (2) To explore the unique contributions of social engagement and understanding of intentions to individual differences in imitating others' acts.

Design/Methods: Four successful intentionality trials, four failed intentionality trials, and four turn-taking games were administered to 9 young children with autism (mean CA = 40.33, SD = 6.46) and 8 young children with other developmental disabilities (mean CA = 39.50, SD = 7.58), matched on nonverbal ability.

Results: Analysis involved a mixed 2 between group (autism vs. DD) by 2 within group (imitation [e.g. successful intention] vs. intentionality [failed intention]) factorial design. Significant main effect of group ($F=5.35$; $p<.05$) was found in the successful intention condition, but not in the failed intention condition. Children with autism showed fewer turn-taking actions

compared to the control group (F=5.90; p<.05). Multiple regression analysis revealed that, after controlling for diagnosis, only the turn-taking variable uniquely and significantly predicted imitation skills (²=.57, p<.05).

Conclusions: Preschool children with autism showed worse performance than children with other developmental disabilities in the successful intention condition, but not in the failed intention condition. We hypothesize that imitating another's successful act reflects primarily social engagement, while completing a failed act reflects an instrumental focus on means-end reasoning.

This research was supported by a grant from NICHD #U19 HD35468-08.

S12.3 **IMITATION OF INTENTIONS AND ACCIDENTS IN CHILDREN WITH AUTISM.** B. D'Entremont and A. Yazbek. Psychology Department, University of New Brunswick.

Children with autism often show deficits in joint attention, understanding others' mental states and use of conventional gestures. The ability to understand others as intentional beings with psychological relations to the outside world has been suggested to underlie these skills. Therefore, determining what children with autism understand about others' intentions is important.

Objective: Determine if children with autism selectively imitate intentional versus accidental actions.

Design/Methods: A procedure by Carpenter, Akhtar and Tomasello (1998) was utilized. An experimenter demonstrated either an “intended” and an “accidental” action or two “intentional” actions on the same toy, resulting in three conditions: accidental-intentional (AI); intentional-accidental (IA); and intentional-intentional (II)). Seventeen children with autism (42 - 67 months), six children with developmental delay (41 - 87 months) and 14 typically developing children (28 - 57 months), matched for verbal ability, were tested.

Results: Children imitated more intentional than accidental actions ($F(1,29) = 18.60$, $p < .001$). Responding differed across groups ($F(12, 174) = 2.55$, $p < .01$). Children with autism tended to imitate the experimenter exactly and reproduced two-action sequences as often in the AI and IA conditions as the II condition ($F(4,58) = 2.51$, $p = .05$). Control groups reproduced only the intentional action as often as they imitated the experimenter exactly and produced more two actions sequences in the II condition.

Conclusions: The responses of the children with autism suggest mimicking (copying the exact actions of another with no attention to goals/intentions). In contrast, the comparison groups show an appreciation of the adult's intentions. Implications for understanding autism and theories of social cognition will be discussed.

S12.4 **A COMPARATIVE STUDY OF PRETEND PLAY IN CHILDREN WITH HIGH FUNCTIONING AUTISM AND ASPERGER'S DISORDER.** A. Dissanayake and S. Prescott. Child Development Unit/La Trobe University.

Pretend play deficits are regarded as a hallmark of Autistic Disorder (AD), and are included as one of the diagnostic criteria for AD. However, research indicates that these children engage in pretence under elicited conditions. This finding questions Leslie's (1987) metarepresentational account of autism which has been used to explain not only the pretend play deficits but also their deficits in theory of mind (ToM). Children with Asperger's Disorder (AsD) have some ToM abilities, but there is no information on their pretence abilities. The aim in this study was to investigate the spontaneous and elicited pretend play in children with AD and AsD, to determine whether pretence can be used to distinguish between these groups. A secondary aim was to test the validity of Leslie's theory.

Fifty-three children (19 with high-functioning AD, 17 with AsD and 17 typically developing (TD) children), aged between 4 and 7 years and matched on verbal and overall mental age, participated in an elicited pretend play task with an experimenter, and then spent 10 minutes in free play with their parent. Participants were also assessed on their ToM abilities.

The children with AD showed deficits in ToM compared to the other groups, but, with the exception of object substitution, none of the pretend play categories, observed under both elicited and spontaneous conditions, differentiated the three groups. Thus no support was found for Leslie's metarepresentational deficit theory. The children with AD and AsD were not differentiated on any play

category, supporting the notion that these conditions are variants on a single autism spectrum

S12.5 **LET'S PRETEND! PRETEND PLAY AS A PREDICTOR OF SOCIAL FUNCTIONING IN CHILDREN WITH AUTISM.** M. Manning and L. Wainwright. University of Massachusetts at Boston.

Pretend play, and more broadly the ability to use objects symbolically, have been recognized as deficits among children with autism. Pretense play is an arena for social practice and the development of social skills that can be applied to real life situations. If pretend play is found to be related to later social functioning, it would suggest that early intervention efforts should focus on pretend play skills.

Objective: To examine the association between pretend play abilities in pre-school and social functioning at seven and nine years of age in two groups of children, one group diagnosed with high-functioning autism (with IQ in the normal range) and a second group diagnosed with a variety of developmental language disabilities.

Design/Methods: The pretend play abilities of approximately 30 children with autism or developmental language delay were analyzed. School-age social functioning will be analyzed using a coding system developed for this study. Whereas previous studies have relied on parent questionnaires, social functioning in this study is measured with behavioral coding during a semi-structured play session with an unfamiliar adult.

Data Analysis: A regression model will examine the extent to which pre-school pretend play and diagnosis predict school-age social functioning, as well as the correlation between school-age social functioning and school-age level of pretend play.

S12.6 **A MULTI-DIMENSIONAL ASSESSMENT OF EMPATHY IN ASPERGER SYNDROME.** K. Rogers, I. Dziobek, J. Hassenstab, W. Oliver and C. Antonio. Center for Brain Health, NYU School of Medicine.

A lack of empathy has consistently been cited as a central characteristic of Asperger Syndrome (AS). However, previous research has predominantly focused on cognitive empathy (understanding another's perspective; sometimes referred to as Theory of Mind), effectively ignoring the role of affective empathy (the emotional response to the affective state of another).

Objective: to elucidate the empathic abilities of individuals with AS by measuring cognitive and affective empathy simultaneously in a group of adults with AS.

Methods: Empathy was measured in 21 adults with AS and 21 matched controls using the Interpersonal Reactivity Index (IRI). The IRI is a self-report questionnaire consisting of two cognitive empathy subscales (Perspective Taking, Fantasy) and two affective empathy subscales (Empathic Concern, Personal Distress).

Results: Group means comparisons revealed that the AS group scored significantly lower on both cognitive subscales of the IRI. However, there was no significant difference between the groups on the Empathic Concern subscale, a measure of affective empathy, and the AS group scored significantly higher on the Personal Distress subscale, a second measure of affective empathy.

Conclusions: Our results corroborate previous reports that individuals with AS have difficulty understanding the feelings and perspectives of others. However, our results extend the analysis to affective empathy, and seem to indicate that if another person's perspective is made clear to them, individuals with AS are likely to respond to that person with as much care and concern as would neurotypicals.

This research was funded by a grant from the National Alliance for Autism Research (NAAR).

S12.7 **IMITATION OF INSTRUMENTAL VERSUS NON-INSTRUMENTAL ACTIONS IN YOUNG CHILDREN WITH AUTISM.** S. Rogers, I. Cook, G. Young and A. Giolzetti. M.I.N.D. Institute, Dept. of Psychiatry, University California Davis.

Previous studies have found that young children with autism are less impaired on object imitation than gestural or oral motor imitation, suggesting that imitation may not be a unitary skill. Rogers et al recently suggested that only certain functions of imitation may be specifically affected by autism.

Objective: To determine whether children with autism show preserved ability to imitate instrumental actions compared to non-instrumental acts on

objects.

Design/Methods: Eight instrumental actions with objects and eight identical movements with perceptually similar objects but with no instrumental effect were administered to 20 young children with autism (mean CA = 40.7 months, SD = 9.08) and 15 younger typically developing children (mean CA = 24.9 months, SD = 8.80), matched on nonverbal ability.

Results: Analysis involved a mixed 2 (group: autism vs typical) by 2 (action type: instrumental vs. non-instrumental) factorial design. Significant main effects of group ($F=16.88$; $p<.001$), and action type ($F=7.31$; $p<.05$), and interaction of group and action type ($F=6.28$; $p<.05$) were found. Autism group performance declined sharply from instrumental to non-instrumental actions; in contrast, typical group performance was stable across action types.

Conclusions: Compared to typically developing children, preschool children with autism showed much greater difficulty imitating non-instrumental than instrumental actions with objects, supporting the hypothesis that the apprenticeship function of imitation may be much less affected than the social-communicative function in autism.

Funded by NICHD U19 HD35468, one of the Collaborative Programs of Excellence in Autism (CPEA).

S12.8 **VAGAL TONE AND SOCIAL BEHAVIORS IN CHILDREN WITH AUTISM.** S. Sheinkopf, A. Neal, C. Miller-Loncar and A. Johnson. Brown Medical School, Bradley Hospital.

Vagal tone (VT), a measure of respiratory sinus arrhythmia, may help to increase our understanding of how parasympathetic activity mediates social behaviors in autism. There are no published studies of VT in autism.

Objective: To test relations between VT and social behaviors (including joint attention) in children with autism.

Design/Method: Participants included 11 children with autism (9 males, 2 females; Mean Age = 60m.). Joint attention (JA) was measured with the Early Social and Communication Scales; adaptive behaviors by the Vineland Scales. ECG data were acquired during a series of social events with increasing intrusiveness: [1] Baseline; [2] Distress Display; [3] Stranger Approach - Distal; and [4] Stranger Approach - Proximal. An artifact detection algorithm was applied to the ECG signal and VT was calculated using the Porges method.

Results: Mean differences in VT from baseline to distress display and distal stranger approach were not significant. There was a trend for reductions in VT during proximal stranger approach. Decreases in VT during this episode (vs. Baseline) were related to social behaviors. Independent T-tests revealed that children who showed reductions in VT had significantly higher Vineland Communication ($p < .01$) and Socialization scores ($p < .05$), and produced more JA acts during the ESCS ($p < .10$).

Conclusions: Changes in VT during intrusive social events may index reactivity to social stimuli in children with autism. Although preliminary, these results suggest that VT may reflect regulatory functions that support adaptive social behaviors in young children with autism

Funding: NIMH and National Alliance for Autism Research

S12.9 **WHAT CAN WE LEARN ABOUT SOCIAL FUNCTIONING IN AUTISTIC SPECTRUM DISORDERS FROM CHILDREN WITH 47,XXY?.** H. Swaab, P. Cohen-Kettenis and H. van Engeland. Department of Child and Adolescent Studies, University Leiden and Department of Child and Adolescent Psychiatry, Rudolf Magnus Institute of Neuroscience.

Klinefelter syndrome (47,xxy) is a very common sex chromosome abnormality (1:600 males) with behavioral features that are often comparable to autistic spectrum disorders. Therefore we can learn from this group about the development of social behavior and social disfunctioning.

Objective: To learn more about social functioning from a group of 47,xxy children that show behavioral comparisons with children with autistic spectrum disorders.

Methods/Design: 35 47,xxy boys were compared to 41 boys with PDD, to 51 boys with ADHD and to 50 normal control boys with respect to social functioning, language functions, visual information processing and face recognition and emotion recognition.

Results: In children with 47,XXY we found severe social problems, comparable to the problems of PDD

children. Underpinning the social problems we found difficulty in using pragmatic language, difficulty in recognition of faces and emotions and problems in selecting essential visual information.

Conclusion and discussion: From 47, xxy we can learn about the development of social disfunctions, that are comparable in this group of children to the problems found in autistic spectrum disorders. It will be discussed which functions are supportive in social functioning and which are disturbed, probably due to the extra x-chromosome in 47,xxy. These findings might suggest an x-chromosome linked disfunction in autism.

S12.10 **CULTURAL INFLUENCES ON THE BEHAVIORAL SYMPTOMS OF AUTISM IN KENYA AND THE UNITED STATES OF AMERICA.** J. Weru. University of Texas at Austin.

Although Autism has been heavily studied, little is known on the disorder within a cultural context. Specifically, are the behavioral symptoms of Autism expressed the same way across culture?

Objective: To explore cultural differences on the behavioral symptoms of autism.

Method: The behavioral symptoms of 80 individuals with autism (40 Kenyans and 40 African Americans) between the ages of 3-21 were assessed using the Gilliam Autism Rating Scale (GARS) and Autism Behavior Checklist (ABC). In addition, Developmental History Questionnaire (DHQ) developed specifically for this study was used to further explain the findings. Twenty typically developing children served as a comparison group to control for perceptual differences between Kenyan and American raters.

Results: Independent t-tests revealed significant differences on social impairments

($p< 0.001$) stereotypic behaviors ($p<0.01$), developmental disturbances ($p<0.001$) and overall behavior problems ($p<0.001$) between individuals with autism in Kenya and African Americans in the U.S. The direction of the difference indicated that Kenyans showed consistently more problems on all symptoms of autism than African Americans except on the sensory subscale on ABC where younger African Americans (3-7 years old) showed more problems than Kenyans of the same age. There were no significant differences between typically developing Kenyans and African Americans on all symptoms.

Conclusions: Differences found between Kenyans and African Americans with autism seem to reflect real differences in the symptoms and not a reflection of the observer's different frame of reference.

## Poster Session 4A: Topic 1

### *Genetics*

P4A.1.1 **EXAMINATION OF IMPRINTING AND MATERNAL EFFECTS AT CANDIDATE GENES ON CHROMOSOMES 2, 7 AND 19 IN AUTISM.** A. Ashley-Koch, J. Jaworski, E. Martin, H. Mei, D. Ma, D. Skaar, R. Rabionet, M. Menold, G. DeLong, R. Abramson, H. Wright, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Duke University Center for Human Genetics.

Previous analyses of our dataset and others suggest the potential for imprinting effects contributing to autism risk.

Objective: Test for imprinting and maternal genotype effects with candidate gene SNPs located on chromosomes 2, 7 and 19 in our autism families.

Methods: 470 Caucasian families with > one individual with ADI-R confirmed autism were genotyped for SNP assays from Applied Biosystems Incorporated. Statistics included the Pedigree Disequilibrium Test (PDT; Martin et al., 2000) and Weinberg's log-linear model (Weinberg et al., 1998; Weinberg 1999), a method for testing of maternal genotypic effects and imprinting. To examine imprinting with the PDT, we examined two family subsets: ones with homozygous mothers and heterozygous fathers, and ones with homozygous fathers and heterozygous mothers.

Results: On chromosome 2, there was no evidence for imprinting, but evidence for maternal effects was observed with the Weinberg method at markers RS231723 ($p=0.01$), RS926169 ($p=0.03$), HCV1735124 ($p=0.03$) and RS925881 ($p=0.01$). On chromosome 7, evidence for imprinting was detected at RS2075219 ($p=0.03$) and RS759550 ($p=0.03$). Evidence for a maternal effect was detected at RS614260 ($p=0.002$), HCV9508467 ($p=0.03$), RS176518 ($p=0.02$), and RS2395868 ($p=0.02$). On chromosome 19, we detected evidence for imprinting at RS891202 ($p=0.03$), RS7125 ($p=0.04$) and RS3745348 ($p=0.01$). Evidence for a

maternal effect was observed at marker HCV1654983 (p=0.03).

Conclusions: The best evidence for imprinting and maternal effects was observed on chromosomes 19 and 7, respectively. These data indicate that imprinting and maternal effects may indeed contribute to autism risk.

P4A.1.2 **FREQUENCY OF FRAGILE X IN MULTIPLEX AUTISM: TESTING AGRE FAMILIES.** W. Brown, S. Nolin, C. Dobkin, G. Houck, A. Glicksman, X. Ding, L. Crawford, S. Spence and D. Geschwind. NYS Institute for Basic Research.

Objective and Methods: Autism has high heritability. The Autism Genetic Resource Exchange (AGRE) is a publicly available resource of well-characterized multiplex families for genetic studies of autism. To better characterize this resource, we conducted fragile X DNA analysis (Brown 93) on one proband in each of 480 AGRE families, with follow-up family studies when indicated.

Results: Testing revealed 6 families to be positive for fragile X. Review of 326 available medical records showed 114 (35%) had prior negative genetic testing. Thus, the prevalence of fragile X among the approximately 312 previously untested AGRE families was ~ 1.9%. An estimate of the IQ score of the autistic subjects was 80+35 with range 34-144, based on the Raven. Thus, the AGRE sample is likely to have a higher IQ distribution than typical for fragile X subjects (mean ~40+25). Previous prevalence studies of fragile X in autistic samples range from 0 to 16%; with mean ~4%; (Feinstein 98). Our 1.9% is similar to a report of 1.6% among 123 unrelated autistic individuals (Bailey 93), but lower than the 13% we found on an earlier multicenter study of 183 individuals (Brown 86).

Conclusions: A growing awareness of fragile X syndrome may increase the probability of prior fragile X screening in multiplex autism families and their exclusion from AGRE. The observed frequency of 1.9% is lower than the expected 4%, perhaps due to higher IQs in AGRE subjects than typical for fragile X. It confirms an association of fragile X and autism.

Support: AGRE/CAN.

P4A.1.3 **POLYMORPHISMS IN THE GENE FOR ß2 ADRENERGIC RECEPTOR AND RISK FOR AUTISM IN THE AGRE COHORT.** K. Cheslack-Postava, M. Fallin, D. Avramopoulos, S. Connors, A. Zimmerman, C. Eberhart and C. Newschaffer. Center for Autism and Developmental Disabilities Epidemiology, Johns Hopkins Bloomberg School of Public Health.

The ß2-adrenoceptor (B2AR) is part of the catecholamine system, with variants at two polymorphic sites, rs1042713 (codon 16) and rs1042714 (codon 27), conferring increased activity. Over-stimulation of this receptor may alter brain development, and has been linked to autism in non-identical twins (IMFAR poster 2002).

Study Objectives: Determine whether the presence of Gly16 or Glu27 alleles in the B2AR gene is associated with diagnosis of autism in the Autism Genetic Resource Exchange (AGRE) population.

Methods: The study population included 609 autism case-parent trios from 358 families. Genotyping was done using TaqMan assays by design (ABI). Association between autism and genotypes at each polymorphic site was tested using allelic and genotype-based TDT. Sensitivity to designation of the proband in each family was assessed by performing 1000 repeats of the analysis selecting probands randomly. Haplotype based association tests (HBAT) using both polymorphisms together were also conducted.

Results: There was a statistically significant increased GRR of 1.66 for the Glu/Glu homozygote at codon 27 that was not sensitive to designation of probands. HBAT results were consistent with the direction of observed association, but did not reach a level of statistical significance. There was no significant association with genotype at codon 16.

Conclusions: The Glu27 allele in the B2AR gene may confer increased risk of autism. The possibility of interaction with stress during pregnancy will also be examined.

This work was supported by cooperative agreement U10CCU320408 from the National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention, and a NAAR Pre-Doctoral Fellowship.

P4A.1.4 **DELETION OF CHROMOSOME 7Q11.21-Q11.23 AND DUPLICATION OF CHROMOSOME 15Q11.1-Q11.2 ASSOCIATED WITH WILLIAMS SYNDROME AND AUTISM.** H. Cope, C. Wolpert, S. Donnelly, N. Schanen, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Duke University Medical Center.

Williams syndrome (WS) and autism are generally regarded as opposite phenotypes. Autism is a neurodevelopmental disorder characterized by impairments in communication and socialization. In contrast, WS is classically characterized by language strengths and a sociable personality. Despite these differences, many individuals with WS exhibit autistic symptoms including verbal perseveration, sensory defensiveness, and difficulties relating to peers. Few cases of concomitant WS and autism have been reported.

Objective: Investigate the genetic etiology of concomitant WS and autism.

Methods: A 15-year-old, nonverbal male diagnosed with both WS and autism was ascertained through an autism genetic study. The diagnosis of autism was confirmed by the Autism Diagnostic Interview-Revised (ADI-R) and the Autism Diagnostic Observation Schedule (ADOS).

Results: Chromosome analysis revealed a karyotype of 46,XY,del(7)(q11.21q11.23),dup(15)(q11.1q11.2). Fluorescence in situ hybridization (FISH) analysis with the Prader-Willi/Angelman critical region (PWACR) probe SNRPN showed no duplication.

Conclusion: Duplications of 15q involving SNRPN have been described in autism. Phenotypes associated with duplications of proximal 15q not including SNRPN range from silent variants to developmental delay. The implication of the 15q duplication detected in this patient on the autism phenotype is unknown. In addition, this patient has a visible deletion in the proximal long arm of chromosome 7, extending beyond the region that is deleted in 99 percent of individuals with WS. The presence of autistic symptoms in individuals with WS implicates genes at locus 7q11.23 in the etiology of autism. Furthermore, additionally deleted genes at 7q11.21-q11.23 in this patient may be attributable for the more severe autism phenotype observed.

This work was supported by NIH grants NS26630 and NS36768 and by the National Alliance for Autism Research (NAAR).

P4A.1.5 **ASSOCIATION ANALYSIS OF GABAERGIC GENES AND PHENOTYPE ANALYSIS IN AFRICAN AMERICAN AUTISM FAMILIES.** M. Cuccaro, D. Ma, E. Martin, S. Donnelly, H. Cope, C. Wolpert, R. Abramson, H. Wright, J. Hussman, J. Gilbert, P. Whitehead, G. Delong and M. Pericak-Vance. Duke University Medical Center.

Autism genetics research has focused on Caucasian (CA) samples. There are no compelling reasons for under-representation of other groups. This study extends autism genetic studies beyond a single racial-ethnic group and examines 14 GABAergic genes for autism susceptibility.

Objective: Examine phenotypic and genetic variation in African American (AA) autism families.

Methods: Participants (AA N=41/CA N=254) were ascertained through an autism genetics study. The clinical protocol included the ADI-R, Vineland Adaptive Behavior Scales (VABS), and Aberrant Behavior Checklist (ABC). The groups were compared on ADI-R items (initial words, phrase speech, motor coordination and age of onset), VABS Adaptive Composite Score and ABC scales (Hyperactivity, Lethargy, Irritability, Stereotypy, Inappropriate Speech). Association testing for the GABAergic candidate gene SNPs used the Pedigree Disequilibrium Test (PDT).

Results: AA participants had delayed acquisition of first words (Ç2=13.32, df=2, p<0.001) and phrase speech (Ç2=10.33, df=2, p <0.006) and borderline significantly lower VABS composite scores (t=1.92, df=227, p=0.057). The groups did not differ on ratings of motor coordination, age of onset, or ABC scales. Significant association was found for GABRB3 (chromosome 15) at rs754185 (p=0.02) and for GABRA4 and GABR1 (chromosome 4) at rs2280073 (p=0.005) and HCV2119841 (p=0.03). These results support similar findings in CA (Ma et al. IMFAR 2005).

Conclusions: Phenotypic differences were noted in AA autism families. Results support the hypothesis that GABAergic genes contribute to autism risk. Exploration of genetic influences in autism should consider racial-ethnic differences.

This work was supported by NIH grants NS26630

and NS36768 and by the National Alliance for Autism Research (NAAR). and the JP Hussman Foundation.

P4A.1.6 **AN ASSOCIATION ANALYSIS OF MICROSATELLITE MARKERS ACROSS THE PRADER WILLI/ANGELMAN CRITICAL REGION ON CHROMOSOME 15 (Q11-13) AND AUTISM SPECTRUM DISORDER.** S. Curran, S. Roberts, S. Thomas, M. Veltman, J. Brown, E. Medda, A. Pickles, P. Sham, J. Powell and P. Bolton. Sarah R Curran.

Autism (OMIM 209850) is a neurodevelopmental disorder with a significant genetic component of a complex nature. Cytogenetic abnormalities in the Prader-Willi/Angelman syndrome critical region (PWACR) on chromosome 15 (q11-13) have been described in several individuals with autism. We have examined 5 microsatellite markers spread across the 4 Mb PWACR for linkage disequilibrium in 148 families with autism spectrum disorder (ASD) and a subset of 82 families with autism using the extended transmission disequilibrium test (ETDT). The markers examined were D15S11, D15S128, D15S1506, GABRB3 and D15S1002. In addition we have examined the microsatellite D15S822 for hemizygous deletion status in our sample as it had been previously reported to be increased in autism. We found no significant linkage disequilibrium with any of the markers tested either in the ASD or autism families when looking at paternal and maternal meioses combined. However as there are known imprinted genes in the region, including possibly GABRB3, we also examined for linkage disequilibrium in paternal and maternal meioses separately. Examining paternal transmissions only, we found marginal evidence for linkage disequilibrium with a protective allele at marker D15S11 in the ASD families (Chi-sq 13.7, 7df, p = 0.05) and marginal evidence for risk alleles at markers D15S1506 (Chi-sq 13.7, 6df, p = 0.06), GABRB3 (Chi-sq 15.9, 8df, p = 0.11) and D15S1002 (Chi-sq 17.7, 9df, p = 0.08) in the autism only families. The allele responsible for the association with GABRB3 is the 191 allele which was previously reported to be overtransmitted. Hemizygous deletion of the microsatellite D15S822 was found in 3 out of 340 independent chromosomes in our sample; a rate of 0.8%. This is not significantly different to the frequency in the general population. In conclusion, our results did not rule out the involvement of this chromosomal region, but provided further evidence, albeit very limited, to implicate GABRB3. Further more systematic work in larger samples is required and confirmation that GABRB3 is imprinted is desirable.

We are currently systematically genotyping single nucleotide polymorphisms in candidate genes in the region (UBE3A, ATP10C, GABRB3, GABRG3) and an update on these results will be presented at the meeting.

P4A.1.7 **ASSOCIATION ANALYSIS OF 657 SNPS IN A CANDIDATE AUTISM GENE: CNTNAP2.** J. Duvall, A. Lu, J. Stone, N. Kono, S. Nelson, M. Alarcón, R. Cantor and D. Geschwind. UCLA.

Autism is a neurodevelopmental disorder that is characterized by language difficulties, social deficits, and repetitive, stereotyped behaviors. Numerous family and twin studies provide compelling evidence that autism has a strong genetic component. The contactin-associated protein 2 (CNTNAP2) gene was first identified as a positional candidate through a quantitative linkage scan of autism endophenotypes (Alarcón et al., 2002). Preliminary association analyses of 26 SNPs in this gene suggest that a two-SNP haplotype is nominally associated with the diagnosis of autism (p = 0.016). Interestingly, it was also recently reported that CNTNAP2 is interrupted in a family with Tourette's Syndrome (TS) and Obsessive Compulsive Disorder (OCD), both of which share some characteristics with autism (Verkerk et al., 2003). CNTNAP2, also known as CASPR2, is a large gene, spanning more than 2.3Mb. To attempt to replicate our initial observations, we typed 657 SNPs at a density of 2-4kb to allow complete coverage of the gene. This density of coverage would allow detection of LD should it be present at significant levels given our initial findings. Here we present the analysis of these 657 SNPs within the CNTNAP2 gene in about 220 complete trios from the Autism Genetic Research Exchange (AGRE). The data were tested for possible mistyping and Hardy-Weinberg Disequilibrium using the Mendel program. Transmission Disequilibrium Tests (TDT) were performed on an individual SNP basis using the Mendel. Seven SNPs were found to have p < 0.01, providing additional evidence supporting CASPR2

association. Results of haplotype analysis will be presented.

P4A.1.8 **A STUDY OF THE IMPACT OF OBSTETRIC FACTORS ON AUTISM IN A UK MULTIPLEX SAMPLE.** K. Francis, J. Parr, T. Robinson, S. Palferman, A. Le Couteur, J. Green, A. Bailey and IMGSAC. Department of Child and Adolescent Psychiatry, University of Oxford.

Aim: To evaluate the significance of perinatal complications in the development of Autism Spectrum Disorders (ASD) within a sample of UK affected sibling pairs.

Method: We identified 87 UK affected sibling pairs who were part of a larger sample included by the International Molecular Genetic Study of Autism (IMGSA) in the search for autism susceptibility genes. Within each pair, both individuals had an ASD; diagnosis was confirmed by administration of the Autism Diagnostic Interview (ADI) and the Autism Diagnostic Observational Schedule (ADOS). Where possible, cognitive function (performance and verbal IQ) was assessed using Ravens Matrices, BPVS or Mullens schedules. An obstetric interview was completed with the mother about each pregnancy. When information was missing from the parental interview, it was obtained from the medical notes. Prenatal, perinatal, postnatal and total optimality scores were calculated and correlated with measures of severity of PDD.

Results: Analysis of single interview items and total optimality scores failed to find a statistically significant correlation between obstetric or perinatal adversity and the severity of ASD.

Conclusions: This study indicates that currently identifiable obstetric and mild perinatal adversities does not contribute to the severity of expression of PDD in sibling pairs selected for sharing a genetic susceptibility to PDD.

Funding: Medical research Council, The Wellcome Trust, European Commission

P4A.1.9 **AUTISM AND ENVIRONMENTAL GENOMICS.** M. Herbert, J. Russo, M. Blaxill, S. Kahler, D. Ziegler and E. Hatchwell. Mass Gen Hosp/Harvard Med School.

Autism spectrum disorders (ASD) are behaviorally-defined syndromes with no known biomarkers whose heterogeneous biological causes may include environmental as well as genetic factors.

Objective: Candidate ASD genes have generally been chosen from genes directly related to the central nervous system. The apparent increase in autism incidence supports examination of environmental factors including those that may not primarily target the brain. The NIEHS has implemented the Environmental Genome Project (EGP) to study genetic susceptibility to environmental disorders and has identified a set of "environmental response genes" that may include previously uninvestigated candidate genes for autism.

Methods: This study will utilize bioinformatics methodologies to identify "environmental response genes" in regions identified in published autism genome scans and will genotype SNPs (both functional and otherwise) from relevant genes on groups of individuals with ASD and on normal controls.

Results: Initial analyses reveal at least 51 genes in regions overlapping between EGP and published autism genome scans. Two (NF1 and GAD1) have previously been studied for association. Using the other 49 genes as starting points, we will report genotyping and results from modern methods of network and topic analysis that discern relationships with metabolic and neurological abnormalities identified in autism, and that narrow the candidate list.

Conclusion: Finding multiple overlaps between autism and environmental genomics may suggest that ASD brain abnormalities could be downstream from metabolic or regulatory changes that are more widespread, or that originate in other systems (e.g. immune) and could be modulated by environmental factors. This deserves further investigation.

P4A.1.10 **THE DRD2 GENE AS A CANDIDATE LOCUS FOR AUTISM SPECTRUM DISORDERS.** J. Hettinger, X. Liu, J. Holden and ASD-CARC. Department of Physiology, Queen's University.

The main role of dopamine (DA) in the central nervous system is the modulation of higher order functions including cognition and social behaviour. DA is implicated in Autism Spectrum Disorders (ASDs) since behaviours such as perseverative interests and

impairments in executive functions are obvious in persons with autism. The D2 receptor is integrally involved in the neural circuitry mediating these processes.

Objective: To determine whether the DRD2 gene is associated with susceptibility to ASDs.

Design/Methods: We genotyped 3 polymorphisms (A, B, and D) in the DRD2 gene in 181 affected sib-pair (MPX) families. All families have two or more children with either autism or an ASD. The Canadian comparison group consisted of 190 anonymous individuals. FBAT and haplotype-FBAT (HBAT) analyses were performed.

Results: No significant FBAT or HBAT findings were observed in the complete family set. However, in the 114 families with two or more affected sons (MM), overtransmission of the minor allele of the D polymorphism (P=0.002) was observed. In addition, HBAT analysis in the MM families demonstrated undertransmission of the haplotype derived from the major alleles of all 3 markers (P=0.0007) and overtransmission of a putative risk haplotype characterized by the major alleles of markers A and B and the minor allele of marker D (P=0.0005).

Conclusions: Preferential haplotype transmissions of markers at the DRD2 locus were observed in MM families, supporting the DRD2 gene as a risk gene for ASD.

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P4A.1.11 **AUTISTIC REGRESSION IN AFFECTED SIBLING PAIRS.** E. Jimenez, P. Szatmari, A. Dupuis and W. Roberts. The Hospital for Sick Children.

Regression is a recognized phenomenon in autism, but its etiology is not yet clearly understood.

Objective: To determine if regression in autism is a trait shared by siblings in multiplex families.

Design/Methods: 19 sib pairs and 4 trios were studied (N=50). All participants were assessed using the ADI-R (Autism Diagnostic Interview-Revised) and ADOS (Autism Diagnostic Observation Schedule), meeting DSM-IV criteria for a diagnosis of autism. In addition, a new interview, the RSF (Regression Supplement Form, Goldberg et al., 2003) was completed for each child. This provided detailed information abouth the type of regression, timing, and the possible return of any skills. Each child was also evaluated with the Leiter (short form) and a language measure (PLS or OWLS) (Preschool Language Scales or Oral and Written Language Scales).

Results: A high rate of concordance was observed for regression in family members with autism. The observed concordance was 80% (significantly higher than the expected concordance of 61%, kappa = 0.49). On follow up, the mean IQ and language scores were lower in children who experienced regression than in those who did not (22 points and 15 points lower, respectively, p=0.079 and p=0.08).

Conclusions: Regression appears to be highly concordant in siblings, suggesting that it may be determined genetically. Some regression may be assocaited with lower IQ and language outcomes. Further study is needed to lend support to these findings.

P4A.1.12 **CHARTING THE PROGRESS OF AUTISM RESEARCH: THE IMPACT OF THE AUTISM GENETIC RESOURCE EXCHANGE ON AUTISM GENETICS.** C. Lajonchere and AGRE Consortium. Cure Autism Now, AGRE Program Director.

The Autism Genetic Resource Exchange (AGRE) represents an unprecedented resource for the study of autism and related disorders. Since 1999, AGRE has been offering researchers a wide array of high quality standardized clinical data, and currently houses one of the largest repositories of biomaterials in the field. With over 600 active multiplex families in the collection and over 130 researchers accessing the resource, AGRE continues to be a moving force in accelerating the pace of autism research. Since 2001, AGRE has been cited in 38 peer-reviewed publications, 18 in 2004 alone. AGRE has created partnerships with academic institutions, non-profit organizations, and private corporations in order to maximize resources and increase the breadth of data available to the scientific community. AGRE's commitment to broad data sharing and collaboration has served as a model for large-scale

autism projects currently underway. In doing so, it is bringing scientists closer to finding effective treatments and ultimately, a cure, for autism.

P4A.1.13 **IDENTIFICATION OF SIGNIFICANT ASSOCIATION AND GENE-GENE INTERACTION ON GABAA RECEPTOR (GABAR) SUBUNIT GENES IN AUTISM.** D. Ma, P. Whitehead, M. Menold, E. Martin, A. Ashley-Koch, H. Mei, R. Chung, G. DeLong, R. Abramson, H. Wright, M. Cuccaro, J. Hussman, J. Gilbert and M. Pericak-Vance. Center for Human Genetics, Duke University Medical Center.

Objectives: Multiple lines of evidence implicate the GABAergic system in autism. All known GABAR subunit genes were studied to identify genetic factors associated with autism risk and the interaction between genes.

Methods: 70 single nucleotide polymorphisms (SNPs; intronic and/or silent mutation) were screened in 14 GABAR subunit genes (GABRG1, GABRA2, GABRA4, GABRB1 on chromosome 4p12; GABRB2, GABRA6, GABRA1, GABRG2 and GABRP on 5q34-q35.1; GABRR1 and GABRR2 on 6q15 and GABRA5, GABRB3 and GABRG3 on 15q12) for association with autism risk in 470 Caucasian autistic families (266 multiplex and 204 trios). The family-based pedigree disequilibrium test (PDT) and the family-based association test (FBAT) were used in the analysis. Extended multifactor dimensionality reduction (EMDR) analysis was employed to identify potential gene-gene effects. Multi-locus Geno-PDT, the association in the presence of linkage (APL) method and conditional logistic regression were used to confirm gene-gene interaction in the models identified by EMDR.

Results: Significant allelic association was found for RS1912960 (GABRA4; p=0.01). Consistent with the allelic association result, EMDR confirmed the main effect at RS1912960 (GABRA4) and identified a significant gene-gene effect models: a 2-locus model involving 2 SNPs, one in GABRA4 and one in GABRB1. The Geno-PDT and the APL confirmed these findings indicating a common genotype and haplotype combination positively associated with disease. Conditional logistic regression further supports these findings (OR=2.9 for interaction term, p=0.002), suggesting that GABRA4 might be involved in the etiology of autism, increasing autism risk through interaction with GABRB1.

Conclusion: These results support the hypothesis that GABAR subunit genes are involved in autism risk, possibly through complex gene-gene interactions.

P4A.1.14 **CHROMOSOMAL REARRANGEMENTS IN AUTISM SPECTRUM DISORDERS.** P. Malenfant, L. Waintraub, X. Liu, J. Holden and ASD-CARC. Department of Physiology, Queen's University.

Although genetics plays a role in the etiology of ASDs, no specific genes have been identified as risk factors for idiopathic ASD. The recent identification of duplicons (or low-copy repeats, LCRs) has triggered considerable interest in investigating unstable genomic regions for their role in susceptibility to ASDs. Non-allelic recombination between LCRs leads to deletions and duplications of the intervening genetic material, with the possibility of uncovering susceptibility genes.

Objective: Our hypothesis is that duplicon-mediated chromosomal rearrangements are involved in at least some cases of autism.

Methods: We examined chromosomal regions known to harbour duplicons and associated with various disorders caused by deletions/duplications following recombination between tandem duplicons. These include chromosomal regions for Prader-Willi and Angelman syndromes, Neurofibromatosis type 1, Smith-Magenis syndrome, Williams Beuren syndrome, Charcot-Marie-Tooth type 1A and DiGeorge/Velocardiofacial syndrome. Other regions known to either harbour duplicons or to be unstable were also investigated. We tested parents and affected individuals from 179 sib-pair families and 65 simplex families at 2 or more microsatellite markers located within each region of interest to identify cases showing non-Mendelian inheritance.

Results and Conclusions: In approximately 380 informative meioses, only one deletion was identified in affected siblings from one multiplex family. The deletion was paternal in origin. Characterization of the breakpoints and identification of candidate genes is in progress.

Funded by a CIHR-IHRT grant (#43820) to JJAH and ASD-CARC (www.autismresearch.ca), an OMHF grant to JJAH and an OMHF studentship to PM. PM is a trainee with the CIHR/NAAR STIHR Inter-Institute

Autism Spectrum Disorders Training Program (PI: JJAH).

P4A.1.15 **MDR-PHENOMICS: A NOVEL APPROACH TO UNTANGLING THE GENETICS OF AUTISM.** E. Martin, M. Cuccaro, H. Mei, P. Whitehead, G. DeLong, R. Abramson, H. Wright, J. Hussman, J. Gilbert and M. Pericak-Vance. Center for Human Genetics, Duke University Medical Center.

Genetic heterogeneity in studies of complex diseases such as autism limits identification of disease genes. Development of statistical methods that integrate clinical information into genetic analyses to establish homogeneous subsets of families is critical for gene discovery.

Objective: To present a novel statistical approach that incorporates phenotypic and genetic data into gene discovery and applies this method in a large, clinically rich autism family dataset.

Methods: The multifactor dimensionality reduction-pedigree disequilibrium test (MDR-PDT) is a statistical approach developed to detect gene-gene and gene-environment interactions in family data. We modified this approach to incorporate proband-specific characteristics. This new approach, MDR-phenomics, uses information about genetic association at specific markers and clinical covariates. The algorithm searches for combinations of clinical covariates that maximize the genetic associations to identify phenotypic subsets influenced by the gene under study. The advantage of MDR-phenomics is that no a priori hypothesis is necessary regarding which combination of variables will maximize the results. Computer simulations were used to evaluate the method, and we applied this approach to autism families. We analyzed polymorphisms in GABA sub-unit genes, using measures of severity and level of function.

Results: Simulations demonstrate validity of the approach and show that the method has reasonable power to identify disease genes in the presence of heterogeneity. Analysis of GABA loci in the autism families will be presented.

Conclusions: Incorporating phenotypic information in genetic studies is crucial to decrease heterogeneity. MDR-phenomics provides a rigorous statistical tool for dissecting the cause of autism and other complex genetic diseases.

This work was supported by NIH grants NS26630 and NS36768 and by the National Alliance for Autism Research (NAAR) and JP Hussman Foundation.

P4A.1.16 **SUPPORT FOR ENGRAILED 2 AS AN AUTISM SPECTRUM DISORDER SUSCEPTIBILITY GENE.** J. Millonig, R. Benayed, N. Gharani, V. Mancuso, G. Lazar, S. Kamdar and L. Brzustowicz. UMDNJ-Robert Wood Johnson Medical School.

Our previous research using 167 nuclear families from the AGRE dataset (hereafter called AGRE I) demonstrated that the two intronic SNPs (rs1861972 and rs1861973) of the homeodomain transcription factor ENGRAILED2 (EN2) are significantly associated with Autism Spectrum Disorder (ASD) (Gharani et al., 2004). In the present study, association of rs1861972 and rs1861973 was tested in two additional datasets, 225 further families from AGRE (AGRE II dataset) and 143 families from the NIMH collection. Significant evidence for association was observed in the AGRE II dataset (rs1861972- rs1861973 haplotype: narrow: P= 0.00547 broad: P=0.00185), replicating our previous results. In the NIMH dataset, a trend towards significant association was observed. Additional evidence of association was observed when the data from the AGRE I and II datasets (389 families) were combined and analyzed (rs1861972- rs1861973 haplotype: narrow: P= 0.0000081; broad: P=0.0000043 and when the data from all three datasets were combined and analyzed (532 families) (rs1861972- rs1861973 haplotype: narrow: P= 0.000002; broad: P=0.000001). These genetic data are consistent with EN2 contributing to ASD genetic susceptibility. These genetic data provide further evidence that EN2 might act as an ASD susceptibility locus. Support: NAAR; J.M.

P4A.1.17 **EVIDENCE FOR AN AUTISM SUSCEPTIBILITY GENE ON CHROMOSOME 21 IN A SUBSET OF FAMILIES WITH A HISTORY OF DEVELOPMENTAL REGRESSION.** C. Molloy and M. Keddache. Cincinnati Children's Hospital Medical Center.

Autism is a pervasive developmental disorder with a strong genetic component. Candidate regions of the genome have been identified, but sample heterogeneity in this clinically defined syndrome has hindered efforts to locate genes conferring susceptibility to autism. Subsetting samples by distinct, non-diagnostic clinical features has been recommended to decrease sample heterogeneity. A feature that may define one subgroup is a history of developmental regression, occurring in approximately 30% of children with autism.

Objective: To perform a genome wide scan for autism susceptibility using affected sibling pair (ASP) linkage analysis in a sample of families characterized by a history of regression.

Design/Methods: The database of the Autism Genetic Resource Exchange (AGRE) was examined to identify families with a history of developmental regression as measured by the Autism Diagnostic Interview Revised (ADI-R). Genotype data for 408 microsatellite markers across the genome were analyzed in these families with parametric multipoint linkage analyses under dominant and recessive models using Genehunter v2.1_5.

Results: In this sample of autism-ASPs (n = 137) in which at least one sibling had a history of regression, multipoint maximum LOD scores of 3.76 and 2.27 were observed on 21q and 7q respectively under the dominant model of inheritance when the phenotype was defined by regression.

Conclusion: Genetic elements mapping to a 7 Mb region on chromosome 21 are likely to confer susceptibility to autism or modify disease presentation in a subgroup of children characterized by a history of developmental regression.

Supported by the Cure Autism Now Foundation and AGRE

P4A.1.18 **NRCAM: A MAJOR SUSCEPTIBILITY GENE FOR AUTISM.** R. Pullarkat, D. Kowal, P. Pullarkat, B. Chiou and M. Junaid. NYS Institute for Basic research in Developmental Disabilities.

Autism is the most heritable complex disorder of infancy and probably caused by the interaction of more than ten aberrant genes. So far none of the major susceptibility genes has been identified.

Objective: To evaluate whether gene expression analysis of lymphoid cells from autism families with multiple affected children will aid in the identification of the susceptibility genes.

Design/Methods: Lymphoid cells from families with multiple affected children provide a readily available single cell system in studying aberrant gene expression. Cells from parents and unaffected sibs allow comparison of the data under the same genetic environment. We conducted microarray analyses of RNA from lymphoid cells were carried out using Affymetrix HG-U133 plus 2 arrays.

Results: Microarray data showed increased expression of neuronal cell adhesion molecule gene (NRCAM) in patients. Western blot analysis of brain proteins showed about three-fold increase in NRCAM levels in seven out of eight patients. NRCAM is involved in the development of Purkinje cells, a cell type that is affected in autism brain. The gene lacks TATA or CAAT boxes and downstream promoter element. Core promoter region is GC-rich and contains multiple CACCC and GGGCGG boxes implicating involvement of Sp1 transcription factor. Sequencing the promoter regions is underway to identify SNPs, that may regulate NRCAM expression.

Conclusion: NRCAM may be a major susceptibility gene for autism. This is the first report of a susceptibility gene whose function is related to the neuropathological defects in autism. Supported in part by a grant from NIH (NS40691).

P4A.1.19 **ASSOCIATION OF AUTISM TO CHROMOSOME 19.** R. Rabionet, D. Ma, I. Konidari, E. Martin, A. Ashley-Koch , G. DeLong, R. Abramson , H. Wright, M. Cuccaro, J. Gilbert and M. Pericak-Vance. Duke University Medical Center.

Study Objectives: Evidence from genome-wide screens suggests the involvement of chromosome 19 in autism. The purpose of this study was to investigate this involvement by finemapping a previously identified linkage region on chromosome 19.

Methods: SNPs within the region were identified using Applied Biosystems “Assay on demand” or ordered as custom assays, and genotyped using TaqMan®, following the manufacturer's recommendations. Association analysis was performed by PDT and geno-PDT.

Results: We previously presented the results of our linkage study on 210 multiplex families ascertained through Duke and AGRE (AGRE1) (maximum heterogeneity linkage score (HLOD) of 2.38 at marker D19S593 (17.17Mb)). We further investigated an additional 200 AGRE families (AGRE2), and the HLOD scores did not increase, indicating that the majority of the linkage signal comes from the AGRE1 subset of families. Using the M-test we found significant evidence for heterogeneity showing AGRE1 was significantly different from both Duke and AGRE2 with respect to these linkage data (p=0.001). Fine mapping of the region with SNPs located ~ every 100Kb flanking D19S593 using association studies (Pedigree Disequilibrium Test (PDT) and Geno-PDT (genotypic associations)) showed evidence for significant association (AGRE1 dataset) for rs901792 (p<0.005; 16.65Mb)), rs1870071 (16.37Mb), rs2305777 (13.90Mb) and rs7125 (18.15Mb) (p<0.05). To further define the central candidate region, we are finemapping across the area in the AGRE1 subset of families using SNPs at an approximate density of 20Kb.

Conclusions: The AGRE1 subset of families show linkage to a region of chromosome 19 peaking at D19S593. Association analysis of this region shows four regions of significant association that are being further investigated.

This work has been supported by NIH grants NS26630 and NS36768

P4A.1.20 **GENETIC HETEROGENEITY IN THE TRIAD OF AUTISTIC IMPAIRMENTS AS ASSESSED AS QUANTITATIVE TRAITS.** A. Ronald, F. Happé and R. Plomin. Social Genetic Developmental Psychiatry Center, Institute of Psychiatry.

The view pervades that autism spectrum disorders (ASDs) are highly heritable and defined primarily by a triad of impairments -- social impairments, communication difficulties, and restricted repetitive behaviors and interests (RRBIs); at the same time, there is no empirical evidence to demonstrate whether the same genetic and environmental influences affect these three types of impairments.

Study Objectives: To determine the genetic architecture of the triad of impairments that characterize ASDs by using quantitative measures.

Method: A sample of >3000 monozygotic (MZ) and dizygotic (DZ) twins from the U.K.-based Twins Early Development Study (TEDS), were assessed on measures of DSM IV-relevant behaviors at age 7 and on the Childhood Asperger Syndrome Test (CAST) at age 8, by parents and teachers. Twin model-fitting was used to analyze the data.

Results: MZ correlations were consistently higher (.60-.82) than DZ correlations (.17-.49) suggesting genetic influence on all three impairments. Model-fitting analyses confirmed that all three impairments are highly heritable (62-81%). Moreover, multivariate genetic analyses revealed that largely different sets of genes are involved (genetic correlations, indicating degree of genetic overlap, were .07-.50) between the three domains. Greatest genetic heterogeneity was found between social impairments and RRBIs.

Conclusions: This is the first study to suggest on the basis of twin data that the triad of impairments that characterize ASDs may be due to largely different sets of genes. The most direct implication of these findings is that molecular genetic projects might benefit from studying social impairments and RRBIs separately.

TEDS is supported by program grant G9424799 from the UK Medical Research Council.

P4A.1.21 **MAPPING CHROMOSOME 15 REARRANGEMENTS BY HIGH RESOLUTION ARRAY-COMPARATIVE GENOMIC HYBRIDIZATION (CGH): IMPLICATIONS FOR GENOTYPE-PHENOTYPE CORRELATIONS IN ANGELMAN SYNDROME.** T. Sahoo, S. Peters , J. German, L. Bird, C. Bacino and A. Beaudet. Baylor College of Medicine.

Study Objectives: To develop a high resolution array-CGH platform to map recurrent and novel rearrangements involving chromosome 15. To assess phenotypic variability, especially autistic features, in Angelman syndrome with different classes of deletions.

Methods: We have developed a genomic large-clone based microarray for CGH with a resolution of greater than one clone per Mb for chromosome 15. The array includes subtelomeric clones for all other chromosomes thus enabling comprehensive molecular karyotyping. Our array was validated using a series of cases with cytogenetically characterized segmental gains and losses for 15q to determine the ability of the array to identify rearrangements and localize the

boundaries with precision. Accurate characterization of the deletion size/class in a subset of Angelman syndrome (AS) cases (n=22) was carried out. The ADOS and ADI-R were used to evaluate for autism in these children.

Results: Our chromosome 15-specific microarray is enabling accurate identification of the whole spectrum of 15q rearrangements seen in autism and Prader-Willi/Angelman syndrome. Analysis of deletion class in AS and assessment for autism reveals significant differences in the phenotype in the two molecular classes (X2 = 6.60; p=.01). Children with larger, class I deletions (n=9 of 11) were significantly more likely to meet criteria for autism than those with smaller, Class II deletions (n=2 of 10). One child who also met criteria for autism had an atypical Class II deletion.

Conclusions: Array-CGH serves as a comprehensive molecular assay to help us identify recurrent chromosomal rearrangements, define important genotype-phenotype correlations, and help predict important phenotypic variability in these patients. There are at least four known genes that are deleted in class I but not class II deletions, thus raising the possibility of a role for these genes in the significant differences in the phenotype, primarily autistic features, between patients with class I or class II deletions.

P4A.1.22 **EXAMINATION FOR ASSOCIATION OF REELIN IN ASPERGER SYNDROME.** D. Skaar, J. Solomon, A. Mazurek, J. Jaworski, H. Wright, R. Abramson, J. Gilbert, M. Cuccaro and M. Pericak-Vance. Duke University Center for Human Genetics.

Reelin (RELN) is a candidate gene for Autism, given its location on chromosome 7 in a region of significant autism linkage, and that markers within RELN have been shown to have significant associations to autism. RELN is now being tested as a candidate gene for Aspergers, given the similarities between Aspergers and autism, with Aspergers hypothesized to be a subset of autism.

Objective: Test single nucleotide polymorphisms (SNPs) in and around RELN for association in a group of Aspergers families.

Design/Methods: Fifty families were recruited through the Duke Center for Human Genetics and the University of South Carolina. Genomic DNA purified from blood was used in Applied Biosystems SNP genotyping assays. Association scores were determined by the pedigree disequilibrium test (PDT) and geno-PDT, and linkage scores were calculated by two-point FASTLINK, HOMOG, and Aspex.

Results: Of four SNPs tested in RELN and three SNPs tested in the neighboring gene ORC5L, none showed significant associations in this dataset. However, one SNP in RELN exon 50 did show positive linkage scores, strongest when considered under a recessive model, with HetLOD scores of 1.37 and 1.45 by two-point FASTLINK and HOMOG tests, respectively.

Conclusions: These results do not support RELN as a major susceptibility gene for Aspergers, however, due to the limited sample size, a more moderate effect cannot be excluded. The linkage scores suggest that chromosome 7 does have a role in Aspergers.

This work is supported by NIH grants NS26630 and NS36768 and by the National Alliance for Autism Research (NAAR)

P4A.1.23 **HIGH DENSITY SNP ASSOCIATION ANALYSIS OF 16.6MB COVERING AN AREA OF LINKAGE TO AUTISM ON CHOMOSOME 17.** J. Stone, B. Merriman, D. Geschwind, S. Nelson and A. Consortium. UCLA, Department of Human Genetics.

17q11 was previously identified through linkage analysis as potnetially harboring a susceptibility locus for autism (MLS 2.83) in the Autism Genetic Resource Exchange (AGRE) multiplex family sample (Yonan et al., 2003). Stone et al. (2004) found further evidence for a male-specific susceptibility allele at 17q11 (MLS 4.3) when the AGRE families were stratified based on the presence of at least one affected female in a family. In an effort to follow up on these linkage findings, we have typed 2052 SNPs in 226 trios from the AGRE resource covering 16.6MB (average intermarker distance = 8Kb) on chromosome 17. SNPs were tested for association using the transmission disequilibrium test (TDT). 308 of the SNPs assayed showed a skewed transmission bias at a p-value less than 0.05. The most striking transmission distortion was significant at a p-value of 0.0001 (uncorrected) and is located in the myosin ID (MYO1D), a brain expressed gene believed to work with actin molecules as a molecular motor of the cell.

These high density SNPs have also been used to reconstruct haplotypes over this large region and test for haplotype based associations.

P4A.1.24 **SINGLE GENE CANDIDATE APPROACH IN AUTISM SPECTRUM DISORDER.** F. Tassone, K. Butler DeRose, S. Nowicki, R. Hagerman, R. Hansen, L. Li, P. Hagerman and F. Tassone. Department of Biochemistry and Molecular Medicine, UC Davis, and The MIND Institute.

Study objectives: A number of genes have been associated with autism by linkage studies. To further assess this association, genes selected on the basis of previous linkage with behavioral features of autism or because their role in mediating environmental factors hypothesized to contribute to autism susceptibility, were interrogated using a case-control association study in a well characterized clinical cohort.

Methods: Subjects were evaluated at the MIND Institute after informed consent was obtained according to institutional IRB approval. A clinical assessment, including medical history, cognitive testing, ADOS-G and ADI-R, was carried out for each patient. Families with a typically developing child were included in the study as well as samples of fragile X with autism. Genotyping analysis was carried out by PCR analysis following conditions specific to the single polymorphism analyzed.

Results: Allelic genotyping was performed using a cohort of 94 individuals with autism seen at the M.I.N.D. Institute and 100 control individuals without autism for the following genes: ADA, 5-HTT, GST M1 and T1, DBH 5' and RELN. Preliminary data show a significant association with the GST-M null allele ($p<0.04$) and marginal significance with the ADA2 gene ($p<0.06$). No significant association was found for any polymorphisms analyzed in individuals with fragile X and autism (25 samples) compared to controls.

Conclusions: Significant differences in genotype pattern between individuals with autism and controls were found in the GST M1 and in the ADA genes. Further correlation with the clinical characteristics (including history of regression, infections) in the autistic samples will be presented.

This work has been supported by the UC Davis Health Systems Research Award Program (FT) and by the NIEHS ES11269 (PJH, RH).

P4A.1.25 **CONFIRMATION OF THE ASSOCIATION OF THE C4B NULL ALLELLE IN AUTISTIC DISORDER.** A. Torres, A. Cutler, T. Sweeten and J. Odell. Utah State University.

Using case-control studies our laboratory has consistently found an association between certain human leukocyte antigen (HLA) genes on chromosome 6p and autistic disorder (autism), yet numerous genome-wide screens using sib-pair linkage analysis fail to substantiate involvement of this genomic region. However, the history of immunogenetic researcher has shown that sib-pair designs are ineffective at detecting HLA involvement in various diseases (i.e. thyroid disease) where significant HLA associations have been established by other methods.

Objective: To determine if our previous finding of an increased frequency of the C4B null allele (C4BQ0) in autism was repeatable in a new, larger set of well-diagnosed subjects from various geographical regions.

Design/Methods: Subjects from Utah and Oregon were evaluated including 85 with autism and 69 healthy controls. All subjects met DSM-IV criteria for autism as confirmed by the ADOS and ADI. Control and autistic subjects were of similar age and gender. C4 protein allotypes were determined by immunofixation electrophoresis.

Results: Of the autistic subjects studied, 42.4% carried at least one C4BQ0, compared to 14.5% of the control subjects ($p=0.00013$) with a relative risk of 4.33. Over half of the autistic subjects with C4B null alleles also had C4A duplications. A marked increase in the ancestral haplotype 44.1 that contains C4BQ0 and 2 C4A genes was also noted.

Conclusion: The results of this study suggest that C4BQ0, or a nearby HLA gene, may contribute to the genetic susceptibility of autism. In ongoing research, our laboratory continues to evaluate the association of HLA genes with autism.

This work was supported by NICHD Grant P01 HD35476 and PHS Research Grant M01-RR00064.

P4A.1.26 **RH AND ABO MATERNAL-FETAL INCOMPATIBILITY AND RISK OF AUTISM.** P. Zandi, A. Kalaydjian, M. Fallin, D. Avramopoulos, Yuquing and C. Newschaffer. Johns Hopkins Bloomberg School of Public Health.

Background: The etiology of autism is likely complex and may involve non-Mendelian mechanisms of transmission. Rh maternal-fetal incompatibility is a non-Mendelian phenotype that may lead to an adverse prenatal environment with implications for fetal neuro-development. Two epidemiologic studies have implicated Rh incompatibility as risk factors for autism. However, these studies were of limited sample size and the results were inconclusive.

Objective: To assess whether Rh maternal-fetal incompatibility or, alternatively, the presence of a susceptibility allele at the maternal or fetal Rh locus is associated with autism risk.

Methods: The Rh locus was genotyped in a sample of 403 autism trios (an affected offspring and biological parents) collected by the Autism Genetics Resource Exchange (AGRE). The data was analyzed using the maternal-fetal genotype incompatibility (MFG) test adapted by Sinsheimer and colleagues (2003) from the log-linear model for case-parent trios of Weinberg and colleagues (1998).

Results: All trios had at least one parent genotyped, and over 90% had both parents. Approximately 76% of the affected offspring were male, and over 85% had at least one older sibling. Models tested did not show any evidence of maternal-fetal incompatibility ($p<0.5$) or the presence of a high risk allele in the child ($p<0.25$) or mother ($p<0.5$). Results were similar when a narrow diagnosis of autism was considered and all trios from a multiple birth were excluded.

Conclusions: Despite the large sample size, there was no evidence that Rh maternal-fetal incompatibility increases the risk for autism.

P4A.1.27 **AGE & TISSUE-SPECIFIC MISREGULATION OFF IMPRINTED AUTISM-CANDIDATE GENE EXPRESSION IN THE MECP2-KNOCKOUT MOUSE.** L. Herzing, J. Lyons and A. Broz. Dept of Pediatrics,Children's Memorial Research Center, Northwestern University SOM.

Mutations in the Rett syndrome (RS) gene MeCP2 have been identified in Angelman syndrome (AS) and autism, highlighting the phenotypic overlap between these disorders. UBE3A, the AS gene, and ATP10C are maternally expressed imprinted genes within the autism candidate region 15q11-q13. We have previously demonstrated altered total (UBE3A) and imprinted (ATP10C) expression in cortex from male and female RS patients, and in cell lines carrying AS-imprinting center (IC) deletions.

Objective: To determine the relationship between phenotypic regression in the Mecp2-knockout mouse model of RS and expression in brain regions exhibiting preferential (olfactory bulb; OB) or partial (cortex; CX) Ube3a imprint.

Methods: Relative gene expression between Mecp2-deletion animals/ littermate controls was quantitated using Real-Time RT-PCR. Allele-specific expression was determined using sequencing and RFLP analysis on animals carrying polymorphisms of known parental origin.

Results: Atp10c expression is imprinted in mouse brain, and, as seen in human cortex, loss of Mecp2 is coordinate with a decrease in maternal expression. Ube3a imprinted expression is unaffected by Mecp2 deletion; however, total expression varies considerably over lifespan in a region-specific manner. In both OB & CX, expression increases transiently in the juvenile/early adult period, prior to phenotype development. In CX, however, basal levels are low (50-80%) from birth, whereas wild-type OB expression increases to 150-200%, then declines to 60-80% in aged animals.

Conclusions: Loss of Mecp2 disrupts regulation of autism-candidate genes controlled by the AS-IC. Aberrant expression of these genes may contribute to regression, and to the overlap between RS, AS and autism. Sponsors: PFF, IRSA.

P4A.1.28 **OCCURRENCE OF LANGUAGE REGRESSION AND EEG ABNORMALITIES IN CHILDREN WITH DOWN SYNDROME AND AUTISTIC SPECTRUM DISORDER.** f. hickey and B. Patterson. Cincinnati Children's Division of Developmental Disabilities.

Objective: To determine clinical characteristics, including language regression and results of prolonged (greater than 23 hours) EEG's, of children with the dual diagnosis of Down syndrome and autistic spectrum disorder.

Methods: A retrospective chart review of children with Down syndrome (18 months-18 years), evaluated from 1981-1999, was performed to identify children diagnosed with autistic spectrum disorder. Two developmental pediatricians reviewed the charts to ascertain that the DSM-IV criteria for autism or PPD-NOS were met. Eighteen children were identified as having autistic spectrum disorder and 13 of these had prolonged EEG studies.

Results: Six of 13 children identified had abnormal EEG findings-3 had slowing; 3 had epileptiform spikes. None of the children had a history of clinical seizures when diagnosed with autism. Twenty percent (3/13) had epileptiform abnormalities on their EEG's, this is the same percentage reported in the general population of children with autistic spectrum disorder. Seven of the 13 children in the study (54%) had a history of language regression in comparison to the 20-30% of all children with autism described with language regression in the literature.

Conclusion: Children with Down syndrome and autistic spectrum disorder have evidence of EEG abnormalities on prolonged EEG studies in the same incidence as reported in children with autism in the general population (20%). However, the clinical history in this dual diagnosis population indicates an increased occurrence of language regression (54% vs. 20-30%), which suggests a possible role of chromosome 21 in language regression in autistic spectrum disorder.

Research supported by Emily Hays Fund.

## Poster Session 4A: Topic 2

### *Emotions & Behavior*

P4A.2.1 **EEG ASYMMETRY AND SOCIAL-EMOTIONAL BEHAVIORS IN HIGH FUNCTIONING AUTISM: A REPLICATION STUDY.** C. Burnette, N. Zahka, C. Schwartz, S. Sutton, H. Henderson, A. Pradella and P. Mundy. University of Miami.

Objective: Previous observations indicate that resting frontal electroencephalogram (EEG) asymmetry is a measure of neuro-motivational processes that provide a marker of subtypes in social-emotional development in children with high functioning autism (HFA; Sutton, et al. 2004). The present study replicates and extends these findings with an independent sample.

Design/Methods: Participants were 24 HFA children between 8- and 15-years-old. Diagnoses were confirmed with the Autism Spectrum Screening Questionnaire (ASSQ) and the Social Communication Questionnaire (SCQ). Social emotional functioning was assessed with parent report and child self-report on three questionnaires. Resting EEG data from paired left and right hemisphere frontal electrode sites were collected during twelve 30-second trials. Frontal asymmetry scores were computed for each child such that higher scores indicated relatively more left than right frontal activity.

Results: Consistent with data from Sutton et al., left frontal asymmetry was significantly related to self-reports of more Social Stress, Anxiety, and Fear of Negative Evaluation (rs .44 - .64, ps < .02). Left frontal asymmetry also was significantly related to self-reports of greater interpersonal problems, less sense of control, and more atypical and obsessional thoughts (rs = .35 to .45, ps < .05). Measures of IQ were not correlated with asymmetry. Thus, HFA children with higher left frontal asymmetry scores report more emotional and behavioral difficulties than do children with right frontal asymmetry.

Conclusions: These results provide support for the hypothesis that frontal asymmetry is a bio-behavioral marker of clinically significant differences among HFA children.

Funding: UM CARD Research Fund.

P4A.2.2 **REPETITIVE BEHAVIORS AND SENSORY PROFILES IN CHILDREN WITH AUTISM SPECTRUM DISORDERS.** R. Gabriels. University of Colorado Health Sciences Center/The Children's Hospital.

The few available studies in the area of restrictive and repetitive behaviors (RRBs) and sensory profiles in children with autism spectrum disorders (ASD) suggest a possible relationship between these variables.

Objective: To assess the relationship between the severity of RRBs and sensory abnormalities in children

with ASD.

Design/Methods: Preliminary data (Sensory Profiles, Repetitive Behavior Scale-Revised, and IQ) from a larger chart review study were examined from 16 children (3 to 15 years; Mean age = 9.94) with a clinical diagnosis of an ASD. Population demographics were as follows: 69% on psychotropic medications, 44 % pubescent, 50% had co-morbid psychiatric diagnoses, and one child had a seizure disorder.

Results: The RBS-R total score was significantly correlated (r = -0.575; p = .020) with the sum of the 6 subscales from the Sensory Profile (Auditory Processing, Visual Processing, Vestibular Processing, Touch Processing, Multisensory Processing and Oral Sensory Processing). Partial correlation controlling for the effects of IQ and age continued to indicate a significant relationship (r = -0.601; p = .023). The 6 Sensory Profile subscale correlations with the RBS-R total score revealed a significant correlation with the Visual Processing subscale after adjusting for multiple comparisons (r = -0.645; p = .007). The Touch Processing subscale approached significance (r = -0.558; p = .025).

Conclusions: Relationships between RRBs with other neurophysiologic characteristics, controlling for IQ, may assist in identifying subgroups of better responders to targeted interventions. This has significant implications for neurobiological studies including dissection of genetic etiology.

P4A.2.3 **THE RELATIONSHIP BETWEEN STEREOTYPED MOVEMENTS AND SELF INJURIOUS BEHAVIOURS.** E. Gal, M. Dyck and A. Passmore. University of Haifa.

Stereotyped movements (SM) and self-injurious behaviors (SIB) are both included under the umbrella term "repetitive behaviours". The link between the performance of SM and emergence of SIB is often observed in people with autism for whom repetitive behaviours are known to be a defining feature. However relationships between these constructs remain unclear.

Objective: Assess the relationship between SM and SIB and investigate if they represent a continuum of behaviours distinguished by their severity.

Design/Methods: One hundred and sixteen children aged 6 to 12 years participated in this study, including typically developed children, and children with autism, intellectual, vision and hearing disabilities. The children's teachers were interviewed using the Stereotyped and Self-Injurious Movements Interview (SSIMI) which was used to identify each child's repetitive movements.

Results: Comparison of mean SM and SIB scores showed a significant difference between groups (one way ANOVA, F test; P-value<0.01). SM and SIB scores were significantly correlated (0.579; P-value<0.001). The presumed extreme form of behaviour (SIB) was rarely evident (3% of the cases) in the absence of the less extreme form of behaviour SM. Conversely, SM was evident more often in the presence of SIB (51%). However, frequency of occurrence of SM and SIB, did not provide any evidence of a threshold level of SM at which SIB is likely to be displayed.

Conclusions: Some of the SIB and SM may represent a sequence of behaviors that fall under one umbrella term, while others may serve a different function.

Source of funding: Australian Postgraduate Awards

P4A.2.4 **A COMPARISON OF BEHAVIORAL AND EMOTIONAL FUNCTIONING IN CHILDREN WITH AUTISTIC DISORDER AND PDD-NOS.** D. Pearson, K. Loveland, D. Lachar, D. Lane, B. Handen, C. Johnson, S. Reddoch, R. Mansour and L. Cleveland. Univ. of Texas Medical School at Houston.

Objective: To compare behavioral and emotional symptomatology in children and adolescents with Autistic Disorder (AD) and those with Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS).

Methods: Thirty-five participants meeting DSM-III-R or DSM-IV criteria for AD (30 males, mean age= 9.0 years, mean IQ=69, mean CARS=34) and 25 participants meeting DSM-III-R or DSM-IV criteria for PDD-NOS (20 males, mean age= 9.9 years, mean IQ=90, mean CARS=29) were assessed using the Personality Inventory for Children-Revised, a parent behavioral questionnaire tapping a variety of internalizing and externalizing behavioral and emotional problems.

Results: MANCOVA analyses, controlling for group

differences in IQ, revealed that children with AD had significantly more problems with overall behavioral adjustment, Wilks' Lambda= .507, F(12,46)= 3.73, p=.001. Follow-up univariate analyses revealed that relative to children with PDD-NOS, children with AD had significantly more symptoms of depression (p=.009), social withdrawal (p=.005), atypical behaviors (p<.001), and immature social development (p=.01). These differences emerged even though the mean level of psychiatric symptomatology was generally clinically significant in both groups in each of these four areas (depressive symptomatology and withdrawal did not quite reach clinical significance in the PDD-NOS group). No group differences emerged in somatization, family problems, anxiety, delinquency or hyperactivity, although the mean T-scores for both groups approached clinical significance in the areas of family functioning and anxiety.

Conclusions: Although children with Autism and PDD-NOS appear to manifest a variety of psychiatric and social problems, children with AD are at particularly high risk for these concerns--even when IQ is taken into account.

P4A.2.5 **FACE PROCESSING ABILITIES IN YOUNG CHILDREN WITH AUTISM.** J. Giovannelli, M. Strauss, C. Best, L. Newell, K. Rump, K. Turner and N. Minshew. University of Pittsburgh.

Despite the fact that young children with HFA and Asperger's Syndrome display typical intelligence, face processing abilities are impaired. For example gender recognition, memory for faces, facial prototype formation and ability to recognize subtle expressions of emotion are all thought to be weaknesses. One proposed mechanism that could account for these deficits is the inability to form prototypes in general, and in the present case, prototypical structures regarding information contained in faces. Previous studies suggest that prototype and category formation are deficits in autism (Klinger and Dawson, 2001, 1995; Plastid, 2001), but little is known about the effects of a prototype-formation deficit on face processing. For example the inability to form a prototype or average expression of emotion, while only identifying expressions when presented in a static, artificial, and exaggerated format may be one example of the inability to form prototypical structures.

Objective: Examine face processing abilities in children aged 5-7 with HFA/ Asperger's syndrome.

Design/Methods: 30 HFA/Aperger's Children (aged 5-7) and 30 VMA matched controls were assessed using tasks including; a)participants' ability to identify static, exaggerated expressions of emotions vs. video clips of more subtle expressions of emotion; b)memory for distinctive vs. typical faces; c) gender categorization abilities; and d) prototype formation of artificially constructed faces.

Results and Conclusions: Preliminary results indicate that HFA/Asperger's children perform significantly worse than matched controls on face processing tasks despite equal visual attention to faces, providing support for a prototype-formation deficit. Further research should be conducted with non-face objects to provide additional evidence.

This research was supported by NICHD Grant (HD35469), and by an NICHD Collaborative Program of Excellence in Autism (CPEA).

## Poster Session 4B: Topic 1

### *Emotions & Behavior*

P4B.1.1 **THE USE AND UNDERSTANDING OF SELF-PRESENTATIONAL DISPLAY RULES IN CHILDREN WITH HIGH-FUNCTIONING AUTISM, CHILDREN WITH ASPERGER'S DISORDER AND TYPICALLY DEVELOPING CHILDREN.** J. Barbaro and C. Dissanayake. Child Development Unit, School of Psychological Science, La Trobe University.

Display rules refer to the principles governing emotion expression. Self-presentational display rules (SPDRs) are used to control others' evaluation of the self, requiring recursive cognition. There has been no comparative research on the use and understanding of SPDRs in children with high-functioning autism (HFA) and Asperger's disorder (AsD).

Objective: To investigate the use and understanding of SPDRs in children with HFA, AsD, and typically developing (TD) children.

Design/Methods: The use and understanding of SPDRs were investigated in 21 children with HFA, 18 children with AsD, and 18 TD children (all male, aged 4- to 11-years, matched on overall mental age).

Discreet behaviour categories and an overall global scale were developed for the purpose of coding the children's use of SPDRs during a deception scenario, whereby the child and an experimenter jointly hid a ball from another experimenter. The children's understanding of SPDR's was assessed via three real/apparent emotion understanding questions on three affective-perspective taking vignettes.

Results: The children with HFA and AsD used less effective SPDRs than the TD children, with no differences found between the groups in their understanding of SPDRs. There were no differences in the use and understanding of SPDRs between the clinical groups. While there was a positive relationship between the (effective) use and understanding of SPDRs in the TD children, no such relationship was found in either clinical group.

Conclusions: Children with HFA and AsD present with very similar profiles in their use and understanding of SPDRs, supporting the view that these disorders belong on the same diagnostic continuum.

P4B.1.2 **FACE KNOWLEDGE IN INDIVIDUALS WITH AUTISM: ABSTRACTING SPECIFIC INFORMATION FROM FACES.** C. Best, M. Strauss, L. Newell and N. Minshew. University of Pittsburgh.

Through natural experience with faces, typically developing individuals can abstract a prototype of varying facial features. Valentine (1991) theorizes that faces are represented as a multidimensional “face space” where typical faces are densely stored close to the prototype, whereas distinctive faces are scarce and distant to the prototype. This model explains why distinctive faces are remembered better than typical faces, why typical examples of faces are classified by gender faster than less typical examples, and why individuals rate prototypical faces as more attractive. The ability to abstract specific information from faces begins during infancy and develops through childhood. Yet, research on individuals with autism has not considered whether known face processing deficits are related to their ability to learn how facial features vary and to represent faces in a typicality “face space” structure.

High-functioning children and adults with autism and matched control participants were tested in 4 studies. Experiments studied participants' memory for distinctive versus typical faces, gender categorization ability of faces varying in typicality, prototype formation of artificially constructed faces, and face attractiveness ratings.

Results indicate that individuals with autism are unable to abstract prototypes (i.e., they do not represent faces in a typicality “face space” structure). Unlike controls, they do not remember distinctive faces better than typical faces, they have equal reaction times in categorizing gender of typical and less typical faces, and they differ in perceptions of attractiveness. Results will be discussed in relation to current developmental research concerning infants' and children's face processing abilities.

This research was supported by NICHD Grant (HD35469), and by an NICHD Collaborative Program of Excellence in Autism (CPEA).

P4B.1.3 **FACE PROCESSING IN CHILDREN WITH PERVASIVE DEVELOPMENTAL DISORDER (PDD): THE ROLES OF EXPERTISE AND SPATIAL FREQUENCY.** M. Boeschoten, C. Kemner, L. Kenemans and H. Engeland. Department of Child and Adolescent Psychiatry, Rudolf Magnus Institute for Neurosciences, University Medical Center Utrecht.

Two main hypotheses exist concerning the cause of abnormal face perception in autism: The first proposes that a diminished social interest leads to reduced face expertise which disturbs the acquirement of configural processing of faces. The second holds that abnormalities are the result of a basic abnormality in magno-cellular processing, i.e. low spatial frequency (LSF) processing.

Objective: Investigate the roles of expertise and SF in face perception of children with PDD.

Methods: Measurement of event related potentials (ERPs) and of the dipole sources of the ERPs in response to (upright and inverted) high- and low-pass filtered faces, houses, and stimuli for which children with PDD were experts.

Results: Children with PDD showed the same ERP differences between faces and objects and effects of HSF and LSF content as control children. However, ERP source analyses showed clear differences between groups: In typical children, if stimuli contained LSF, more anterior sources were activated for the

processing of faces whereas more posterior sources occurred for both object categories. This difference was not seen if stimuli contained high spatial frequencies. Children with PDD activated similar posterior sources for all categories in both filter conditions.

Conclusions: Typical children seem to use specific substrates for the processing of faces in comparison to objects, which is mediated by LSF. This is not the case in children with PDD. Present results suggest that these differences are not due to a lack of expertise with faces.

The work described was supported by a grant of Dutch Organization of Scientific Research (NWO) to CK.

P4B.1.4 **A FMRI STUDY OF EMOTION RECOGNITION TRAINING IN AUTISM.** S. Bölte, D. Hubl, S. Feineis-Matthews, T. Dierks and F. Poustka. J.W.Goethe-University, Dept. of Child and Adolescent Psychiatry.

Objective: In this functional magnetic resonance imaging study, we examined the neurobiological correlates of the effects of a computer-based program to teach emotion processing.

Design/Methods: Ten male adolescent and adult individuals with higher functioning autism (ages 17-37) were included in the study. Five of them were randomly selected and intensively trained in basic emotion detection over a period of five weeks using the computer-based Frankfurt Facial Affect Recognition Training (FEFA), while the remainder did not receive any comparable intervention. Two facial affect recognition measures on the behavioural as well as blood oxygen level-depending (BOLD) signal changes in the fusiform gyrus and other regions involved in visual processing of faces of faces were assessed at baseline and post training.

Results: Compared to the control group, the sample of trained subjects with autism showed marked improvements on both behavioural measures ($F>8.5$, $p<.014$), which were accompanied by higher BOLD signals in the right medial occipital gyrus and superior parietal lobule ($F>4.1$, $p<.20$).

Conclusions: Results indicate that gains in facial affect recognition in autism are associated with higher activation in some cerebral regions being part of a compensatory facial processing network, not necessarily with an increase of activation in the fusiform face are.

P4B.1.5 **FACE PROCESSING IN HIGH FUNCTIONING AUTISM: BEHAVIORAL FINDINGS.** S. Faja, S. Webb, G. Dawson, M. Bloomquist and M. Walters. University of Washington.

Introduction: Research indicates that typically developing individuals process faces holistically and make use of configural relations between features. Studies have shown that individuals with autism have difficulty recognizing and remembering faces and that they tend to focus their attention on features within the face.

Study Objectives: This study used two behavioral tests to examine holistic and configural processing in individuals with high functioning autism, as compared to typical controls.

Methods: Two computerized delayed match to sample behavioral measures were used. One paradigm (Joseph & Tanaka, 2003) examines featural versus holistic processing of eyes and mouths, and indirectly tests configural processing by measuring the inversion effect. The other paradigm tests sensitivity to small and large changes in eye and mouth configuration. The two groups were also compared on standardized tasks assessing face and object perception and memory.

Results: The performance of typical controls replicated previous findings by demonstrating advantages for whole faces, a significant inversion effect, and an advantage for the eye region. Controls were also sensitive to changes in configural information, especially large discrepancies. Overall, the group with autism performed significantly worse on both measures of face processing and had significantly longer response times, despite FSIQ above 85.

Conclusions: These results suggest that individuals with autism continue to have generalized difficulty with face processing despite otherwise average perceptual abilities. In addition, their efforts to remember faces were less efficient than controls.

This research was supported by a grant from Cure Autism Now Foundation, NICHD and NIDCD (U19 HD34565).

P4B.1.6 **RESPONSIVENESS TOWARD ADULT PAIN, AND INFANT AND ANIMAL DISTRESS IN YOUNG CHILDREN WITH ASD.** K. Hudry and V. Slaughter. Early Cognitive Development Unit, School of Psychology, University of Queensland.

Sigman's (1992) paradigm, in which participants are exposed to adults displaying negative emotions (e.g., pain, anger), has permitted the investigation of empathy in low-functioning children with ASD. Prior results indicate children with ASD to be less responsive toward emotive adults than are control children.

Study Objective: To further explore the limits of, and possible reasons for this relative unresponsiveness of children with ASD.

Methods: Groups of children (CA = 5.5y) with ASD and Down syndrome, and one group of typically developing children (matched on functional communicative abilities; CA = 2.5y) observed their mother and an unfamiliar experimenter pain (at home and in the lab). Children were also exposed to sounds of an infant crying, a dog whining, and a neutral control sound.

Results: Preliminary analyses oppose previously reported results (Sigman, 1992), as the children with ASD were more interested in and concerned about their mother in pain, than they were about the experimenter. Children with ASD were also more interested in and concerned about the two emotional sounds (dog and infant) than the neutral sound. Simiarly, control groups of children were more concerned about the emotional than the neutral sounds, and inhibited their play at these times. Although interested and concerned, the children with ASD failed to inhibit their play when the emotional sounds were presented.

Conclusions: The empathy deficit in children with ASD may be more likely due to difficulty with appropriate response behaviour toward emotional agents than deficient emotional awareness in the first instance.

P4B.1.7 **REFLEXIVE AND VOLUNTARY ORIENTING TO EYE-GAZE CUES IN YOUNG HIGH FUNCTIONING CHILDREN WITH AUTISM.** G. Iarocci, A. Rombough, J. McLaughlin, N. Jauernig and S. Grant. Simon Fraser University.

Typically developing 4 year old children, as well as adults, automatically orient to the location cued by a gaze stimulus even when they are informed that the gaze cue is not predictive of the target location. Conversely, we found that high-functioning adolescents (HFA) with autism did not reflexively orient to the location indicated by eye-direction cues when they were not predictive of the target location. However, when they were told that the eye-direction cues predicted the location of the target, the adolescents with HFA were able to voluntarily orient as well as their mental age matched peers

Objective: Assess orienting to eye-gaze in younger children with HFA.

Design/Methods: A total of 20 children with HFA and 20 typically developing children (TD), which were matched for mental age, viewed static displays of deviated gaze and were asked to detect targets occurring to the left or right of the face following one of the four cue-target delay intervals Participants were assigned randomly to either the nonpredictive gaze condition or the predictive gaze condition. In the nonpredictive condition a target appeared at the gazed-at or not-gazed-at location 50% of the time. In the predictive condition a target appeared at the gazed-at location 80% of the time and at the not-gazed-at location 20% of the time.

Results: Children with HFA showed no significant difference between predictive and non predictive trials as compared to TD children whose responses were facilitated for valid versus invalid trials at both short and longer cue-target intervals for both predictive and non predictive gaze.

Conclusions: Children with HFA may learn to orient through probalistic correspondence between eye direction and salient events in their environment and may fail to use the social relevance of eye-gaze cues that TD children ordinarily employ.

Funded by: HELP- Human Early Learning Partnership

P4B.1.8 **AN ERP INVESTIGATION OF ATYPICAL PROCESSING OF SPATIAL FREQUENCIES IN SOCIAL AND NON-SOCIAL INFORMATION IN AUTISM SPECTRUM DISORDER.** B. Jemel, M. Boeschoten, L. Mottron, A. Hosein, H. van Engeland and C. Kemner. Riviere-des-Prairies Hospital.

According to recent data involving both social (Lahaie et al., in press) and non social (Plaisted, 1999; Mottron et al., 2001) information, atypical face and emotion perception in autism may be related to peculiarities in low-level visual processing, instead of being a consequence of a social impairment per se. Among the possible candidates is an altered processing of spatial frequencies.

Objective: Investigate early visual processing of high- and low-spatial frequency (i.e. HSF and LSF) gratings as well as the differential use of frequency scales in face/object perception and in the perception of emotions in autism.

Methods: Event related potentials (ERPs) triggered by LSF and HSF gratings, upright and inverted LSF and HSF faces and houses, and LSF and HSF emotional faces were recorded in high functioning autistic (HFA) and Asperger adults (Total N = 14) and in IQ- and age-matched typical adults (N = 14).

Results: Overall, early occipital ERP differences between HSF and LSF stimuli for all categories were reduced in HFA and Asperger adults relative to their matched control group. Differences were even abolished for emotional stimuli. Although both groups showed an occipital-temporal N170 (negative ERP peaking at 170 ms) that was larger to faces than houses, the N170 difference among categories was smaller in patients, in all filter conditions.

Conclusions: These data suggest that social impairment hypothesis cannot univocally explain atypical face and emotion processing in autism. Instead our finding of generalized reduction in ERP spatial frequency differences is consistent with a low-level visual account.

The work described was supported by grants of the Ter Meulen Fund and Van Walree Fund of the Royal Netherlands Academy of Arts and Sciences to MB, by a Canadian Institutes of Health Research grant to LM, a Fernand-Seguin Research Centre start-up grant to BJ and a VIDI grant of the Dutch Organization of Scientific Research (NWO) to CK.

P4B.1.9 **DEVELOPING A QUANTITATIVE MEASURE OF FACE EMOTION RECOGNITION IN AUTISM.** R. Joseph, A. Verbalis, R. McNally, B. Keehn, C. Connolly and H. Tager-Flusberg. Boston University School of Medicine.

Although emotion perception deficits characterize autism, they have not consistently been found in empirical studies. Our goal was to develop a quantitative measure of face emotion recognition using a graded continuum of expression intensity that would be more sensitive to impairment and that could serve as a prototype for much-needed quantitative measures for intervention and other studies.

Participants were 14 high-ability, male children with autism, aged 13-17 years, and 14 age- and IQ-matched, male controls. Face emotion stimuli were made by morphing male neutral faces with increasing increments of one of four emotions (fear, anger, sadness, happiness) from the same face. Participants viewed 2 faces expressing 4 emotions at 10 levels of increasing intensity in an initial test condition and in a retest condition (with different faces) administered one hour later. Participants' task was to name the emotion.

A groupXtest ANOVA showed a main effect of group, $F(1,26)=7.4$, $p<.02$, but no effect of test for either group (i.e., no test-retest effect). Although the autism group performed relatively poorly, this was apparent only at lower intensities. Corollary measures of skin conductance response (SCR) to dynamic presentations of the same 4 emotions revealed increased autonomic arousal in the autism group, $F(1,22)=4.0$, $p<.06$, which was inversely related to their accuracy in the emotion recognition experiment ($r=-.58$). Recognition accuracy was also inversely related to ADOS symptom severity in the autism group ($r=-.45$).

These findings suggest that a continuous, graded test of face emotion recognition can provide a sensitive and valid measure of autism-related social impairment.

This research was funded by the Repligen Corporation and NIDCD (U19 DC 03610; Helen Tager-Flusberg, PI) and was conducted as part of the NICHD/NIDCD Collaborative Programs of Excellence in Autism.

P4B.1.10 **AUTOMATIC PROCESSING OF EMOTIONAL FACES IN HIGH-FUNCTIONING PERVASIVE DEVELOPMENTAL DISORDERS: AN AFFECTIVE PRIMING STUDY.** Y. Kamio, J. Wolf, T. Saitoh, Y. Yamamoto and D. Fein. Kyushu University.

Background: Previous behavioral and neuroimaging studies have revealed atypical face processing in autism; however, the pathogenesis of these abnormalities in autism is unknown.

Objectives: The present study examined automatic processing of emotional faces in children and adolescents with high-functioning Pervasive Developmental Disorders (HFPDD) using an affective priming paradigm.

Methods: In Experiment 1, U.S. participants (HFPDD n=16; controls n=16) were presented with happy faces, fearful faces and objects in subliminal exposure conditions, followed by Japanese ideographs for which the participants provided liking ratings. In Experiment 2, Japanese participants (HFPDD n=24; controls n=24) were presented with happy, fearful and neutral faces in the same subliminal conditions, followed by Korean characters.

Results: Experiment 1: Although controls demonstrated higher liking ratings when ideographs followed emotional faces than when they followed objects, such affective priming was not found in the HFPDD group, despite the fact that they were able to recognize facial expressions consciously. Experiment 2: No differences were found between liking ratings for Hangul following emotional faces and those following neutral faces, for either the HFPDD or control group. In controls, however, the magnitude of affective priming was positively correlated with age, and affective priming was significant for adolescents but not for children. This effect was not found in the HFPDD group.

Conclusions: Results suggest that in typical development, emotional faces have a salience that may develop from an implicit preference for faces. This face preference seems to be absent in PDD individuals. Findings are discussed in terms of the amygdala dysfunction in autism.

P4B.1.11 **EMOTION PERCEPTION IN ASPERGER'S SYNDROME AND HIGH-FUNCTIONING AUTISM: THE IMPORTANCE OF DIAGNOSTIC CRITERIA AND CUE INTENSITY.** C. Mazefsky. Brown University/Virginia Commonwealth University.

Socioemotional deficits characterize individuals with Asperger's Syndrome (AS) and high-functioning autism (HFA). However, studies of nonverbal emotion perception, a key aspect of socioemotional processing, have yielded inconsistent findings. These discrepancies may stem from the utilization of heterogeneous groups or diagnostic criteria with limited differential ability. Furthermore, the role of emotion cue intensity and tone of voice in emotion perception has largely been ignored.

Objective: Clarify emotion perception skills in AS and HFA.

Methods: Thirty children (8 - 15 years) were diagnosed with AS or HFA based on empirically-supported diagnostic criteria for AS (Klin et al., in press) and ADOS/ADI results. Information on adaptive behavior, adjustment, and IQ was gathered (IQ was a covariate). An assistant blind to diagnosis administered an emotion perception test consisting of facial expressions and tone of voice cues that varied in intensity.

Results: Participants with AS and the typically-developing standardization sample of the emotion perception instrument had the same mean emotion perception accuracy, whereas participants with HFA performed significantly worse. Follow-up analyses indicated that group differences were primarily due to significantly more errors by the HFA group on subtle tone of voice cues. Accuracy perceiving this type of cue also showed the strongest relationship to adaptive and social functioning.

Conclusions: Nonverbal emotion perception accuracy differs between AS and HFA, with significant impairments limited to HFA. These group differences suggest that previous inconsistent findings may stem from combining diagnostically distinct groups. In addition, accuracy perceiving subtle tone of voice cues may be particularly relevant to social functioning.

P4B.1.12 **AFFECTIVE DYSREGULATION AND REPETITIVE BEHAVIORS IN AUTISM.** R. McNally, B. Keehn, C. Connolly, K. Dominick and R. Joseph. Boston University School of Medicine.

Objective: To address this hypothesis, we investigated the relationship between social anxiety, elicited by engaging the direct gaze of another person, and repetitive behaviors in 18 children with autism.

Design/Methods: There were two specific hypotheses for our study: (1) children with autism who displayed increased arousal to social stimuli would engage in more stereotyped behaviors, reflecting attempts to decrease autonomic arousal; (2) children who displayed decreased arousal to social stimuli would engage in more repetitive self-injurious behavior as a maladaptive response to an under-aroused autonomic system. This experiment examined autonomic arousal to faces with direct versus averted gaze by measuring skin conductance response (SCR) to computer-presented stimuli. Repetitive behaviors were measured using parents' ratings of children's current behaviors on the Repetitive Behavior Scale-Revised (RBS; Bodfish, 1999).

Results: There was no significant difference between the mean SCR amplitudes, corrected for individual differences in skin conductance level, for direct versus averted gaze. As predicted, there was a significant positive correlation between mean SCR amplitude to direct gaze stimuli and stereotyped behaviors, $r = .518$, $p < .05$. Also as predicted, there was a negative correlation between SCR amplitude to direct gaze stimuli and self-injurious behaviors, but this relationship did not reach significance.

Conclusions: These results provide preliminary evidence that heightened autonomic response to social contact is associated with more frequent and intense stereotyped behaviors in autism.

This research was funded by NIDCD (U19 DC 03610; Helen Tager-Flusberg, PI) and conducted as part of the NICHD/NIDCD Collaborative Programs of Excellence in Autism.

P4B.1.13 **THE NEUROPHYSIOLOGICAL CORRELATES OF FACE PROCESSING IN ADULTS AND CHILDREN WITH ASPERGER'S SYNDROME.** K. O'Connor, J. Hamm and I. Kirk. Department of Psychology, University of Auckland.

Objective: To examine the neurophysiological basis of face and emotional expression processing in children and adults with Asperger's Syndrome (AS) relative to age- and gender-matched neurotypical (NT) controls.

Methods: High-density, 129-channel EEG was recorded in 32 adults (16 AS, 16 NT, 18 to 45 years old) and 32 children (16 AS, 16 NT, 9-14 years old) during the explicit processing of happy, sad, angry, scared and neutral facial expressions.

Results: Analysis of event-related potential (ERP) data revealed that ERPs were similar across facial expression within each group and were therefore collapsed with respect to expression for further investigation. Between groups comparisons found adults with AS to exhibit reduced amplitude and latency duration of the N170 and P300 components relative to NTs. However, these differences were not observed between AS and NT children.

Conclusions: From the present ERP findings we can conclude that a) early face processing differences are present between adults with AS and NTs, which may result from an impaired ability to process facial configurations and b) that the absence of significant differences between NT and AS children may reflect incomplete development of the neuronal generators of the N170 and P300 components.

This research was supported by a grant from the Neurological Foundation of New Zealand. The first author received a Scholarship from the Foundation for Research, Science and Technology of New Zealand.

P4B.1.14 **RECOGNIZING SUBTLE EXPRESSIONS OF EMOTION: INDIVIDUALS WITH AUTISM AND THE EMOTION RECOGNITION.** K. Rump, M. Strauss, J. Giovannelli, K. Turner and N. Minshew. University of Pittsburgh.

Despite a common belief that individuals with autism have difficulty recognizing emotional expression, studies to date have yielded conflicting results. Most studies use prototypic stimuli of expressions and do not control for stimulus presentation time. Thus, in lab settings, individuals may employ compensatory strategies to aid in expression recognition. In real life interactions, however, emotional expressions are often subtle and fleeting. Faced with real life examples, individuals with autism may be less

able to use compensatory strategies; it is in these situations that their deficits in emotion recognition may be clearly delineated.

In this study, high functioning adults and children with autism and matched controls were tested with six basic emotional expressions using both static, prototypic stimuli, as well as dynamic stimuli of varying degrees of subtlety. Participants viewed the static, prototypic stimuli for as long as needed before responding. Dynamic stimuli comprised 2000 millisecond videos exhibiting graded increases in the movement of appropriate facial muscles necessary to model each emotion. Participants were shown each video to determine their emotion recognition "threshold," that is, the level at which they could accurately identify the expression.

Results indicate that while individuals with autism perform similarly to controls on the static, prototypic examples, they perform worse than controls in identifying subtle expressions that are displayed only briefly. Results suggest that individuals with autism may use compensatory strategies to identify emotional expression and that these strategies may not be fully amenable to more typical daily interactions.

This research was supported by NICHD Grant (HD35469) and by an NICHD Collaborative Program of Excellence in Autism (CPEA).

P4B.1.15 **FAMILIAR AND UNFAMILIAR FACE RECOGNITION IN CHILDREN WITH AUTISTIC SPECTRUM DISORDERS.** R. Wilson, M. Blades and O. Pascalis. University of Sheffield.

Face recognition is essential for effective socialisation and communication, however children with autistic spectrum disorders (ASD) have been shown to display deficits in face recognition. Most studies have focussed on unfamiliar face recognition with little research considering familiar face recognition.

Objective: To investigate accuracy and processing style in recognition of unfamiliar and familiar faces.

Design/Methods: Forced choice recognition of recently seen (unfamiliar), or familiar faces, by their inner and outer face features.

Exp 1 Familiar Faces: 17 children with ASD compared to Developmental Delay (DD) and Typically Developing (TD) controls on ability recognise staff from school.

Exp 2: Unfamiliar Faces: 12 children with ASD compared to DD and TD controls on ability to recognise recently seen faces (3 second video of moving face).

Results:

Exp 1: Three groups showed the same pattern of recognition (Full>Inner>Outer) ASD and DD are significantly less accurate than TD but there is no ASD specific processing abnormality

Exp 2: The three groups presented the same pattern of recognition (Full>Outer>Inner), ASD and DD are significantly less accurate than TD but there is no ASD specific processing abnormality.

Conclusions: There was no ASD specific deficit or abnormalities in processing familiar and unfamiliar faces. The results would suggest that children with ASD can be shown to process faces in a manner consistent with their developmental level.

P4B.1.16 **SCREENING FOR AUTISTIC SYMPTOMS IN CHILDREN WITH ADHD.** A. Di Martino, A. Krain, M. Dijkstra , S. Rathor, K. Bannon and F. Castellanos. NYU Child Study Center, Institute for Pediatric Neuroscience, NYU School of Medicine.

Objective: To test the feasibility of using parent ratings on the Children's Communication Checklist-2 (CCC-2) and the Social Responsiveness Scale (SRS) to screen for autistic symptoms in a sample of children with ADHD.

Methods: Participants were recruited through a therapeutic summer day camp designed for children with ADHD. Parents completed the SRS and the CCC-2. The SRS measures deficiencies in reciprocal social behavior as a single continuous variable, thus quantifying autistic traits below the threshold for a full diagnosis of autism. Higher scores indicate greater social impairment. The CCC-2 provides a general communication composite score assessing language structure, vocabulary, and discourse; and a social interaction-deviance composite score (SIDC), measuring the disproportion between pragmatic-social and structural language impairments.

Results: Twenty-five parents and their children (age range: 7-12 y, 23 male) consented to participate. All children were diagnosed with DSM-IV ADHD. On the CCC-2, 18 of 23 (78%) had a SIDC score below 0,

suggestive of impaired pragmatic language or Autism/Asperger's syndrome. On the SRS, 18 of 24 (75%) had a total score above 60. By reference, children with PDD-NOS or Asperger's are reported to score between 60 and 165. Of the 22 children with both ratings, 40% exceeded screen cut-offs on both scales.

Conclusion: Both the CCC-2 and SRS appear to be useful in detecting autism-related symptoms in comorbid children who are also inattentive, and/or hyperactive and impulsive. Preliminary results on the correlates of these symptoms, such as cognitive measures of inhibition/interference control and rhythmic motor responses, will also be reported.

This study was supported by a grant from Stravros Niarchos Foundation

P4B.1.17 **THE FUNCTIONAL ANALYSIS: EXAMINING THE ATTENTION COMPONENT OF A TANGIBLE CONDITION.** S. Ferraioli and K. Potoczak. University of Rochester.

Determining the function of a problem behavior is important for planning treatment. For example, a behavior that serves to obtain access to tangible items may require a different intervention from a behavior that serves to secure attention from other people. However, standard assessment procedures may not accurately distinguish between these functions.

Objective: Establish attention as a confound of the tangible condition.

Method: A single subject multi-element experimental design was employed to evaluate an Experimental Functional Analysis (EFA). Participants included two children with autism who exhibited verbal perseverations (e.g., repeating "I want skittle"). The EFA included four conditions: attention, in which the behavior was reinforced with social validation; tangible-attention, in which the behavior was reinforced with attention and an edible; tangible-no attention, in which the behavior was reinforced with an edible presented in a stimulus box; and play (control). Frequencies of aberrant behavior were compared across conditions.

Results: The first subject perseverated primarily during the attention and tangible-attention conditions, establishing attention as the function. The second subject engaged in the behavior primarily during the tangible-attention and tangible-no attention conditions, establishing tangible as the function.

Conclusions: Inclusion of both the tangible-attention and tangible-no attention conditions was critical in isolating the function of behavior. However, because of the heterogeneity of autism and the small sample in the study, replications should be established among populations of varying ages and diagnoses.

This study was submitted as an undergraduate thesis and was privately funded.

P4B.1.18 **RESPONSE TO THE SSRI CITALOPRAM FOR CHILDREN WITH AUTISM SPECTRUM DISORDER.** S. Gallagher, K. Lekagul and S. Roberts. Hospital for Sick Children, University of Toronto.

Problem behaviour as a core deficit in autism spectrum disorders (ASD), may be exacerbated by frustration and/or anxiety, due to an inability to communicate, self regulate, or cope with change.

Objective: To evaluate treatment with low dose citalopram used to target anxiety based behaviour causing functional impairment in children with ASD

Methods: Chart review was conducted for 27 (25M: 2F) children, age range 6.5-15.25 years, median 9.9 years, with ASD (63% confirmed by Autism Diagnostic Observation Schedule and/or Autism Diagnostic Interview). Citalopram treatment effect on behaviour was assessed using Clinical Global Impression Scale (CGI-I) ratings by 2 independent clinicians. Ratings of behaviour were scored at first follow-up (1), duration 8 days-1.75 years (median 2 months) and second follow-up (2), duration 3 months-1.16 years (median 6 months).

Results: Problem behaviours included emotional outbursts/agitation (55%), repetitive behaviour/restricted interests (44%), aggression (41%), and compulsions/rituals (37%). At follow-up (1), on citalopram dose 2.5mg-10mg/day, CGI-I scores indicated improvement in each group as follows: repetitive behavior 59%, compulsions 50%, aggression 27%, and agitation 40%. Seventeen out of 27 continued on citalopram, dose 5mg-15mg/day. At follow-up (2), CGI-I scores indicated further group improvement: agitation 11%, aggression 33%, and compulsive behaviour 14%. Ten children discontinued citalopram after follow-up (1), 7 due to activation, 3 due to unchanged target behaviour. Seven discontinued

after follow-up (2), 5 due to no change in the target behaviour, 2 due to activation.

Conclusion: Citalopram was most effective for parent reported repetitive and compulsive behaviours presumed due to anxiety.

P4B.1.19 **THE INFLUENCE OF ATTENTION PROBLEMS ON AUTISTIC BEHAVIOR DOMAINS.** F. Poustka, M. Holtmann and S. Boelte. Child & Adolescent Dept. Goethe University Frankfurt am Main.

Objective: The aim of the present study was to examine whether the autistic phenomenology differs in individuals suffering from an autism spectrum disorder (ASD) at very high or lower levels of co-existing attention problems.

Design/Methods: A sample of N = 212 subjects diagnosed showing an ASD were divided into a high and lower attention problem subgroup by median split (T = 75) using the subjects' scores on to the scale "attention problems" of the Child Behavior Checklist or Young Adult Behavior Checklist. The two groups were then compared regarding their scores on the behavior domains of the ADOS and ADI-R. Descriptively, the subsample of autistic subjects with a high degree of co-morbid attention problems (n = 104) included a higher percentage of females (26%), showed lower average IQ (mean = 67.6) and more clear neurological abnormalities (9%) than the lower attention problems group (n = 108; % females = 19%, mean IQ = 82.8%, neurological disorders = 5%).

Results: MANCOVA routine did not yield a significant global effect of group membership on the autistic phenomenology after covarying for age, IQ and socio-economic status. Univariate ANCOVAs revealed a trend (p=.10) for a group effect for the scale "social interaction" of the ADI-R as well as a interaction effect of sex and group for the social interaction area of the ADI-R und ADOS (p=.08)(girls showing more severe social abnormalities).

Conclusions: Co-existing attention problems may influence the severity of social interaction problems in autism spectrum disorders, particularly in females.

P4B.1.20 **MODIFIED FUNCTIONAL ANALYSIS FOR YOUNG CHILDREN WITH AUTISM.** J. Zarcone, R. Reese and E. Shumate. University of Kansas Medical Center.

Study Objectives: A brief analog functional analysis was conducted with five young boys to evaluate the frequency of problem and positive social behavior under specific conditions.

Methods: Based on the results of the Functional Assessment Interview conducted with the parents prior to the assessment, up to five different possible reinforcement conditions were conducted with each child to assess the role of attention, task demand and access to toys on problem and prosocial behavior. In addition, we evaluated specific contingencies more closely associated with symptoms of autism including access to perseverative activities, to escape demands when engaged in perseverative activities, and to escape from sensory stimulation.

Results: Positive social behavior occurred across all of the conditions, with the lowest frequencies in the Attention and in Toy Removal condition for 4 out of the 5 children. Problem behavior occurred the most frequently in the Task and in the Toy Removal conditions. Given the young age of the participants (mean age = 3.8 years), this is not unexpected.

Conclusions: These results support the idea that young boys with autism are less likely to engage in problem behavior to gain attention, and more likely to engage in problem behavior to gain access to preferred toys and to escape demands. Surprisingly, although these children were reported to have sensory aversions, they escaped from them by other methods than problem behavior (e.g., wiping hands on pants or therapist's skirt).

P4B.1.21 **SENSORY SYMPTOMS IN AUTISM.** S. Hyman, C. Stodgell, L. Bennetto, D. Morris and C. Aman. University of Rochester School of Medicine and Dentistry.

Sensory symptoms are not included in the core features of autism, but are commonly reported. Little is known about how sensory functioning relates to other symptoms of autism.

Objective: Examine a commonly used parent report measure, the Short Sensory Profile (SSP), in relation to

autism diagnostic, cognitive, and adaptive functioning measures.

Methods: Twenty-seven children with ASDs (via ADI and ADOS) and 19 typically-developing controls were assessed with the SSP, Stanford-Binet, and Vineland. Participants were 5-15 years-old, and mean IQs were ASDs: 103 (SD 10.7) and controls: 108 (SD 9.7) (p>.05). Analyses examined SSP profiles, as well as the relationship of the SSP to sensory items on the ADI and to functional skills.

Results: SSP total and section scores were analyzed via MANOVA. There were significant differences between children with and without ASDs for SSP total, tactile sensitivity, taste/smell sensitivity, auditory filtering, low energy/weak, and visual/auditory sensitivity (all p<.0001), but not for movement sensitivity and underresponsive/seeks attention. The SSP total correlated with the Vineland Daily Living Score. The SSP sections scores correlated only with some ADI sensory items.

Conclusions: This study extends previous work by showing that the SSP distinguishes well-characterized children with ASDs from controls in this age range. The SSP can be an important tool because it may identify a broader range of sensory symptoms than the ADI, and thus help to enhance our characterization of the autism phenotype.

Supported by: NIH (PO1HD35466), General Clinical Research Center (5MO1RR00044

P4B.1.22 **FACIAL EMG AND AFFECT PROCESSING IN AUTISM.** M. Magnee, J. Stekelenburg, B. Gelder, H. Engeland and C. Kemner. Department of Child and Adolescent Psychiatry, University Medical Center Utrecht, Heidelberglaan 100, 3584 CX Utrecht, the Netherlands.

Objective: To assess visual and audio-visual affect processing in subjects with PDD via electromyographic measures of facial muscles. It has been shown consistently that positive affect increases zygomaticus major muscle activity and negative affect evokes activity in corrugator supercilii.

Methods: 10 patients with PDD (average age 21.5; average IQ 122) and 12 healthy controls (average age 23.0; average IQ 127) participated in the study (all males). Stimuli consisted of audio-visual stimulus pairs with either a congruent or an incongruent affective content. Visual stimuli consisted of happy and fearful faces; auditory stimuli of spoken sentences, which were neutral with respect to content, but pronounced in either a happy or fearful tone of voice. Facial EMG was recorded over corrugator supercilii and zygomaticus major with standard Ag/AgCl electrodes, two on each muscle.

Results: In the PDD group, visually presented happy faces evoked zygomaticus activity and visually presented fearful faces increased corrugator activity, which did not differ with the healthy controls. For the audio-visual EMG, congruent happy face-voice trials elicited increased zygomaticus activity, whereas congruent fearful face-voice trials increased corrugator activity, both in comparison with incongruent trials. Again, there were no differences between groups.

Conclusions: Affect processing in high-functioning autistic patients as measured by EMG responsivity is intact for visually and audio-visually presented information.

## Poster Session 4B: Topic 2

### *Social Behavior & Play*

P4B.2.1 **EFFECTS OF TEACHER ENGAGEMENT ON THE SOCIAL BEHAVIORS OF STUDENTS WITH AUTISM.** B. Boyd, M. Conroy and T. Nakeo. University of Flordia.

Increasing numbers of young children with autism are being served in inclusive classroom settings to provide access to appropriate peer models. However, a dearth of research has focused on the classroom contextual factors that affect the quantity and quality of their social interactions with peers.

Objective: To examine the influence of teacher engagement on the occurrence of appropriate and inappropriate social behaviors demonstrated by students with autism.

Methods: Participants included five children, ages 3-6 years old, diagnosed with ASD, and engaged in low rates of appropriate social behaviors or high rates of inappropriate behaviors. Ten hours of direct observational data on participant social behavior was collected in various classroom contexts. Descriptive statistics were used to examine the effects of teacher

engagement (active, passive, or disengaged) on participants' mean rate of social initiations, responses, and interactions.

Results: Across the social behavior categories, teacher disengagement (teacher not attending to children or engaging in activity) resulted in the highest mean rates of behavior. Mean rates/minute for active teacher engagement were: 0.04 (initiations), 0.14 (responses), and 0.08 (interactions). Mean rates/minute for passive engagement were: 0.09, 0.15, and 0.09, respectively. Mean rates/minute for disengagement were: 0.15, 0.22, and 0.15. Interobserver agreement for rate data ranged from 48%-100% (Mean: 80%).

Conclusion: The results of this research indicate that teacher engagement did not positively affect child social behavior, and may in fact inhibit such behavior. However, the generality of the research findings should be investigated and expanded to increase the number of participants.

P4B.2.2 **CAN YOUNG CHILDREN WITH AUTISM USE GESTURES AND OBJECTS AS SYMBOL?.** C. Chiang, C. Lee and C. Wu. Department of Psychology, National Chung Cheng University.

Though the literature have showed that children with autism have impairment on symbolic play, very few of them mentioned about the symbol comprehension of play while using gesture or object in this population. In the study, we modified the paradigm from Tomasello, et al.(1999) and explored the symbol comprehension in young children with autism.

Objective: The study was examined symbol comprehension in young children with autism.

Methods: The subjects were 16 young children with autism (mean CA = 43 months, mean MA = 26 months), 16 CA and MA matched children with developmental delay and 19 MA matched typically developing children. The modified symbol comprehension task was used to test whether the children can comprehend an adults' use of either a replica/natural object or an associated gesture to communicate which object in an array she wanted.

Results: first, all children in the three groups displayed better on the replica object condition than the natural object condition. Second, young children with autism, either via gestural or object prompting, could exhibit the performance as the two control groups in the replica object condition. While in the natural object condition, regardless of gestural or object prompting, autistic children revealed difficulty relative to the two control groups.

Conclusions: Early symbol use difficulty in young children with autism was partially supported. Further studies need to clarify that this kind of impairment is delay or deficit?

P4B.2.3 **EARLY PREDICTORS OF SOCIAL BEHAVIOR OF CHILDREN WITH AUTISM AT SCHOOL.** A. Dijamco, L. Travis and M. Sigman. University of California, Los Angeles.

While most children with autism spend numerous hours in a classroom setting, surprisingly few studies have examined the performance of these children in the school environment. The current project investigated the social development of 36 young children with autism at school. This study aimed to identify factors predicting gains in social performance over time. The data were part of the Young Child Project, a longitudinal investigation of home, school, and biological factors potentially impacting the progress of young children with autism. Naturalistic observations and laboratory assessments were conducted annually over four years. Classroom measures were taken in a time-sampling format. Social behavior was calculated as a composite of items on a checklist, including parallel, simple, and higher social behaviors. Focusing on early levels of abilities, we investigated whether response to joint attention, language age, and empathy would positively predict improvement in social performance over time. We also examined differences in social behavior during structured time versus free play.

The longitudinal measurements were analyzed using a random intercept and slope model in SAS Proc Mixed. Single-predictor models revealed that children who began the study with higher joint attention, language, or empathic abilities were significantly more likely to exhibit growth in social behavior over time than children starting with lower levels of abilities. Gains in social behavior were significantly larger during teacher-structured activities than during child-directed free play. Entering multiple predictors into the model revealed

that response to joint attention at Time 1 alone accounted for most of the variance in social gains.

P4B.2.4 **A COMPARISON OF SOCIAL AND PLAY SKILLS IN CHILDREN WITH INVERTED DUPLICATION OF CHROMOSOME 15 AND CHILDREN WITH AUTISM.** J. Earhart, J. Mussey, M. Sigman and C. Schanen. UCLA.

Objective: Examine the relationship between children with Inverted Duplication of Chromosome 15 (IV-15) and children with autism in the areas of social skills and play.

Method: Each child was administered non-standardized measures of social communication (Early Social Communication Scales) and play (Structured Play). Specific areas of interest included initiating and responding to joint attention and social interaction, producing acts to regulate other's behavior, and engaging in functional and pretend play.

Results: Preliminary results suggest that children with IV-15 responded significantly less to joint attention than children with autism. Also, children with IV-15 initiated social interaction and acts of behavior regulation less frequently than did children with autism. Results on measure of play are currently under analysis.

Conclusion: On measures of social skills, children with IV-15 do not show marked differences from children with autism, suggesting a common underlying pathology between these two groups of children.

P4B.2.5 **CHILDREN WITH AUTISM IMITATE HANDSHAPE, BUT NOT HAND DIRECTION.** Y. Kunihira, A. Senju, T. Hasegawa and Y. Tojo. Dept. of Cognitive and Behavioral Science, Univ. of Tokyo.

Objective: It is known that some young children with autism wave their hand with their palms against themselves when saying good-by to someone, but the mechanism underlying such behavior is still unknown. So we investigated how children with autism imitate the direction of the model's hand actions. In order to investigate the relation to perspective taking, we conducted the imitation tasks in both face-to-face and side-by-side positional relationship.

Methods: Fourteen children with autism (mean age 11.9) and 15 typically developing children (mean age 10.9) were asked to imitate the model's hand action with various directions. There were two conditions controlling positional relationship between the child and the model (face-to-face or side-by-side).

Results: There were two types of error: Reversal error (imitating in the wrong way around) and Rotation error (imitating in the wrong direction). Children with autism made more reversal errors than typically developing children only in face-to-face condition, replicating the past researches. On the other hand, children with autism made more rotation errors than typically developing children both in face-to-face and side-by-side condition. There were no children who made handshape mistakes.

Conclusions: Results showed that children with autism might imitate other's handshape, but rotate or neglect its directions, which cannot be fully explained by perspective taking deficits. Such indifference to the hand direction in children with autism might relate to their 'reversed good-bye.'

P4B.2.6 **SOCIAL AND SPATIAL MEMORY IN AUTISM SPECTRUM DISORDERS AND THEIR RELATION TO EVERYDAY BEHAVIOR.** I. Levy, G. Wallace, D. Black, L. Gilotty, M. Gibbs, P. Lee and L. Kenworthy. Center for Autism Spectrum Disorders.

All individuals with autism spectrum disorders (ASDs) demonstrate impairments in social interaction. Whether these social impairments pervade other cognitive functions, such as memory, remains an open question. Williams, Goldstein, and Minshew (in press) suggest that difficulty remembering social scenes in ASDs is due to difficulty remembering complex stimuli rather than social aspects of the stimuli.

Objective: Compare social and spatial memory and their relation to everyday behavior.

Methods: We compared the Children's Memory Scales' Family Pictures and Dot Locations Learning subtests in high functioning children with ASDs (n=121; age=10.37 + 2.86; FSIQ=101.79 + 17.58; 86% male). Because Family Pictures stimuli are relatively more complex than Dot Locations Learning stimuli, determining the precise cognitive demands for the task is challenging. However, we predict that social memory, unlike spatial memory, will be correlated with real-life

social behavior as measured by the teacher ratings from the Behavior Assessment System for Children.

Results: Individuals with ASD score significantly higher (p=0.05) when asked to remember dot locations (M=10.7 + 2.9) as compared to social scenes (M=9.9 + 3.6) after a long delay. Additionally, we find social memory is uniquely and significantly (p<0.05) related to social skills (r=0.26), atypicality (r=-0.31), and adaptive skills (r=0.34), whereas spatial memory is uniquely and significantly related to learning problems (r=-0.33) and school problems (r=-0.22).

Conclusions: These results indicate that, as a group, children with ASDs do not demonstrate impairments in spatial and social memory. However, social memory scores are relatively lower and, as predicted, relate uniquely to everyday social behaviors.

P4B.2.7 **JOINT ATTENTION OVER TIME IN YOUNG INFANTS WITH AUTISM.** F. Naber, S. Willemsen-Swinkels, J. Buitelaar, E. Daalen, M. Bakermans-Kranenburg, M. Ijzendoorns and H. Engeland. Dept. of Child and Family Studies, Leiden University.

Joint attention is often referred to as a triadic relation between self, other and object. It is widely accepted that young children with autism show deficiencies in the use of joint attention behaviors although individual differences are displayed. These differences may be determined by social processes, as well as by factors associated with cognition or attachment relationship.

Objective: To contribute to a better understanding of development of joint attention behavior in infants with autism and other developmental disorders.

Methods: Using ethological observations, joint attention behaviors of young children with Autism Spectrum Disorders (ASD, n = 13) children with other clinical (n = 14) and non-clinical children (n = 12) are collected during structured settings. In this study we investigate the joint attention skills of children with ASD compared to children with other developmental disorders and typical developing children at two years of age (mean age 26.84 months SD = 5.45) and at four years of age (43.93 months, SD = 3.99). The joint attention behaviors demonstrated at both time-points are analyzed using repeated measures.

Characteristics like amount of autistic symptoms (using the Autistic Diagnostic Observation Schedule; ADOS), developmental level (Mullen Scales of Early Learning), security of attachment (Richter Score) and Disorganization of attachment are measured for all children. Contribution of these variables to the joint attention behavior of all groups of children is investigated. Effects of these variables to joint attention will be discussed.

P4B.2.8 **DO THE MEANS JUSTIFY THE ENDS? A NEW LOOK AT IMITATION IN AUTISM.** M. Nielsen and K. Hudry. Early Cognitive Development Unit, School of Psychology, University of Queensland.

Children with autism can copy others' actions on objects. Do they do so by imitating or by employing other mechanisms of social learning?

Study Objective: Compare copying behaviour of children with ASD to intellectually impaired and typically developing children. Do they use their own behavioural means to bring about a modelled outcome or do they copy the means used by the model?

Methods: Participants were a group of high and low functioning children with ASD (CA = 72 and 54 months), a group of children with Down syndrome (CA = 69 months), and a group of typical 18-month-olds. Children were shown how to open three novel boxes by using an arbitrary tool to activate a mechanical switch. Children could activate the switch as the model had done (using the tool) or devise their own means.

Results: The high functioning children with ASD performed at ceiling. They opened more boxes than children in the other groups and copied the technique used by the model - 6 of 9 children opened all three boxes using an object. Albeit at lower levels than the high functioning children, the low functioning children also opened some of the boxes and attempted to do so using an object. In fact their copying behaviour was not dissimilar to that of the typically developing 18-month-olds.

Conclusions: Children with ASD show evidence of what has been termed ‘true' imitation. They not only reproduce the outcome of others' actions on objects but will attempt to do so using the same behavioural means.

# Author Index

## A



## B

## Author Index



## C



## D

## Author Index



## E



## F



## G

## Author Index



## H



## I

## Author Index



### J



### K



### L

## Author Index



## M

## Author Index



## N



## O



## P

## Author Index



## Q



## R

## Author Index

### S

## Author Index

### T



### U



### V



### W

## Author Index



### Y



### Z

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**Over the last 40 years, the Society has grown from a handful of parents into the leading source of information, research, and referral on autism. ASA is the oldest and largest grassroots organization within the autism community. Today, more than 50,000 members and supporters are connected through a working network of 200 chapters nationwide. ASA membership continues to grow as more and more parents and professionals unite to form a collective voice representing the autism community.**