Sixth Annual

Dr. Benjamin Goldberg

Developmental Disabilities

Research Day

Program and Abstracts

Online Event

https://zoom.us/webinar/register/WN_2PJ3jJD2SXG8da2DRxkO1A

12:45pm – 5:00pm

Presentation Schedule

12:45 pm **Welcome**
Dr. Rob Nicolson and Dr. Julio Martinez-Trujillo

12:50 pm **Opening Remarks**
Dr. Ben Goldberg

Presentations

1:00 pm Multifactorial Model for Autism Spectrum Disorder: Studying Gene-Environment Interactions between Genetic Cntnap2 Deletion and Exposure to Maternal Immune Activation during Pregnancy.
Haddad, F., De Oliveira, C., Maroon, M. & Schmid, S.

1:15 pm Evaluating Function Stability Across Psychotropic Medication Changes in Persons with Intellectual and Developmental Disabilities.
Kozluk, A., & Cox, A.

1:30 pm Linking Social Communication and Metalinguistic Ability in Autism Spectrum Disorder.
Hannah, K., Carlson, N.M., McRae, K., & Stevenson, R.A.

1:45 pm Hunkering Down: How children with complex health care needs are affected by temperature and weather extremes.
Howard, S., Ogilvie, J., Gunz, A., Cameron, S., & Atkison, P.

2:00 pm Bridging the Gap: Building collaborative psychoeducational assessment practice.
Babcock, S., & Saklofske, D.H.

2:15 pm Do the Quality and Quantity of Interactions with Autistic Individuals Influence Autism Bias?
Sait, M., Scheerer, N.E., Stevenson, R.A., Boucher, T.Q., & Iarocci, G.

2:30 pm   Individuals with Autism and Intellectual Disabilities Transitioning to Adulthood.
Mehta, R., Wilson, J., & Nicolson, R.

2:45 pm   Autism Spectrum Screening Checklist (ASSC): A decision-support tool.
Stewart, S.L., Celebre, A., & Poss, J.W.

3:00 pm   Practice-Based Research Involving Speech-Language Pathologists: A language and literacy assessment tool for school-age children.
Vollebregt, M., & Archibald, L.

3:15 pm   Sensory and Anxiety Phenotypes of Autism Spectrum Disorder and Attention-Deficit/Hyperactivity Disorder.
Ding, Z, Scheerer, N. E., Yang, C., Stojanoski, B., Shafai, F., Kelley, E., Georgiades, S., Crosbie, J., Schachar, R., Liu, X., & Stevenson, R. A.

3:30 pm   Electrophysiological Properties of Neurons in the Primary Auditory Cortex of the Cntnap2 KO Rat Model for Autism.
Mann, R.S., & Schmid, S.

3:45 pm   Expanding the Reliability Analysis of a Severity Tool to Classify Severe Problem Behaviour.
Morgan, M-C., & Cox, A.

4:00pm   Keynote Address
Insights Into Autism Spectrum Disorder Using Functional Brain Organoids.
Alysson R. Muotri, Ph.D

5:00pm   Annual Maria Gitta Award for Best Presentation.
Dr. Rob Nicolson, Dr. Julio Martinez, and Ms. Maria Gitta

Dr. Alysson R. Muotri
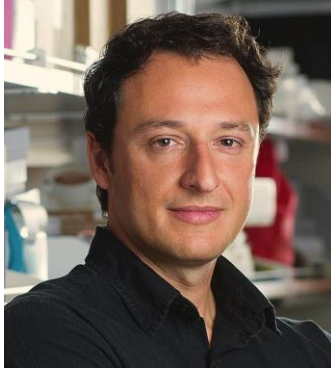
Dr. Alysson Muotri is a Professor in the Departments of Pediatrics and Cellular & Molecular Medicine at the University of California, San Diego. He is also the director of the University of California Stem Cell Program and the director of the University of California San Diego Archealization Center.

Dr. Muotri completed his undergraduate degree in biological sciences at the State University of Campinas and his doctoral degree in in genetics in 2001 at the University of Sao Paulo. He then completed a postdoctoral fellowship in neuroscience and stem cell biology at the Salk Institute.

Dr. Muotri's research focuses on human brain development and evolution, exploring mobile elements as generators of neuronal diversity. Dr. Muotri's lab is also interested in modeling neurological diseases using human induced pluripotent stem cells and his lab pioneered the use of these cells in modeling important aspects of Autism Spectrum Disorders. In particular, his research focuses on modeling social neurological conditions using human cerebral organoids. This work has implications for the generation of human disease models by determining the molecular and cellular mechanisms driving complex neurological disorders, including Autism Spectrum Disorder, and it is also creating opportunities for identifying and testing novel therapeutic approaches.

Dr. Muotri has published more than 140 papers in journals such as Nature, Science, and Cell. He has also won numerous awards during his career, including the NIH Director's New Innovator Award, Emerald Foundation Young Investigator Award, Tokyo Surugadai Award, Rock Star of Innovation, and the NIH-EUREKA award.

Abstracts – Oral Presentations

Multifactorial Model for Autism Spectrum Disorder: Studying Gene-Environment Interactions between Genetic Cntnap2 Deletion and Exposure to Maternal Immune Activation during Pregnancy.
Haddad, F., De Oliveira, C., Maroon, M. & Schmid, S.

Study Objective:
Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder linked with various genetic and environmental risk factors. Besides core symptoms of altered social communication and repetitive behavior, individuals with ASD exhibit changes in sensory processing and sensory reactivity.
ASD preclinical models have focused on studying individual risk factors, as opposed to how multiple risk factors interact to cause ASD-related phenotypes. Our study investigated gene-environment interactions and their influence on sensory processing.

Methods:
We used a "double-hit" model combining two well-established models of ASD: Genetic deficiency of Contactin Associated Protein-like 2 (*Cntnap2*), and prenatal exposure to maternal immune activation. At gestational day 9.5, pregnant *Cntnap2+/* rats were administered either a saline injection or 4 mg/kg or the immune stimulant Polyinosinic polycytidylic acid (poly I:C). Offspring from these pregnancies, which were either wildtype, *Cntnap2+/-*, or *Cntnap2-/-*, were tested on measures of sensory processing using the acoustic startle response.

Results:
Our results show that poly I:C MIA did not influence ASR measures on its own. However, adolescent *Cntnap2 -/-* rats exposed to prenatal poly I:C showed higher ASR reactivity compared to saline *Cntnap2-/-* rats. Similarly adult poly I:C *Cntnap2-/-* rats showed changes in pre-pulse inhibition (PPI) of the ASR compared to saline *Cntnap2-/-* rats. In both reactivity and PPI results, males were more susceptible to the poly I:C-Cntnap2 synergistic effect.

Conclusions:
Our results support the double-hit effect of two risk factors linked with ASD on sensory processing phenotypes. Future work will attempt to uncover the brain mechanisms underlying these synergistic effects.

Evaluating Function Stability Across Psychotropic Medication Changes in Persons with Intellectual and Developmental Disabilities.
Kozluk, A., & Cox, A.

Study Objectives:
Research evaluating psychotropic medication impact on persons with intellectual and developmental disability (IDD) is relatively limited, and as such evidence supporting the efficacy of psychotropic medication in treating challenging behaviour in this population has been described as controversial. Behaviour analytic research could contribute to the limited research base by evaluating psychotropic medication changes in impact on behaviour function. That is, whether medication changes (e.g., additions, removals, increases, or decreases) shift the function of a given behaviour.

Methods:
The featured project evaluates function stability across clinically indicated psychotropic medication adjustments. To evaluate this, participants take part in an individualized functional analysis three times per medication phase, when a given medication has reached the clinically indicated concentration level in the bloodstream (also referred to as steady state). Participants are individuals with IDD who engage in challenging behaviour and are being prescribed psychotropic medications that their psychiatric treatment team are strongly considering adjusting. Following three medication adjustments, I will use a Spearman rank correlation coefficient to evaluate stability in behaviour function across medication phases.

Results and Conclusions:
The current project is well underway and will report preliminary or hypothetical data, as well as potential implications for future research and clinical utility.

Linking Social Communication and Metalinguistic Ability in Autism Spectrum Disorder.
Hannah, K., Carlson, N.M., McRae, K., & Stevenson, R.A.

Background:
Research suggests that autistic individuals exhibit differences in metalinguistic ability, the ability to understand language outside the concrete meaning of words, compared to typically-developing peers. Metalinguistic ability plays an important role in social communication, and differences in this area may contribute to social communication differences observed in autism. However, this relationship has not been thoroughly explored.

Study Objectives:
1. Assess group differences in metalinguistic abilities and social communication between autistic and non-autistic youth.
2. Analyze covariance between metalinguistic abilities and autistic traits, specifically social communication differences.

Methods:
118 youth (30 autistic; 88 non-autistic, including 80 with other conditions) from the Healthy Brain Network completed the CELF-5 Metalinguistics assessment. Parents/guardians completed the Autism Spectrum Screening Questionnaire, Social Aptitudes Scale, Social Communication Questionnaire, and Social Responsiveness Scale.

Results:
Autistic youth had significantly higher autistic traits and lower social communication abilities than non-autistic youth. Furthermore, autistic youth exhibited significantly lower overall metalinguistic abilities compared to non-autistic youth. Measures of social abilities were not significantly related to metalinguistics, with the exception of lower figurative languages scores being associated with higher ASSQ scores. However, participants standardized metalinguistic ability scores ranged from very low to average.

Conclusions:
Autistic youth are more likely to have lower metalinguistic ability compared to non-autistic peers. Contrary to our hypothesis, metalinguistic ability did not relate to autistic traits/social communication. This may be due to the non-autistic group presenting with a high rate of other diagnoses, reflected by their relatively constrained distribution of metalinguistic abilities. Further analyses would benefit from a broader range of metalinguistic ability scores.

Hunkering Down: How children with complex healthcare needs are affected by temperature and weather extremes.
Howard, S., Ogilvie, J., Gunz, A., Cameron, S., & Atkison, P..

Study Objectives:
Climate change is associated with increased frequency and severity of weather events as well as an increased frequency of extreme temperatures. Children with complex health care needs are projected to be disproportionately affected, but there is little research exploring the experiences of this population and their families during these periods.

Methods:
We conducted semi-structured, in-depth interviews with parents of children with complex health care needs living in Southwestern Ontario, to better understand how weather impacts their children. Grounded theory methodology informed our design and interpretation of the data. Questions were framed using the International Classification of Function. Interviews were transcribed and subsequently coded by the research team.

Results:
Several common themes emerged; caregivers described that high temperatures can cause significant respiratory distress, dehydration and sunburns during regular activities and outings. For some children, underlying health conditions (e.g. Seizures) were exacerbated by temperature extremes. Children's activities were limited, and participation was reduced compared to siblings and peers, which in turn had notable effects on the child's mood. Parents expressed frustration at the preparations and adaptations that are required to overcome physical and accessibility barriers related to severe weather – especially snow. Several families expressed fear for their child's future, as weather and temperature extremes increase with climate change.

Conclusions:
In summary, children with complex health care needs experience a burden of temperature and weather extremes, for which they have made many adaptations. As the climate in Canada warms, further research should explore these measures to improve climate resiliency for this population.

Bridging the Gap: Building collaborative psychoeducational assessment practice.
Babcock, S.E., & Saklofske, D.H.

Study Objectives:
Identification of unique learning challenges in children is multifaceted, but typically involves a school psychologist's assessment. And while cognitive ability assessment is an integral and informative part of the process, one major concern is that the integration of teacher and parent observations into the psychoeducational diagnostic process has, thus far, been neglected. Therefore, evidence-based measures are needed to streamline the process and integrate teacher and parent observations. The purpose of this research program was to identify specific, observable behaviours to develop Home and Classroom Screening tools that align with current cognitive measures, specifically the Wechsler intelligence tests.

Methods:
Development of these assessment measures involved both qualitative and quantitative approaches. Focus groups, panel reviews, and electronic surveys with expert groups allowed items to be generated, reviewed, and revised to develop pilot scales. The final phase will collect WISC-V data, as well as screener data to establish alignment between data sources.

Results:
Based on data, the pilot Home and Classroom Screeners were developed. Both include five scale composites reflecting the WISC-V factor structure, with 10-12 behavioural items for each scale.

Conclusions:
These scales serve to inform psychologists about the child's cognitive functions expressed in the home and classroom. This creates the opportunity for more meaningful dialogue and a common language for diagnosis, support, and progress monitoring to promote the child's academic success and overall well-being. This study was supported by funding from the C. Kingsley Allison Research Grant (Department of Psychiatry - Schulich School of Medicine & Dentistry).

Do the Quality and Quantity of Interactions with Autistic Individuals Influence Autism Bias?
Sait, M., Scheerer, N.E., Stevenson, R.A., Boucher, T.Q. & Iarocci, G.

Background:
Negative perceptions of autistic traits and discriminatory behaviours towards autistic individuals has been demonstrated in mentors (teachers and professionals), and other autistic individuals. However, this negative bias towards autism may be ameliorated by autism knowledge as well as quality and quantity of contact with autistic individuals.

Objectives:
To assess whether:
1. A relationship exists between autism stigma and:
   - Autism knowledge
   - Quality and quantity of contact with autistic individuals
2. Autism bias is more strongly reflected in judgements of autistic traits, or by a lack of willingness to interact with autistic individuals

Methods:
Mentors (N=24), autistic individuals (N=26) and controls (N=100) were recruited and asked to rate ten-second audiovisual clips of autistic and non-autistic individuals. Participants rated the individuals in the videos on various traits as well as their own behavioural intentions towards the individuals in the videos. They then filled out 3 questionnaires assessing autism knowledge, level of contact, and quality of interactions with autistic individuals.

Results:
Overall, mentors and fellow autistic peers were positively biased towards autistic individuals but undergraduates were negatively biased towards autistic individuals ($F(2,156)=60.57$, $p<.001$), with traits having a larger influence on autism bias than behaviors ($F(1,158)= 24.47$, $p<.001$). Level of contact ($r(150)=.311$, $p<.001$) was associated with autism bias, but quality of contact ($r(150=-.015$, $p=.856$) and autism knowledge ($r(150)=.075$, $p=.361$) was not.

Conclusions:
The relatively positive perceptions held by mentors and autistic peers may soften the adverse effects of the negative perceptions and behaviours held by non-professional, non-autistic populations. Additionally, leveraging and creating numerous opportunities for non-autistic and autistic individuals to interact in a safe space may be a powerful tool for reducing autism bias.

Autism Spectrum Screening Checklist (ASSC): A decision-support tool.
Stewart, S.L., Celebre, A., & Poss, J.W.

Study Objective:
Autism Spectrum Disorder (ASD) is one of the most common childhood onset neurodevelopmental disorders and has been deemed the fastest growing developmental disability. Due to the increased demand for diagnostic assessments and subsequent increased wait times, standardized screening as part of standard of care is needed. More specifically, there
is a critical need for the development of a more streamlined screening tool within an existing assessment system to identify those at greatest risk of having ASD. Therefore, the objective of this study was to develop and validate a scale that would assist service providers in identifying children who have a higher likelihood of having ASD within an assessment-to-intervention system that is widely used in mental health agencies across Ontario.

Methods:
Data from approximately 17,000 assessments obtained within the province of Ontario based on the interRAI Child and Youth Mental Health (ChYMH) and Child and Youth Mental Health and Developmental Disability (ChYMH-DD) were analyzed to develop a decision support algorithm to identify children and youth at risk of having ASD. The algorithm was then validated with data from the interRAI 0-3 Early Years instrument.

Results:
The Autism Spectrum Screening Checklist (ASSC) was found to be a strong predictor of ASD with high sensitivity (.80) and specificity (.72); these results were consistent across several age ranges (i.e. from 2-18 years of age). This suggests that the ASSC is an empirically based decision-support tool that may be used to identify those at greatest risk of having ASD.

Conclusion:
The main goal for the development and implementation of the ASSC scale is to harness the power of the existing interRAI assessment system to provide a more efficient, effective screening and referral process. This will ultimately help improve patient outcomes through needs-based care.

Practice-Based Research Involving Speech-Language Pathologists: A language and literacy assessment tool for school-age children.
Vollebregt, M., & Archibald, L.

Study Objectives:
This research describes a practice-based research partnership between researchers and school board speech-language pathologists (SLP). The SLPs designed a phonological awareness and narrative language tool to meet their service delivery needs. Study 1 determined the extent to which the tool captured differences between groups of children and developmental language growth over time. Study 2 assessed the tool's validity.

Methods:
In Study 1, Phase 1, 2 groups of kindergarten children completed the assessment tool. One group consisting of children on SLP caseload (n=108) completed the tool 3 times over an academic year and the second group of children (n=121), who were not on SLP caseload, completed the tool twice. In Phase 2, 24 children completed a revised assessment tool twice over one year. In Study 2, 37 children completed the revised tool along with standardized measures of language.

Results:
Phase 1, Study 1 revealed that the phonological awareness component of the tool was sensitive enough to capture developmental change over time and across the different groups of children; however, the narrative language component of the tool did not capture developmental change. After revisions, Phase 2 results revealed that both components were sensitive to both differences. The results of Study 2 demonstrated good construct validity of the tool as an assessment of language and literacy.

Conclusions:
This work presents an assessment tool designed to fit an educational context and identify children with weak language skills. This work was supported by the Goldberg Scholarship Fund and a Partnership Development grant from the SSHRC.

Sensory and Anxiety Phenotypes of Autism Spectrum Disorder and Attention Deficit/Hyperactivity Disorder.

Ding, Z., Scheerer, N.E., Yang, C., Stojanoski, B., Shafai, F., Kelley, E., Georgiades, S., Crosbie, J., Schachar, R., Liu, X., & Stevenson, R.A.

Background:
Sensory processing difficulties and anxiety are commonly found in ASD and ADHD. The high heterogeneity in the type and severity of these symptoms was shown to hinder the development of treatments and etiology-tracing efforts. Despite some efforts on identifying subtypes of individuals with similar sensory features to parse the high heterogeneity, no consensus has been reached on the optimal model of sensory subtypes and few studied anxiety phenotypes.

Objectives:
The current research aimed to examine whether meaningful anxiety and sensory phenotypes could be identified from ASD and ADHD, and if so, whether these anxiety and sensory phenotypes were correlated.
Methods: 421 participants aged between 3 and 19 with a diagnosis of either ASD or ADHD were included. A K-means cluster analysis was conducted on the Short Sensory Profile and Revised Child Anxiety and Depression Scale subscale scores to explore possible sensory and anxiety phenotypes, respectively. Follow-up ANOVAs were conducted to examine relationships between specific anxiety issues and sensory phenotypes.

Conclusions:
A 5-cluster solution ("Sensory Adaptive", "General Sensory Difference", "Under-responsive/Sensory Seeking", "Taste/Smell Sensitive" and "Low energy/weakness with Movement Difficulty") was considered the best-fit sensory model, providing well-differentiated subtypes (based on sensory processing patterns and sensory systems) and low error variance. Resultant anxiety clusters varied in anxiety severity instead of types of anxiety and thereby, no meaningful anxiety phenotypes were identified from ASD and ADHD. Phenotypes with general and movement-related sensory difficulties were associated with specific anxiety symptoms. These findings provide implications for treatments that are tailored to individuals' sensory and anxiety profiles.

Electrophysiological Properties of Neurons in the Primary Auditory Cortex of the Cntnap2 KO Rat Model for Autism.

Mann, R.S., & Schmid, S.

Study Objectives

The CNTNAP2 gene is important for language development in humans and is associated with the onset of ASD when altered. CNTNAP2 is also expressed in rodents, and when disrupted it results in ASD-like symptoms and impaired auditory processing. In order to understand the role of CNTNAP2 at a neuronal level, I investigated the intrinsic electrical properties of neurons in the auditory cortices of rats with a CNTNAP2 mutation. The Cntnap2 gene is hypothesized to be necessary for the maintenance of intrinsic neuronal membrane properties.

Methods:

Whole-cell patch clamp electrophysiology were performed in brain slices from juvenile (P8-12 and P18-21) and adult (P70-90) wildtype (Cntnap2+/+) and knockout (Cntnap2-/-) Sprague Dawley rats.

Results:

Action potentials were significantly larger in Cntnap2-/- rats at P8-12 and P18-21, and Cntnap2-/- rats at both P8-12 and P18-21 exhibited smaller half-widths compared to wildtypes. Compared to wildtypes, Cntnap2-/- rats exhibited larger sEPSCs at P8-12, but they were smaller at P18-21 and P70-90. The Cntnap2-/- rats also had higher sEPSC frequencies at P70-90, but there were no differences at the younger ages.

Conclusions:

These results indicate that intrinsic cell properties are altered in Cntnap2-/- rats, as well as that there are changes in synaptic input. These differences were mostly age dependent. Our experiments will provide novel insights into how Cntnap2 impacts auditory processing at a cellular level, and possibly the cellular basis for language and communication impairments seen in people with ASD.

Expanding the Reliability Analysis of a Severity Tool to Classify Severe Problem Behaviour.
Morgan, M-C., & Cox, A.

The term 'severe' is a common descriptor for problem behaviour in research and practice. However, it is often applied inconsistently, and at times based on ill-defined or arbitrary criteria. Existing problem behaviour measurement tools often rely solely on caregiver recall (e.g., interviewing primary caregivers). This study explores the reliability of the first iteration of a severity tool employing direct measurement strategies (e.g., response rate, injury severity as evidenced by permanent product) to classify an individual's problem behaviour severity. Eighteen Board Certified Behavior Analyst (BCBA) raters were recruited, 10 novice raters and eight expert raters. This study featured three conditions with the presentation of different 20 case scenarios for each condition. The first and second condition had raters classify the severity of each scenario without access to the tool. In the third condition, raters classified scenarios after completing the tool for each case. Nine raters (five novice and four experts) experience a pre-post design of condition one (no tool access) and condition three (tool access). The other 11 raters (seven novice and four experts) experienced two baseline conditions (no tool access) before completing condition three (tool access). We calculated the reliability of rater consistency within and across groups, as well as the internal consistency of the tool items. We discuss inconsistences that may exist in the classification of severe problem behaviour and how they could be mitigated with the proposed tool.

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