



3rd Annual Developmental Disabilities Research Day

Program and Abstracts

Presentation Schedule

- 9:30am Registration
- 10:00am Poster Viewing
- 10:55am Introductory Remarks - Dr. Rob Nicolson,
Chair, Developmental Disabilities Program, Department of Psychiatry
- 11:00am Morning Keynote Address – **Sensory Processing and Reactivity in Autism.**
Dr. Susanne Schmid, Ph.D.
Associate Professor, Department of Anatomy and Cell Biology,
Schulich School of Medicine & Dentistry,
Director - Neuroscience Graduate Program
Associate Dean - Research, Graduate and Postdoctoral Studies, Western University.
- 11:45am Lunch
- 12:45pm **Evaluating Medication Impacts on Client Behaviours and Behavioural Functions**
Cox, A., & Pryor, C.
- 1:00pm **Bacterial Metabolites and Brain and Behaviour.**
Bishnoi, I., Kavaliers, M., & Ossenkopp, K-P.
- 1:15pm **Bridging the Gap: Revolutionizing psychoeducational assessment by building a collaborative evaluation process between classroom teachers and psychologists**
Babcock, S.E., & Saklofske, D.H.
- 1:30pm **Auditory Temporal Processing Deficits in the CNTNAP2 Knockout Rat.**
Scott, K.E., Schormans, A.L., Schmid, S., & Allman, B.L.
- 1:45pm **Intervention Intensity & Off-Task Behaviour**
Neil, N., Esipu, C., Hansford, R., & Young, K.
- 2:00pm Break

- 2:15pm **Investigating the Role of ATRX in Hippocampal Pyramidal Neurons**
Tamming, R., Jiang, Y., & Berube, N.
- 2:30pm **Examining Service Complexity in Children With Intellectual Disability and Mental Health Problems who Receive Inpatient or Outpatient Services**
Lapshina, N., & Stewart, S.L.
- 2:45pm **Molecular Diagnosis of Hereditary Syndromes Using Genomic DNA Methylation**
Aref-Eshgi, E., Schenkel, L.C., Schwartz, C., Boycott, K.M., Lin, H., Ainsworth, P., Rodenhiser, D., & Sadikovic, B.
- 3:00pm **A Social Skills Support Program for Children With Down Syndrome and their Typically Developing Siblings: Effect on coping, adjustment, and sibling relationship**
Amicarelli, A.R., Miko, J.Y., & Neil, N.
- 3:15pm **Statistical Learning and Autism-Related Social Communication Difficulties**
Parks, K.M.A., Griffith, L.A., Sehl, C.G., Dalal, T.C., & Stevenson, R.A.
- 3:30pm Break
- 3:45pm **Relating Sensory Sensitivity to Autistic Traits in Typically Developed-Adults**
Schulz, S.E., & Stevenson, R.A.
- 4:00pm Afternoon Keynote Address – **BDNF/TrkB Signalling as a Diagnostic and Therapeutic Target for Autism.**
Dr. Margaret Fahnestock, Ph.D.
Professor, Department of Psychiatry and Behavioural Neurosciences,
McMaster University.

Keynote Speakers

Sensory Processing and Reactivity in Autism

Dr. Susanne Schmid

Dr. Schmid earned a degree in Biology from the University of Tuebingen, Germany, in 1993, and a Ph.D in Animal Physiology in 1997. She started her own group in 2000 in Tuebingen, working on synaptic plasticity underlying learning. After a year as a guest professor at the Psychology department at the University of Toronto, she was appointed as an Assistant Professor at Schulich Medicine & Dentistry, Western University in 2007. She has been the Director of the Neuroscience Graduate program since 2015 and has been appointed as the Associate Dean Research, Graduate and Postdoctoral Studies, in 2018.

Dr. Schmid's research is focused on elucidation of cellular and molecular mechanisms underlying sensory processing and filtering and its impact on higher cognitive processes. Dr. Schmid has been the recipient of a number of research awards, including doctoral and postdoctoral intramural research training awards from the German Academic Exchange Council, the German Research Council, and the Wilhelm Schuler Foundation. She has also received a Rainer and Maria Teufel Award, Young Investigator Award, as well as more recent support from the CIHR, Canada Foundation for Innovation, Ontario Brain Institute, Ontario Mental Health Foundation, and NSERC.

BDNF/TrkB Signalling as a Diagnostic and Therapeutic Target for Autism.

Dr. Margaret Fahnestock.

Dr. Fahnestock earned a Bachelor of Science from the Department of Biological Sciences at Stanford University in 1974, and a Ph.D in the Department of Biochemistry at the University of California at Berkeley in 1979. She went on to complete a Postdoctoral Fellowship in the Department of Cell Biology at Baylor College of Medicine in Houston Texas and the Department of Neurobiology at Stanford. She is currently a Professor in the Department of Psychiatry and Behavioural Neurosciences at McMaster University in Hamilton Ontario. Her Research interests include the regulation of neurotrophic factor expression and the role of neurotrophic factors in neurological disease. Her teaching interests include molecular neurobiology, neurotrophic factors and their receptors, and genetics and therapy of neurological diseases.

Poster Presentations

- Poster 1 **The Facilitators and Barriers of Physical Activity Engagement for Youth and Young Adults with Childhood Onset Physical Disabilities**
Downs, M., MacDermid, J., & McDougall, J.
- Poster 2 **CdLS is More Than a Few Letters, It's a Lifestyle: A sibling caregiver's experiences with developmental disability captured through photovoice**
Graham, J., & Sibbald, S.L.
- Poster 3 **A Test to Measured Discrimination Thresholds for Gaze Direction Using 3D Virtual Reality Displays. Implications for the study of gaze avoidance in developmental disorders**
Buitrago-Piza, D., Dalal, H., Mahmoudian, B., Nicolson, R., & Martinez-Trujillo, J.
- Poster 4 **"Why are Kids With Learning Disabilities Left Out of Things at School?" An examination of third- and fourth-graders' perspectives**
Lau, T-W.Z., & Nowicki, E.A.
- Poster 5 **Cognitive Functioning and Adaptive Behaviour in Children With Autism Spectrum Disorder**
Nicolson, R., & Al-Darwish, M.
- Poster 6 **Training in Developmental Disabilities in Canadian Psychiatry Residency Programs**
O'Flanagan, S., Hocke, V., & Nicolson, R.
- Poster 7 **The LHSC Whole Exome Sequencing Study – A Progress Report**
Carere, D.A., Aref-Eshghi, E., Kerkhof, J., Stuart, A., Lin, H., Ainsworth, P., Rupar, T., Siu, V., Prasad, C., Saleh, M., Karp, N., Chakrabarti, R., Campbell, C., Zapata-Aldana, E., & Sadikovic, B.
- Poster 8 **Treatment of Adolescent Rats With Lipopolysaccharide Followed by Propionic Acid Induces Anxiety-Like Behavior and Altered Startle Response in Adulthood: Relation to Autism Spectrum Disorder**
Wah, D., Kavaliers, M., & Ossenkopp, K-P.
- Poster 9 **Prevalence and Determinants of Psychiatric Disorders in Children With Intellectual Disability**
Stewart, S.L., & Hassani, K.F.

- Poster 10 **Pupillary Responses to Manipulation of Stimuli Type and Synchrony in Children with Autism Spectrum Disorder**
Segers, M., Bebko, J.M., Ncube, B., & Stevenson, R.A.
- Poster 11 **Neonatal Thalamic Development is Associated With 4.5 Year Sensory Processing in Very Preterm Born Neonates**
Duerden, E.G., Chau, C., Glass, T., Mackay, M., Foong, J., Guo, T., Chau, V., Synnes, A., Miller, S.P., & Grunau, R.E.

Abstracts – Oral Presentations

Evaluating Medication Impacts on Client Behaviours and Behavioural Functions

Cox, A., & Pryor, C.

Psychopharmacological and behavioural interventions are often used to treat challenging behaviours. Sometimes these intervention types are implemented concurrently, called comorbid interventions, while other times they are applied in isolation. Given that a large proportion of persons with intellectual disability and challenging behaviour are prescribed psychotropic medications, it is likely behavioural practitioners will be responsible for supporting clients who are prescribed at least one psychotropic medication. Further, clinicians may be asked to attend psychiatric consultations to support families who are pursuing a medication trial for their loved one.

In the interest of effectively managing challenging behaviour through the use of psychotropic medication, behavioural practitioners may add value to the psychiatric process by identifying, implementing and overseeing effective, objective data collection strategies. These strategies may better inform the prescribing physician on how medications changes may be positively or negatively impacting the client.

After a thorough review of the behavioural literature, existing proposed guidelines have only targeted clinicians conducting research studies in applied behavioural pharmacology. Some of these recommendations may not be relevant for behavioural practitioners who are not within a research setting but still want to objectively record medication impact to inform their own practice, as well as share objective outcomes with the psychiatric team.

We developed and piloted an evidence-informed checklist for behavioural practitioners operating within a clinical setting. The intent of this tool was to support clinicians in selecting strategies to objectively evaluate medication impact and thereby perhaps influence individualized medication trials, which may improve overall client outcomes. Developing ways to provide more specific communication about behaviour-medication relationships with medical practitioners was also considered. Two specific case studies are described including the time committed required in following the checklist, as well as client outcomes.

Bacterial Metabolites and Brain and Behaviour

Bishnoi, I., Kavaliers, M., & Ossenkopp, K-P.

A subset of children diagnosed with autism spectrum disorder (ASD) have been found to have an altered composition of their microbiome. This includes alterations in the levels of short chain fatty acids (SCFA) which may influence the expression of ASD related behaviours. At low levels, propionic acid (PPA) is naturally produced through fermentation of carbohydrates within the gut. A subset of children with ASD have been found to have higher than normal levels of PPA within their gut microbiome. The present study investigated the effects of repeated intraperitoneal treatments of rats with PPA, a SCFA that can cross the gut-blood and the blood-brain barrier, on anxiety-like and locomotor behaviour. Twenty-four adult male rats were randomly assigned into one of three groups: phosphate buffered saline (2.0 ml/kg), PPA 250 (2.0 ml/kg) or PPA 500 (2.0 ml/kg), (all n=8). Behavioural testing was conducted using the light-dark anxiety test to measure anxiety-like behaviour and locomotor activity levels. It was found that PPA at the highest dose (500 mg/kg) had a significant anxiogenic effect and significantly decreased the locomotor activity level. The present study supports the hypotheses that alterations in the levels of PPA lead to behavioural changes reminiscent of those seen in ASD.

Bridging the Gap: Revolutionizing psychoeducational assessment by building a collaborative evaluation process between classroom teachers and psychologists.

Babcock, S., & Saklofske, D.H.

Currently, the assessments needed for the identification of learning, developmental and behavioural challenges have long wait times, which delays support and negatively affects children's educational progress and well-being. Further, lack of background and concurrent information about the child causes further delay in understanding the full-scope of abilities and challenges. Therefore, efficient, evidence-based tools are needed to identify children requiring intervention. At present, the field lacks a tool that combines intelligence test data with teacher, parent and child input. The development of a measure that assists in identifying specific learning and social behaviours observed in the school and home settings can complement cognitive measures for diagnosis (WISC-VCDN).

This mixed-methods study combines qualitative and quantitative methodologies. Items included in the measure will consist of descriptions of behavioural qualities that conceptually align with the WISC-V indices. Items will be developed under the guidance of assessment experts (school & clinical psychologists) and feedback from focus groups of parents and teachers. Children who have been/will be administered the WISC-V will have the screener completed by teachers and parents in order to evaluate how items relate to WISC-V index scores.

Together with WISC-V, this screener informs the psychologist of the child's cognitive functioning, allowing for more meaningful, focused assessment. In addition, it adds ecological validity to the WISC, allowing for improved dialogue with teachers and parents for diagnosis, intervention, and monitoring, ultimately improving support available to the child

Auditory Temporal Processing Deficits in the CNTNAP2 Knockout Rat

Scott, K.E., Schormans, A.L., Schmid, S., & Allman, B.L.

The auditory system undergoes tremendous plasticity during development; however, its typical maturation is perturbed in individuals with neurodevelopmental disorders, like in autism spectrum disorder (ASD). Consequently, they have a reduced ability to process the basic features of sound such as the temporal structure - as evidenced by longer response times in the brainstem and cortex to acoustic stimuli. Importantly, loss-of-function mutations of CNTNAP2 cause a severe form of autism and language disorder. Furthermore, CNTNAP2 plays an important role in regulating auditory and language development. Here, we determined the impact of the loss-of-function of *Cntnap2* on the brain's ability to accurately encode the rapidly-changing temporal features of sound in Sprague Dawley rats. Using subdermal electrodes, we found slowed transmission of neural activity in response to acoustic stimuli throughout the auditory brainstem in juvenile *Cntnap2*^{-/-} rats that showed improvement by adolescence and appeared typical by adulthood. Interestingly, this delay was more pronounced in the higher order brainstem structures. Furthermore, multi-unit spiking activity recorded from the adult auditory cortex with a microelectrode revealed a prolonged latency to the response onset, and an inability of neurons to consistently respond to the repeated presentation of acoustic in *Cntnap2*^{-/-} rats compared to wildtypes. These results are strikingly similar to those found in humans with ASD, and provide the first validation of the *Cntnap2* knock-out rat model for sensory disruptions associated with autism.

Intervention Intensity & Off-Task Behaviour

Neil, N., Esipu, C., Hansford, R., & Young, K.

Developmental disabilities are expected to affect 13.87% of the population. Discrete trial instruction (DTI) is the most well-established intervention for individuals with developmental disabilities. This study is an examination of intervention intensity among individuals who either have a diagnosis of Autism spectrum disorder (ASD) or down syndrome (DS). The purpose of this study is to manipulate the level of dose intensity while measuring off-task behaviour, and skill acquisition during DTI. Dose can be explained as the number of properly administrated teaching episodes (e.g., the presentation of 10 or two opportunities to imitate words) during a single session. Intervention targets were taught using five assigned intensities and a single-subject alternating treatment design. Three children participated in the study; two with a diagnosis of ASD, and one with a diagnosis of DS. All participants were between two to six years old and were recruited through local organizations throughout the community. Results suggested that the lowest intensity condition produced fewer trials to mastery, while high intensity conditions took the fewest minutes to mastery.

Investigating the Role of ATRX in Hippocampal Pyramidal Neurons

Tamming, R., Jiang, Y., & Berube, N.

The ATRX intellectual disability gene is involved in chromatin architecture regulation, and chromatin alterations can contribute to synaptic plasticity during learning and memory. We have previously shown that ATRX regulates gene expression. I hypothesize that ATRX regulates the expression of genes required for synaptic plasticity and proper neuronal morphology in hippocampal neurons. To investigate this, created a mouse model in which ATRX is deleted in forebrain pyramidal neurons (“knockout” mice). Control and knockout mice underwent a battery of behavioural tests. Knockout mice displayed impaired long-term spatial memory in the Morris water maze as well as decreased freezing behaviour in the contextual fear conditioning task. In the Paired-Associate Learning touchscreen test the knockout mice were unable to perform above chance levels. These results cumulatively demonstrate that loss of ATRX expression in forebrain pyramidal neurons leads to impaired spatial memory. Focused analysis of apical dendrites of CA1 pyramidal neurons showed a small but non-significant decrease in branching ($p=0.06$). Branch complexity has been linked to impaired cognition, therefore this may contribute to their decreased spatial memory. RNA-sequencing of control and knockout hippocampi revealed decreased expression of genes related to both the pre- and post-synaptic cleft, which could potentially underlie the learning and memory impairments in ATRX mutant mice. Our study has therefore identified a potential mechanistic link between ATRX and neurological deficits.

Examining Service Complexity in Children with Intellectual Disability and Mental Health Problems who Receive Inpatient or Outpatient Services

Lapshina, N., & Stewart, S.L.

Background: This study examined predictors of service complexity in children with co-morbid IDD and mental health concerns. We examined whether patient type, safety risk, exposure to trauma, and family dysfunction were related to service complexity.

Method: The study had a cross-sectional design, wherein trained clinicians assessed 330 outpatient and inpatient children with IDD and mental health problems using an interRAI ChYMH-DD instrument.

Results: Inpatients experienced more abandonment by caregiver than outpatients. Patient type moderated relationships between family dysfunction and service complexity, such that higher family dysfunction predicted higher service complexity in outpatients but not inpatients. Similarly, as safety risk increased in outpatients, the complexity of provided services also increased.

Conclusions: In addition to older age, recent trauma, family dysfunction and safety risk needs to be considered when predicting service complexity in this population.

Molecular Diagnosis of Hereditary Syndromes Using Genomic DNA Methylation

Aref-Eshgi, E., Schenkel, L.C., Schwartz, C., Boycott, K.M., Lin, H., Ainsworth, P., Rodenhiser, D., & Sadikovic, B.

Introduction: DNA methylation of the CpGs plays an integral role in the regulation of the processes that control normal development. Aberrant DNA methylation in early development leads to neurodevelopmental syndromes, while its disruption in somatic tissues is associated with carcinogenesis. As a stable molecule, genomic DNA methylation has been the focus of biomarker discovery. Currently, the diagnosis of neurodevelopmental syndromes is challenging due to overlapping clinical presentations. We hypothesize that these conditions generate DNA methylation epi-signatures which can be utilized in molecular diagnosis/screening.

Methods: Peripheral blood samples from patients with neurodevelopmental syndromes were assessed for genome-wide methylation changes. Supervised and unsupervised machine learning techniques were used to develop classification models for each disorder.

Results: We identified highly-sensitive/specific peripheral-blood epi-signatures in multiple conditions including Floating-Harbor, DNMT1 neuropathy, ATRX, Kabuki, Sotos, CHARGE, Claes-Jensen, Genitopatellar, Coffin-Siris and Nicolaides-Braitser syndromes. Using ~900 selected CpGs we trained a multi-class prediction model, enabling concurrent classification of the mentioned disorders, with 100% accuracy as determined using multiple validating cohorts. We demonstrated the ability of the algorithm to identify undiagnosed cases in screening, resolve ambiguous cases carrying variants of unknown significance, or to assign a new diagnosis to patients with an initially different diagnosis.

Conclusion: This study describes unique, machine DNA methylation signatures, enabling highly sensitive and specific molecular diagnosis in developmental syndromes.

A Social Skills Support Program for Children with Down Syndrome and their Typically Developing Siblings: Effect on coping, adjustment, and sibling relationship

Amicarelli, A.R., Miko, J.Y., & Neil, N.

Typically-developing (TD) siblings are a critical part of lifelong support for individuals with Down syndrome (DS). Children with DS demonstrate deficits in social, communication, and play skills resulting in atypical interactions with others, including siblings. TD siblings experience increased maladjustment such as internalizing difficulties, behavioural problems and increased stress, which can also impact the sibling relationship. The current study is an on-going project examining the effects of a 10-week social support program on the sibling relationship and on the social-emotional adjustment of the TD siblings. The social support program consists of skills instruction for children with DS, a support group for TD siblings, and inclusive recreation activities for all the children together. During skills instruction, children with DS receive applied behavior analytic interventions to address social, communication, and play skills important for interacting with siblings. During the support group, TD siblings learn about DS knowledge, and coping strategies. Recreation time includes stretching, relay races, and cooperative games between siblings. Children are between the ages of 5 and 17, recruited from local DS associations. We will report information on 1) the sibling relationship, evaluated via parent and TD sibling report measures and via observational measures of direct sibling interactions, and 2) social-emotional adjustment of TD siblings, evaluated via parent-report and self-report measures, as well as observational measures of the support group. This program is predicted to improve the sibling relationship and also the coping skills and depression/anxiety symptoms for TD siblings. These results may in turn improve quality of life for the entire family system.

Statistical Learning and Autism-related Social Communication Difficulties

Parks, K.M.A., Griffith, L.A., Sehl, C.G., Dalal, T.C., & Stevenson, R.

One of the defining characteristics of Autism Spectrum Disorder (ASD) is difficulty with social communication, including the production and comprehension of language. One contributor to learning these language skills is the ability to track patterns in the environment (statistical learning; SL). SL difficulties in ASD make it challenging to learn the inherent rules that govern language and social cues, and thus may contribute to the language and social communication difficulties.

We tested participants SL abilities by administering well-established measures of auditory and visual SL paradigms (N=69; mean age=18.44, SD=2.05), where they were presented with streams of syllables (auditory) and shapes (visual) during a learning phase that were embedded with statistical regularities unknown to them. Participants receptive and expressive language skills were then tested, and they completed clinically-reliable questionnaires examining autistic-traits and social communication. Auditory ($r(68)=.18, p<.08$) and visual ($r(68)=.36, p<.001$) SL were marginally and significantly correlated with receptive language ability, respectively. Further, receptive language ability was significantly correlated with autism-related social responsiveness, ($r(68)=-.21, p<.04$). However, only auditory SL was significantly related to the autistic trait attention to detail ($r(68)=-.20, p<.05$).

Our results demonstrate that SL abilities are specifically related to multiple issues associated with ASD, including language abilities and traits that act as diagnostic markers for ASD, including attention to detail. Further, our results show that impairments in language comprehension are related to increased autism-related social communication difficulties. Therefore, socio-communication impairments in ASD may prevent these individuals from engaging in opportunities or picking up on cues that would otherwise enhance language learning.

Relating Sensory Sensitivity to Autistic Traits in Typically Developed-Adults

Schulz, S.E., & Stevenson, R.A.

Restricted interests and repetitive behaviours (RRBs) are a core diagnostic symptom of Autism Spectrum Disorder (ASD) and tremendously impact an individual's day-to-day life, yet the underlying factors of RRBs are not fully understood. Recent work suggests sensory sensitivities contribute to autistic symptomatology, specifically RRBS. The current study utilized behavioural and self-report measures of sensory sensitivity to compare these two metrics in relation to RRBs.

Participants included 96 adults who completed self-report measures of sensory sensitivity (Sensory Perception Quotient; SPQ), and RRBs (Repetitive Behaviours Questionnaire-2; RBQ-2) and completed a visual detection task as a behavioural measure of sensory sensitivity.

Correlations confirmed a strong relationship between RRBs and visual behavioural thresholds. There was also a strong relationship between RRBs and SPQ Vision. Interestingly, the two measures of sensory sensitivity were not correlated. In fact, a linear regression revealed that both the behavioural and questionnaire measures of visual sensitivity predicted RRBs, but each of them explained different portions of the variance in the RBQ.

The relationship between both the behavioural and self-reported measures of sensitivity confirm that RRBs increase with increased sensitivity. The results suggest that these two metrics of sensory sensitivity actually measure distinct constructs and account for different aspects of RRBs. We hypothesize that the behavioural tasks measure sensory sensitivity and self-report data actually measure sensory reactivity. These data highlight the need to distinguish between sensory sensitivity and reactivity, not only in the literature, but also in the assessment and treatment of ASD symptoms.

Abstracts – Poster Presentations

The Facilitators and Barriers of Physical Activity Engagement for Youth and Young Adults With Childhood Onset Physical Disabilities

Downs, M., MacDermid, J., & McDougall, J.

This research project will attempt to identify the motivators, experiences and benefits of participation in an exercise class for youth and young adults with childhood onset physical disabilities. By conducting focus groups with both participants of an exercise program at Thames Valley Children's Centre (TVCC) and a group of clinicians from TVCC, this study seeks to identify the facilitators and the potential barriers youth and young adults (age 12-25) with childhood-onset physical disabilities may experience when attempting to engage in physical activity. This study is also interested in determining if participants enrolled in an exercise program at a children's treatment centre are motivated to continue with an active lifestyle after they are no longer eligible to participate in such community programs. Lastly, this project will examine the ways in which ongoing physical activity will benefit youth and young adults with childhood-onset physical disabilities in the short and long term. The two focus groups and any individual interviews will be audio-recorded by the RA. The audio-recordings will then be listened to and transcribed by the RA. The transcripts will be coded by the RA and read by all members of the research team. A personalized exercise questionnaire (PEQ) will be completed by the youth participants, which will collect information on exercise preferences, barriers and facilitators. The answers to the exercise questionnaire will be entered into SPSS. Frequencies will be examined to assess whether answers on the questionnaires reflect the themes revealed in the focus groups/interviews.

CdLS is More Than a Few Letters, It's a Lifestyle: A sibling caregiver's experiences with developmental disability captured through photovoice

Graham, J., & Sibbald, S.L.

Study Objectives: Although previous literature typically focuses on individuals who have a developmental disability, or their parents, there are relatively few studies documenting the experiences and roles of their sibling caregivers. Within the realm of developmental disabilities, Cornelia de Lange Syndrome (CdLS) is fairly rare, affecting approximately 1 in 10,000 individuals (Cornelia de Lange Syndrome Foundation, 2016). This research aims to provide better insight into the experiences and needs of sibling caregivers, specifically siblings to individuals who have CdLS.

Methods: The photovoice method was employed to understand experiences of a caregiver with two siblings who have CdLS.

Results: Themes were interrelated and were associated with both positive and negative aspects of sibling caregiving. The five dominant themes found are as follows: messiness and behavioural challenges; modifications and attention; habits and acceptance; compassion and helping; and learning as a family.

Conclusion: This research serves to augment awareness for sibling caregivers of individuals who have a developmental disability. The need for a productive dialogue to subsequently improve services and social supports is discussed. Methods to improve sibling caregiver life, such as improving communication

A Test to Measured Discrimination Thresholds for Gaze Direction Using 3D Virtual Reality Displays. Implications for the study of gaze avoidance in developmental disorders.
Buitrago-Piza, D., Dalal, H., Mahmoudian, B., Nicolson, R., & Martinez-Trujillo, J.

Perceived gaze direction results from a mechanism that takes into account the orientation of the eyes and the head relative to the observer (Todorovic 2006). Here we hypothesize that individuals with gaze avoidance, who do not fixate the eyes of other individuals, will show impaired gaze discrimination abilities and will mainly rely on head orientation to perceive gaze. To test this hypothesis, we first build a test that measures perceived gaze direction while varying head and eye orientation in 3D displays. We presented 3D virtual reality displays of digitized faces using an Oculus rift. The stimulus presentation and data collection were conducted using Unreal Engine 4. Within a virtual world, emotionally neutral human heads with human or monkey eyes with 3 head and 7 eye orientations were presented. Monkey eyes were used to decrease the visibility of the sclera and test whether the white sclera characteristic of human eyes has an effect on gaze orientation discrimination. Subjects (n=9) judged whether gaze pointed right or left relative to them. A Weibull function was fit to the data; α (point of equality) and β (slope) were determined for each subject. The function provided a good fit to the data in all subjects demonstrating that our method accurately measures thresholds for perceived gaze orientation. We also found that the slope of the psychometric curves was steeper using human-eyes (human-eyes vs monkey-eyes, β median 12.14 vs 3.87; signed-rank test; $p = 0.0053$). Subjects showed longer reaction times with monkey eyes (median difference = 61ms; Kruskal-Wallis $p < 0.001$). The latter shows that the white sclera of the human eye substantially contribute to gaze orientation discrimination. We are currently standardizing the test and incorporating eye movement measurements to test a population of subjects with ASD.

“Why are Kids With Learning Disabilities Left Out of Things at School?” An examination of third- and fourth-graders’ perspectives.

Lau, T-W.Z., & Nowicki, E.A.

Children with learning difficulties continue to struggle with acceptance in regular classrooms decades after the implementation of inclusive education (United Nations Children's Fund [UNICEF], 2013). Considering the substantial role of classmates in making schools welcoming places, children may be able to uncover unique insights and strategies that allow them to better embrace their peers into inclusive classrooms (Nowicki & Brown, 2013). The focus of the present study was to examine third- and fourth-graders’ thoughts on social exclusion of peers with learning difficulties; participants’ responses were expected to corroborate Aboud’s (1988, 2008) social-cognitive developmental theory of prejudice. Moreover, Trochim’s (1989) Group Concept Mapping method was applied to engage the participants in the data collection and analysis processes. Since Group Concept Mapping has rarely been used in studies with elementary school-aged children, the second goal of this study was to observe the participants’ capabilities in accomplishing the research tasks. Findings revealed four themes in children’s responses to “Why are kids who have learning difficulties sometimes left out of things at school?”: (a) differences between children, (b) challenges experienced by children with learning difficulties, (c) others’ negative attitudes, and (d) traits leading to disapproval from others. The corroboration of Aboud’s (1988, 2008) theory suggested that third- and fourth-graders are developing cognitive flexibility to become less prejudice, hence an ideal period to introduce educational interventions about learning difficulties. Furthermore, the participants were capable of providing meaningful responses but would benefit from individual and step-by-step guidance during the research tasks.

Cognitive Functioning and Adaptive Behaviour in Children with Autism Spectrum Disorder

Nicolson, R., & Al-Darwish, M.

Background: Studies have shown that the nature of the relationship between intelligence as measured by standard tests and adaptive functioning in children with autism spectrum disorders (ASD) remains uncertain. The purpose of this study was to compare the correlations between full-scale and sub-scale measures of IQ and socialization scores on the Vineland Adaptive Behavior Scale (VABS) in children with ASD.

Methods: Twenty-three children with ASD and 34 children with a non-ASD spectrum psychiatric diagnosis (8 females), ages between 4 and 18 years, were assessed with the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV) and the Vineland Adaptive Behaviour Scale, Second Edition (VABS-II).

Correlations between the WISC-IV full-scale and subscale (verbal comprehension, perceptual reasoning, working memory, processing speed) standard scores and VABS-II Socialization subscale scores (interpersonal skills, play and leisure, and coping skills) were calculated and compared between groups.

Results: The two groups did not differ significantly on any WISC-IV scores. Children with autism had a significantly lower correlation between their WISC-IV verbal comprehension and VABS-II interpersonal skills scores ($r=-0.05$). At the same time, they had a significantly higher correlation between their WISC-IV perceptual reasoning and their Vineland-II socialization scores ($r=0.4$).

Conclusion: Interpersonal skills in children with autism are best predicted by their perceptual (non-verbal) IQ scores. These findings suggest that examining interpersonal skills scores from the Vineland-II in the context of verbal and non-verbal intelligence scores may be of benefit in clarifying the diagnosis of autism and may further our understanding of the social deficits in these disorders.

Training in Developmental Disabilities in Canadian Psychiatry Residency Programs

O'Flanagan, S., Hocke, V., & Nicolson, R.

Objectives: Numerous studies have found that mental health in people with developmental disabilities is a significantly underserved clinical area. Although the Royal College of Physicians and Surgeons of Canada requires that "Patients with developmental delay across the life span, with or without comorbid psychiatric disorder, must be included" during training in the PGY 2 and PGY 3 years, the type and extent of this experience is not defined. The purpose of this study is to identify the similarities and differences in curricula related to developmental disabilities in Canadian Psychiatry Residency programs.

Methods: This study used a survey with 3 multipart questions. The surveys were sent to Psychiatry Residency directors at all 17 medical schools in Canada.

Results: All respondents report that some formal teaching happens in their program specific to developmental disabilities, however the time dedicated to didactic teaching and the opportunities for clinical rotations differ significantly.

Required and elective rotations in developmental disabilities vary in length, from 1 to 52 weeks. The reported expertise of faculty members giving lectures or supervising clinical rotations also varies significantly.

Discussion/Conclusion: The amount of time dedicated to training Psychiatry residents in developmental disabilities varies significantly in both didactic teaching and in clinical opportunities. Residents exposure to people with developmental disabilities may be significantly different at one Canadian Medical School than at another. Differences in requirements may have an impact on skills, levels of confidence in treating this population, and quality of care for future psychiatrists working with people with developmental disabilities.

The LHSC Whole Exome Sequencing Study – A Progress Report

Carere, D.A., Aref-Eshghi, E., Kerkhof, J., Stuart, A., Lin, H., Ainsworth, P., Rupar, T., Siu, V., Prasad, C., Saleh, M., Karp, N., Chakrabarti, R., Campbell, C., Zapata-Aldana, E., & Sadikovic, B.

Introduction: Whole exome sequencing (WES) enables concurrent analysis of thousands of genes, and may be appropriate when a clinical diagnosis is uncertain or prior targeted testing has not identified a diagnosis. The LHSC WES Study was designed to pilot-test the technical protocols necessary to launch clinical WES.

Methods: LHSC physicians invited patients to the study, and submitted phenotype data, consent form, and DNA sample. Coding regions were enriched with the Roche SeqCap EZ MedExome Target Enrichment Kit (targeting >4600 clinically relevant genes), followed by high-throughput sequencing (Illumina NextSeq). Variants were filtered for quality and frequency with an in-house algorithm, and for phenotype using PhenoTips software. Variants were manually assessed for reporting by a genome analyst and molecular geneticist.

Results: By February 2018, WES was complete in 92 probands (86 families), across 7 diagnostic categories: developmental/intellectual delay plus other features (33%); specified pediatric syndrome or isolated features (e.g., Wilms' tumor; 19%); epilepsy (17%); multiple congenital anomalies (15%); non-epileptic neurological disorder (8%); metabolic disorder (4%); and adult-onset disorder (4%). WES identified ~10,000 variants per case; reduced to ~500 per case by quality/frequency filtering, and <200 per case by phenotype filtering. To date, 44 cases have been assessed, encompassing 38 unique, indication-related reportable variants (14 Pathogenic/Likely Pathogenic; 24 Variants of Uncertain Significance). A molecular diagnosis consistent with referral indication was suggested in 9 of the 44 cases (20%). Pathogenic variants unrelated to indication, but in genes on the American College of Medical Genetics "medically actionable" list, were identified in 7 of 92 cases (8%); of note, these incidental findings are not currently being reported within the study protocol.

Discussion: WES can aid in the diagnosis of a range of conditions of suspected genetic etiology; however, many cases remain unsolved by sequencing of known genes, and unanticipated findings may present challenges to genetic counselling.

Treatment of Adolescent Rats with Lipopolysaccharide Followed by Propionic Acid Induces Anxiety-Like Behavior and Altered Startle Response in Adulthood: Relation to Autism Spectrum Disorder

Wah, D., Kavaliers, M., & Ossenkopp, K-P.

The causes underlying the development of autism spectrum disorder (ASD) are largely unknown. ASD involves a complex set of risk factors including early life immune challenges and altered gut microbiomes. The present study investigated whether the repeated administration of a bacterial endotoxin during early adolescence followed by a short chain fatty acid bacterial metabolite, propionic acid (PPA) leads to altered anxiety-like behaviours, acoustic startle response (ASR), and sensorimotor gating in adulthood. Male adolescent Long-Evans rats were administered lipopolysaccharide (LPS: 0.2 mg/kg i.p.) or NaCl on postnatal days (P) 28, P30, P32, and P34. On P40 and P43, they were administered PPA (500 mg/kg i.p.) or its vehicle, PBS, and were subsequently tested on the light-dark (LD) and ASR tasks, respectively. These treatments and behavioural tasks were repeated in adulthood on P74 and P77. Rats treated with both LPS and PPA showed decreased activity in the dark chamber of the LD task compared to controls, indicating elevated anxiety. LPS produced long-term effects by increasing vertical activity (a putative measure of anxiety) and ASR into adulthood compared to adolescence. PPA decreased percent prepulse inhibition (%PPI) for a 76 dB prepulse compared to controls, but %PPI increased in adulthood such that PPA's effects were no different than controls, suggesting tolerance to PPA. Results of this study support the hypotheses that immune challenges and increased PPA may alter behaviours as observed in ASD.

Prevalence and Determinants of Psychiatric Disorders in Children with Intellectual Disability

Stewart, S.L., & Falah Hassani, K.

Background: We aimed to determine the prevalence of psychiatric disorders among children with and without intellectual disability (ID), and to assess the determinants of specific psychiatric disorders in children with ID.

Methods: The study population consisted of 6069 children without ID and 583 children with ID aged 4-18 years. All participants completed the interRAI ChYMH and ChYMH-DD instruments which are semi-structured clinician-rated interview.

Results: Comorbid mental disorders were common in children with ID and in children without ID who sought mental healthcare services. In children with ID, psychiatric disorders and comorbid mental disorders were more common in boys, older children, and in children who lived with guardians other than both parents. Bullying, and sexual, physical or emotional abuse were associated with ADHD or disruptive disorders. Risk of harm to others and caregiver distress were associated with comorbidity.

Conclusions: Children exposed to trauma meet a number of criteria for various psychiatric disorders. Conducting a thorough, comprehensive assessment to examine developmental trauma is needed to ensure that trauma-informed treatment is provided.

Pupillary Responses to Manipulation of Stimuli Type and Synchrony in Children with Autism Spectrum Disorder

Segers, M., Bebko, J.M., Ncube, B., & Stevenson, R.A.

Individuals with ASD have been shown to have a decreased sensitivity to the timing of multisensory inputs that are linguistic in nature, but not to simple, non-social stimuli. These difficulties have been theoretically and empirically linked to speech perception and communication difficulties. Pupillary responses (dilation and constriction) are reliable indices of cognitive operations including preference, mental load, and incongruity. The current study is the first to measure pupillary responses to dynamic, temporally manipulated audio-visual stimuli to infer cognitive processes involved in perception of non-social, social, and social-linguistic stimuli. Children with ASD and typically developing children were matched for chronological and mental age. Stimuli presented included non-social, social non-linguistic, and social-linguistic which were presented synchronously or asynchronously (1000ms delay). Children with ASD showed significantly smaller pupillary responses to social information than TD children but did not differ from typically developing children in the non-social condition. Analysis of temporal processing was more equivocal and no significant interaction was apparent. Correlational analyses reveal a negative relationship between pupillary responses and ASD symptomatology across both groups. These data reveal attenuated pupillary responses to all social information in the ASD group, whereas no differences were observed for the non-social conditions. Differences in multisensory processing of social stimuli were significantly correlated with symptom severity, providing convergent evidence that early-stage physiological processing (i.e., pupillary change) may contribute to clinical impairments in ASD.

Neonatal Thalamic Development is Associated With 4.5 Year Sensory Processing in Very Preterm Born Neonates

Duerden, E.G., Chau, C., Glass, T., Mackay, M., Foong, J., Guo, T., Chau, V., Synnes, A., Miller, S.P., & Grunau, R.E.

Introduction: Children born very preterm (<32 weeks gestational age [GA]) exhibit differing behavioral responses to sensory stimuli. The etiology of altered sensory processing in preterms may result from greater sensory stimulation during intensive care, including procedural pain, resulting in altered cortical and subcortical maturation. The development of the thalamus is particularly vulnerable to excessive sensory stimulation as it is a major relay to the cortex.

Objectives: To determine if sensory processing assessed in the 4th year of life is predicted by (i) neonatal clinical factors, including infection and skin breaking procedures, and (ii) neonatal thalamic development.

Methods: A group of 140 very preterm born neonates (median GA 28 weeks IQR 26-30) underwent MRI early-in-life (median 32 weeks) and at term-equivalent age (median 40 weeks). Children returned at 4.5 years and were assessed on the Short Sensory Profile, a standardized test. Generalized linear models were used to assess factors predicting sensory processing. Models testing the association of clinical care factors, including infection and skin breaks, thalamic volumes and fractional anisotropy (FA) of thalamocortical pathways with sensory processing assessed at 4.5 years of age, adjusting for gestational age at birth, age at scan and age at assessment.

Results: Sensory processing was not associated with neonatal infection ($p=0.9$) or procedural pain ($p=0.1$), in the overall cohort. Only in extremely preterm neonates (born <28 weeks' GA) who were exposed to more procedural pain in comparison to very-preterm neonates (29-32 weeks' GA, $p<0.001$), were skin-breaking procedures associated with reduced sensory processing ($p=0.02$). In the overall cohort, sensory processing was associated with thalamic growth ($p<0.0001$). An interaction analysis revealed a significant effect of birth GA ($p<0.0001$), and a subsequent analysis indicated that extremely preterm neonates exposed to more procedural pain had lesser sensory sensitivity ($p=0.003$). Similarly, extremely preterm neonates exposed to high skin-breaks had lesser sensory sensitivity and altered FA in commissural fiber pathways ($p=0.002$).

Conclusions: The relationship between sensory processing in early childhood and neonatal pain is evident in extremely preterm neonates. Thalamic and white-matter fiber pathway development are important predictors of later sensory processing and may be key biomarkers for targeted therapies to manage sensory deficits in children high risk for developmental disabilities.

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