# Kara Murias MD, PhD, FRCPC

Child Development Services

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## Employment

Assistant Professor, Paediatric Neurologist. University of Calgary and Alberta Health Services (July 2018 to Present). Division of Developmental Pediatrics, Departments of Pediatrics and Clinical Neuroscience, Cumming School of Medicine.

0.7 FTE allotted to research, 0.2 FTE clinical, 0.1 FTE education

Paediatric Neurology / Clinician Investigator Resident. Alberta health Services (July 2009 – 2017).

Research Assistant. University of Calgary (May – Dec 2004). Laboratory of Ken Lukowiak.

Project Geophysicist. Husky Energy (Feb 2000 – Sept 2003).

**Education**

Neurodevelopmental Clinical Fellowship. University of Calgary – Section of Developmental Paediatrics (Nov 20, 2017 – June 30, 2018). Focused clinical training in neurodevelopmental disorders.

Paediatric Neurology / Clinician Investigator Residency Programs. University of Calgary (July 1, 2009 – Nov 17, 2017). Successfully completed Royal College of Canada specialty examinations for Paediatric Neurology and a PhD in Neuroscience.

Degree of Doctor of Philosophy, Neuroscience. University of Calgary (Dec 13, 2015). Thesis in cognitive neuroscience (*The Development of Spatial Orientation in Children After Perinatal Stroke*; supervisor Dr. Giuseppe Iaria). Supported by AI-HS Clinician Research Fellowship.

Leaders in Medicine: Combined Graduate/Medicine Program. University of Calgary (May 30, 2009) Graduated with combined MD and Masters of Science (Neuroscience) with a specialization in learning and memory (Dr. Ken Lukowiak supervisor).

#### Bachelor of Science in Geophysics (hon.) with first class standing. University of Calgary, Dec 31, 1999

## Funding Awards

CIHR Project Grant (2020-2023) $497,250 ”ACCESS: Assessing the Continuum of Care and Eligibility for Services and Supports for Children with Neurodevelopmental Disabilities and their Families” Co-investigator – awarded.

Azrieli Back on Track from Covid19 grant (2020) $7500 ”Long-term attention, executive function, and neuroimaging outcomes in children with neonatal hypoxic-ischemic encephalopathy” Principle investigator – awarded.

Department of Pediatrics Innovation Award (2019-2021) $18,677. ”Complex attention and executive function clinic evaluation project” Principle investigator – awarded.

Alberta Children’s Hospital Research Institute: Start-up Funds (2018-2021) $250,000. Principle investigator – awarded.

Owerko Centre: (2019-2022) approximately $5000 over 3 years. “Owerko neurodevelopmental disorder recruitment database” Principle investigator

Boston’s Children Hospital (2019-2022) $18,000 (USD) (portion for University of Calgary) “A prospective natural history study of Angelman syndrome” Collaborator – awarded.

Owerko Centre Catalyst Grant (2020-2022) $75000. ”Cross-disorder approach to the study of gut microbiome in neurodevelopmental disorders” Collaborator – awarded.

Alberta Innovates Health Solutions: Clinician Fellowship (2012-2015) $211,500.

ACHRI/CIHR: Clinician Fellowship (2012) $70,000+/year salary support: declined.

NSERC: Canadian Graduate Studentship: (2005-2006) $38,000

## Memberships

* Member of the Owerko Centre Alberta Children’s Hospital Research Institute (ACHRI) – Executive committee and Education committee (October 1, 2018)
* Member of the ACHRI – Brain and mental health project – full member (July 1, 2018)
* Hotchkiss Brain Institute - full member (July 1, 2018)
* Research mentor - Developmental Pediatrics residency program (July 1, 2018)
* American Academy of Neurology – member (Jan 1, 2013)
* Alberta Medical Association – member (July 1, 2007)
* Canadian Association of Child Neurologists – member (July 1, 2018)
* Organization for Human Brain Mapping – member (March 1, 2013)
* Canadian ADHD Resource Alliance CADDRA – member (November 1, 2018)
* College of Physicians and Surgeons of Alberta – licensed member (July 1, 2018)
* Royal College of Physicians and surgeons of Canada – fellow (Dec 15, 2015)
* Canadian Medical Protection Agency

## Honors and Awards

CCHCSP Pillar Program Award (2021): Supported by the Haslam Chair in Pediatric neurology

CIHR Reviewer in Training Program (June 2021)

Clinician Investigator / Paediatric Neurology Residency Programs. University of Calgary, Calgary, AB (2009-2017):

* Post Graduate Medical Education travel award (multiple)
* Post Graduate Medical Education leadership travel award
* Graduate Student Association travel award
* American Academy of Neurology Resident scholarship to attend annual meeting
* Tuition for attendance at Norlien Symposium for Early Brain and Behaviour Development
* CIP representative on the Canadian Investigator Trainee Association of Canada (CITAC) executive committee
* Clinician Investigator Program Chief Resident
* Paediatric Neurology Chief Resident

Leaders in Medicine MD/MSc. University of Calgary, Calgary, AB (2005-2009):

* Graduate Research Scholarship - Entrance Scholarship
* Nat Christie Medical Entrance Award

## Trainee supervision and teaching

graduate Students

* Bevin Wiley: Masters of Neuroscience student. Start: September 2021. anticipated completion date May 2023. Primary supervisor.
* Kelsey Harkness: PhD - Neuroscience. Start: September 2019, anticipated completion date May 2023. Primary supervisor. Primary supervisor
* Ishita Moghe: Masters of Neuroscience student. September 2019-May 2021. Awarded CIHR graduate studentship.

Undergraduate Students

* Fanar Ghanim: Bachelor of Science in Neuroscience, summer 2019, PURE summer student award, summer 2020, AIHS summer studentship 2021
* Elana Sarabin: Bachelor of Science in Biology, student research assistant; Sept. 2018 – ongoing
* Harshil Shah: Bachelor of Science in Neuroscience, undergraduate volunteer Dec 2019 – ongoing. Undergraduate neuroscience research award 2020, ACHRI summer studentship 2021
* Yuan Fan: Bachelor of Science and Bachelor of Education, 2018 to fall 2019. Summer student 2019, awarded Markin USRP award
* Oswald Chen: Bachelor of Science in Neuroscience, summer 2019, Undergraduate neuroscience research award

Pediatric Resident Research Project Supervisor

* Jennifer Saunders (2018 - ongoing) Utilization of supports in children with Autism Spectrum Disorder and Parental Satisfaction and Quality of Life

Medical Student Applied Evidence Based Medicine (AEBM) Project Supervisor

* Andrea Moir (2016) “AEBM Research Paper: Systematic review of the utility of MRI for investigating children with developmental delay or cognitive impairment.”

Psychology Honors Thesis Research Mentor

* Melissa W. Yue (2014 – 2015) “Hippocampal Volume Differences in Children with Perinatal Strokes and the Impact on Spatial Orientation Ability”
* Kathy Kwok (2013 – 2014) “Gender Differences in Spatial Orientation among Adults”

Undergraduate Medical Education Teaching (2011-ongoing): Neuroanatomy small group, Course 5 (Integrated Neurosciences, Special Senses and Aging) small group teaching, Course 6 (Children and Women’s Health) small group teaching and lectures.

Summer Student Research Mentor

* Adrian Gil (2013) “Development of virtual reality spatial orientation task for children”.
* Martin Amarell (2006) “One trial training protocol in *Lymnaea stagnalis”.*

High School Student Work Experience Supervisor

* Rylie Dobson (2015-2016) Research assistant work experience.

Lab Staff

* Anila Virani: research assistant November 2020 to present
* Chelsea Durber: psychometrist: January 2020 to August 2020
* sEvan Zhou: Research volunteer May 2020 to present
* Ciara Hanley: Research Assistant September 2019 to June 2020
* Christian Tsang: Research Coordinator October 2018 to March 2020

## Publications (under the names K. Murias and K. Martens)

**Peer Reviewed papers**

Merrikh D, Stone K, Patten S, **Murias K**, Lemay JF, Chenji S, Swansburg R, MacMaster F. “Repetitive Transcranial Magnetic Stimulation (rTMS) as a Treatment for Attention Deficit Hyperactivity Disorder (ADHD): A Systematic Review” *Journal of Attention Disorders.* Submitted 2021.

Russell MJ, Scott CWM, Berrigan P, **Murias K,** Gibbard B, Cui X, Tough S, and Zwicker JD. “The transition to adult income supports for youth that received BC special education: A cohort study” *Health & Social Care in the Community.* Submitted 2021.

Godfrey K, Espenhahn S, Stoke M, McMorris C, **Murias K**, McCrimmon A, Harris AD, Bray S. “Interest intensity associates with attention shifting and behavioural inhibition but not reward or anxiety measures in autistic preschool children” *Autism*, Accepted, 2021.

Larsen N, Craig BT, Hilderley AJ, Virani S, **Murias K**, Brooks BL, Kirton A, Carlson HL. “Frontal interhemispheric structural connectivity, attention, and executive function in children with perinatal stroke” *Brain and Behavior.*  In press 2021.

Russell MJ, Scott CWM, **Murias K,** Gibbard B, Cui X, Tough S, and Zwicker JD. “Cross-ministry data on service use and limitations faced by children in special education” *Disability & Health*. [published online ahead of print, May 15, 2021]. DOI: [10.1016/j.dhjo.2021.101118](https://doi.org/10.1016/j.dhjo.2021.101118)

Espenhahn S, Godfrey K, Kaur S, Ross M, McMorris C, Cortese F, Wright C, **Murias K,** Dewey D, Protzner A, McCrimmon A, Bray S, Harris AD. “Tactile cortical responses and association with tactile symptoms in young children with autism spectrum disorder” *Molecular Autism*, Accepted 2021. [doi.org/10.1016/j.dhjo.2021.101118](https://doi.org/10.1016/j.dhjo.2021.101118)

Hanly C\*, Shah H\*, Au PYB, **Murias K**. “Description of neurodevelopmental phenotypes associated with 10 genetic neurodevelopmental disorders: A scoping review.” *Clin Genet.* March 2021; 99(3) 335-346.

Burles F, Liu I, Hart C, **Murias K,** Graham SA, Iaria G. “The emergence of cognitive maps for spatial navigation in seven- to ten-year-old children” *Child Development*. May 2020; 91(3): e733-e744. doi:10.111/cdev.13285

**Murias K**, Slone E, Tariq S\*, Iaria G. “Development of spatial orientation skills: An fMRI study.” *Brain Imaging and Behavior*. Jan. 2019 (13) 1590-1601.

**MuriasK**, MoirA\*, MyersKA, LiuI, WeiXC (2017) “Systematic review of the utility of MRI for investigating children with developmental delay or cognitive impairment” *Brain and Development*. Sep 2017;39(8):644-655.

**Murias K,** Kirton A, Tariq S\*,Castillejo AG\*, Moir A\*, and G Iaria. (2017) “Spatial orientation and navigation in children with perinatal stroke”. *Developmental Neuropsychology*. 2017;42(3):160-171.

**Murias K,** Kwok K\*, Castillejo AG\*, Liu I, and G Iaria. (2016) “The effects of video game use on performance in a virtual navigation task” *Computers in Human Behaviour*. 2016;58:398-406.

**Murias K,** Brooks B, Kirton A, and G Iaria. (2014) “A review of cognitive outcomes in children following perinatal stroke” *Developmental Neuropsychology*. 2014;39(2):131-57.

Lukowiak K, **Martens K,** Rosenegger D, Browning K, de Caigny P and M Orr. (2008) “The perception of stress alters adaptive behaviours in Lymnaea stagnalis” *Journal of Experimental Biology.* Jun;211(Pt 11):1747-56.

**Martens K,** Amarell M, Parvez K, Hittel C, Ito E, and K Lukowiak (2007) “One-trial conditioning of aerial respiratory behavior of *Lymnaea stagnalis” Neurobiol of Learning and Memory.* Sep;88(2):232-42.

**Martens K,** de Caigny P, Parvez K, Amarell M\*, Wong C, and K Lukowiak. (2007) “Stressful stimuli modulate memory formation in *Lymnaea* *stagnalis”, Neurobiol of Learning and Memory.* Mar;87(3):391-403.

Parvez K, Rosenegger D, **Martens K,** Orr M, and K Lukowiak. (2006) “Learning at a snail’s pace”. *Canadian Journal of Neurological Sciences.* Nov;33(4):347-56.

[Lukowiak K](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Search&itool=pubmed_AbstractPlus&term=%22Lukowiak+K%22%5BAuthor%5D), [**Martens K**](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Search&itool=pubmed_AbstractPlus&term=%22Martens+K%22%5BAuthor%5D), [Orr M](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Search&itool=pubmed_AbstractPlus&term=%22Orr+M%22%5BAuthor%5D), [Parvez K](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Search&itool=pubmed_AbstractPlus&term=%22Parvez+K%22%5BAuthor%5D), [Rosenegger D](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Search&itool=pubmed_AbstractPlus&term=%22Rosenegger+D%22%5BAuthor%5D), and S [Sangha](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Search&itool=pubmed_AbstractPlus&term=%22Sangha+S%22%5BAuthor%5D). (2006) “Modulation of aerial respiratory behaviour in a pond snail.” [*Respir Physiol Neurobiol.*](javascript:AL_get(this,%20'jour',%20'Respir%20Physiol%20Neurobiol.');) Nov;154(1-2):61-72.

Sangha S, Scheibenstock A, **Martens K** and K Lukowiak. (2005) “Impairing forgetting by preventing new learning and memory” *Behavioral Neurosciences.* Jun;119(3):787-96.

**Engagement Events**

Fragile X parent information session. Update on clinical trials and emerging treatments. July 8, 2020. Online

Neurodevelopment mini-symposium and parent engagement event – host and organiszor Nov 13, 2019. Alberta Children’s Hospital, Calgary AB.

**Online Resources**

**Murias K**. “Developmental delay in children: evaluation and management” Medlink Neurology 2019.

Arnold AE, Liu I, **Murias K**, Slone E, Burles F, Guadagni V, and G Iaria. (2015).Human Spatial Orientation, Neural Basis of.  **James D. Wright (Ed.), *The International Encyclopedia of Social and Behavioral Sciences (2nd Edition)*. Elsevier.**

**Theses**

**Murias K** (2015) *The Development of Spatial Orientation in Children After Perinatal Stroke.* Degree of Doctor of Philosophy; Graduate department of Neuroscience, University of Calgary.

**Murias K** (2006) *The Effect of Induced Stress on Long-term Memory in Lymnaea stagnalis.* Degree of Masters of Science; Graduate department of Neuroscience, University of Calgary.

**Conference Abstracts**

Wiley B\*, Ghanim F\*, Taylor K, **Murias K**. Baseline Assessment of Attention and Executive deficits in children with neurodevelopmental disorders: Data from a specialty attention clinic. *Canadian Neurological Sciences Federation Annual Congress*. Oct 2021. Toronto, Canada. – accepted. Meeting cancelled due to pandemic.

Moghe I\*,  Hawe RL, Pringsheim T, **Murias K**. An examination of sensorimotor function in children with Autism Spectrum Disorder using robotic measurement. *ISDN Biennial Meeting*. May 25-27, 2021. Online.

Harkness K\*, Bray S, **Murias K**. The effect of stimulant washout on functional connectivity in Autism Spectrum Disorder. *ISDN Biennial Meeting*. May 25-27, 2021. Online.

Espenhahn S, Godfrey K, Kaur S, McMorris C, Dewey D, **Murias K**, Bray S, Harris A. Somatosensory-evoked potentials in young children with autism spectrum disorder. *INSAR.* June 3, 2020. Online.

Godfrey K, Espenhahn S, McMorris C, Dewey D, **Murias K**, Harris AD, Bray S. Characterizing intense personal interests in young children with autism spectrum disorder. *INSAR.* June 3, 2020. Online.

Moghe I\*,  Medina A, Pringsheim T, **Murias K**. An examination of sensorimotor function in children with Autism Spectrum Disorder using robotic measurement. *HBI Research Day*. May 28, 2020. Online.

**Murias K**, Hanley C, Shah H\*, Au Y-P. Description of neurodevelopmental phenotypes associated with mutations in ten genes: A Scoping Review *Canadian Neurological Sciences Federation Annual Congress*. June 2020. Banff, Canada – accepted. Meeting cancelled due to pandemic

Moghe I\*,  Chen O\*, Tsang C, **Murias K**. An examination of sensorimotor function in children with Autism Spectrum Disorder using robotic measurement. *ACHRI Research Retreat*. Dec 12-13, 2019. Banff Canada.

Harkness K\*, Fan JY\*, Esser M, Bray S, Mohammad K, **Murias K.** Using rs-fMRI to compare attentional and educational outcomes in children with neonatal hypoxic-ischemic encephalopathy. *ACHRI Research Retreat.* Dec 12-13, 2019. Banff Canada.

Espenhahn S, Godfrey K, Kaur S, McMorris C, Dewey D, **Murias K**, Bray S, Harris A. Sensory tactile processing in young children with autism spectrum disorder. *ACHRI Research Retreat.* Dec 12-13, 2019. Banff Canada

Fan JY\*, Tsang C, Esser MJ, Mohammad K, Henderson L, **Murias K**. "Clinical Outcomes in Children with Neonatal Hypoxic Ischemic Encephalopathy: A Retrospective Chart Review”. *Markin summer student symposium.*September 25, 2019, Calgary, AB.

Chen O\*, Tsang C, Nosratmirshekarlou E, Medina A, Hawe R, Dukelow S, Pringsheim T, **Murias K.** "Examining motor inhibition and executive function in children with ASD using the KINARM”. ACHRI Summer Student Symposium; 2019 Aug 23; Calgary, AB

Ghanim F\*, Sarabin E\*, **Murias K**. "Outcomes and quality of life in secondary attention deficits”. *ACHRI Summer Student Research Day,* August 23, 2019, Calgary, AB

Fan JY\*, Tsang C, Esser MJ, Mohammad K, Henderson L, **Murias K**. "Clinical Outcomes in Children with Neonatal Hypoxic Ischemic Encephalopathy: A Retrospective Chart Review”.  *ACHRI Summer Student Symposium,*August 23, 2019. Calgary, AB

**Murias K**, Slone T, Tariq S, Iaria G. “Development of Spatial Orientation Skills in Children: a task fMRI.” *Organization of Human Brain Mapping Annual Meeting.* Geneva, Switzerland, June 26-30, 2016.

**Murias K**, Kirton A, Tariq S, Moir A\*, Iaria G. “Neuroimaging Markers of Cognitive Outcome in Children with Perinatal Stroke.” *American Academy of Neurology Annual Meeting.* Vancouver BC, April 15-21, 2016.

**Murias K**, Liu I, Tariq S, Barton JJS, Kirton A, Iaria G. “Topographical orientation as a model of plasticity in children with perinatal stroke.” *Canadian Neurological Sciences Federation Annual Meeting.* Toronto ON, June 9-12, 2015.

**Murias K**, Liu I, Tariq S, Barton JJS, Kirton A, Iaria G. “The Effect of Perinatal Stroke on Spatial Orientation.” *American Academy of Neurology Annual Meeting.* Washington DC April 19-24, 2015.

**Murias K**, Barton JJS, Kirton A, Iaria G. “The affects of perinatal stroke on spatial orientation.” *Organization for Human Brain Mapping Annual Meeting.* Hamburg, Germany. June 8-13, 2014.

Jadavji Z, Brooks B, Mineyko A, **Murias K**, Kirton A. “Attention deficit and hyperactivity disorder in perinatal stroke.” *ACHRI Symposium*, Calgary AB. April 9, 2014

**MuriasK**, LiuI, MoirA\*, Myers K. “Systematic review of MRI abnormalities in children with developmental delay.” *CITAC Young Investigator Forum.* Ottawa ON. September 16-18, 2013.

**Murias K**, Iaria G. “Cognition in Children Following Perinatal Stroke.” *Canadian Spring Conference: Brain and Behaviour*. Fernie BC, 2013.

**Oral Presentations**

**Murias K,** “Supporting children and families during a pandemic (with special consideration for populations at increased risk)” *Department of Paediatrics Grand Rounds.* University of Calgary, Calgary AB. April 1, 2020.

**Murias K, “**ADHD – What is new?” *ACH Pediatrics Update Conference.* Alberta Children’s Hospital, Calgary AB. May 6, 2019.

**Murias K,** Kusmanovski, D. **“**Interventions within the school of children with attention difficulties: review of literature and practice in Calgary” *Owerko Neurodevelopmental Research Rounds.* University of Calgary, Calgary AB. Nov 6, 2018.

**Murias K. “**Systematic Reviews and Meta-analysis” *Owerko Neurodevelopmental Research Rounds.* University of Calgary, Calgary AB. Oct 3, 2018.

**Murias K.** “Developmental Research in Calgary; Meaningful Progress Through Collaboration” *Department of Pediatrics Grand Rounds.* University of Calgary, Calgary AB. April 18, 2018.

**Murias K.** “MR Imaging and Cognitive Development” *Developmental Neuroscience Grand Rounds.* University of Calgary, Calgary AB. June 19, 2017.

**Murias K**, Kirton A, Tariq S, Moir A\*, Iaria G. “Neuroimaging Markers of Cognitive Outcome in Children with Perinatal Stroke.” *American Academy of Neurology Annual Meeting.* Vancouver BC, April 15-21, 2016.

**Murias K**, Kirton A. “Pediatric case presentation” *Canadian Stroke Consortium Review Course*. Ottawa ON, April 8-10, 2016

**Murias K**, Kirton A, Iaria G. “Development of Spatial Orientation Skills in Children with Perinatal Stroke” *Clinician Investigator Program Resident Research Day*. Calgary AB, Dec 1, 2015.

**Murias K**, Slone T, Iaria G. “fMRI Study of Spatial Orientation Development in Children” *Department of Clinical Neuroscience Resident Research Day*. Calgary AB, Nov 27, 2015

**Murias K**, Lemay, JF. “The company we keep: ASD comorbidities”. *Autism Spectrum Disorders Symposium.* ACH, Calgary AB. February 19, 2015.

**Murias K**, Iaria G. “Spatial Orientation in Children with Perinatal Stroke.” *Hotchkiss Brain Institute Research in Progress Symposium.* Calgary AB, Feb 27, 2015

**Murias K**, Kirton A, Iaria G. “Spatial Orientation in Children with Perinatal Stroke” *Clinician Investigator Program Resident Research Day*. Calgary AB, Jan 26, 2015.

**Murias K**. “mTOR Pathway basic science.” *Rocky Mountain Basic Science Symposium*. Lake Louise, AB. March 11, 2014.

Albrashi Y, **Murias K**, Wei XC. “Case Presentation: Neonatal Hemorrhage” *ACHRI Neuroimaging Symposium.* Calgary AB, Nov 14, 2014.

**Murias K**, Kirton A, Iaria G. “Testing Spatial Orientation Using a Virtual Environment Task” *Department of Clinical Neuroscience Resident Research Day*. Calgary AB, Oct 2013.

**Murias K**, Kirton A, Iaria G. “Cognition in Children After Perinatal Stroke” *Clinician Investigator Program Resident Research Day*. Calgary AB, June, 2013.

\* indicate trainees directly supervised by K Murias