Research Acoled Linguistics

ARIEAL Annual Report 2018





MESSAGE FROM THE DIRECTOR

In the second calendar year since the ARiEAL Research Centre was founded, 2018 has proven to be a busy and unequivocally productive year. It is with great pride that we offer an overview of what ARiEAL researchers and trainees have accomplished during the past year in this 2018 Annual Report.

All of us understand how challenging it is to secure research funding, especially in today's economy. In only our second year of existence, ARiEAL Research Centre has flourished with existing collaborations and has also fostered new partnerships among our own researchers and national and international networks. Together, we started 15 new research grants as either Principal Investigators or Co-investigators in 2018 with funding totaling over 7.2 million dollars across these newly initiated projects (see GRANTS Section of this annual report).

We are also pleased to welcome Dr. Sue Becker to ARiEAL Research Centre as a Full Member in 2018. Dr. Becker directs the Neurotechnology and Neuroplasticity Lab at McMaster University which focuses on the neural bases of learning and memory. Dr. Becker's knowledge and expertise in computational modelling, behavioural and neuroimaging studies further contributes to the breadth and interdisciplinarity of our membership.

Trainees play an essential role in ARiEAL, and their contributions make our collective success possible. It is one of our key objectives to provide opportunities for learning and mentorship across a variety of disciplines during their time at ARiEAL. In 2018, we are proud to announce the launch of the ARiEAL Travel Award Program to support our postgraduate trainees in presenting their research at various relevant peer-reviewed conferences, workshops and/or symposia. 2018 also marked the beginning of the ARiEAL Learning Series that aims to offer various opportunities for trainees (from undergraduate to postdoctoral fellows) to develop and refine their research skills, and to establish their research careers.

Even in this start-up phase, ARiEAL's visibility is being established. In 2018 alone, our website (arieal.mcmaster.ca) welcomed over 6,500 visitors from 97 countries. Our official Twitter account (@ARiEAL_Research) reached over 100,000 impressions with 165 tweets and exceeded 2,300 engagement counts. This 2018 annual report documents our interim productivity as we continue to strengthen the foundation of ARiEAL.

4 Jan

JOHN CONNOLLY

Director, ARiEAL Research Centre Professor, Department of Linguistics and Languages Senator William McMaster Chair in the Cognitive Neuroscience of Language

RESEARCH HIGHLIGHTS

ARIEAL exemplifies interdisciplinary collaboration among its researchers who have expertise in linguistics and languages, relevant clinical conditions, and key neurophysiological, neuroimaging, and behavioural measures. Together, the research leads to an advanced understanding of the neural, behavioural and social foundations of human communication. Highlighted in this report are 2018 research activities from each of the laboratories led by ARIEAL researchers.

Language, Memory and Brain Lab



Co-director of the Language, Memory and Brain Lab, Dr. Elisabet Service.

The Language, Memory and Brain (LMB) Lab, codirected by Drs. John Connolly & Elisabet Service, conducts research using brain recording/imaging and behavioural measures to investigate a range of topics including basic research on language acquisition, spoken word processing, working memory, and other related cognitive processes. Much of this work is then applied in investigations of language challenges including dyslexia as well as studies of brain injury and disorders of consciousness. Dr. Connolly focuses primarily on the neuroscience of cognition with applications to assessment of clinical populations, while Dr. Service's research focuses on cognitive aspects of processing, acquisition and impairments of language. In 2018, two students, San-Hei Kenny Luk (co-supervised by Dr. Elisabet Service and Dr. Daniel Pape) and Natalia Lapinskaya (supervised by Dr. John Connolly), successfully completed their master's degree, and Richard Mah (supervised by Dr. John Connolly) completed his doctoral degree. Dr. Connolly's coma project at the LMB lab continues and successfully received a Collaborative Health Research Projects grant from Canadian Institutes of Health Research and Natural Sciences and Engineering Research Council together with other ARiEAL members, Drs. Jim Reilly and Ranil Sonnadara, to develop a point of care system for automated coma prognosis. Publications on the disorders of consciousness that also involved other ARiEAL members appeared in *IEEE Journal of Biomedical* and Health Informatics and PLoS ONE. Dr. Service and her research partners in Finland published a study protocol on the Helsinki longitudinal specific language impairment project in *BMC Psychology* and she plans to adopt the cognitive part of the protocol in Canada in the coming year. Dr. Service's study on the effects of second language use on performance of work-like tasks continues in 2018 and expansion of the study is being planned.

MELD Programs and The MELD Bilingualism Lab



Director of the **MELD Programs** and the **MELD Bilingualism** Lab, Dr. Anna Moro.

The McMaster English Language Development (MELD) Programs and the MELD Bilingualism Lab are both directed by Dr. Anna Moro. MELD programs are intended for international students whose primary language is not English, but wish to improve their English proficiency to succeed in an English-speaking higher education environment. Starting in 2018, MELD

Programs have expanded the services from the MELD Diploma to also include McMaster English Readiness for Graduate Excellence (MERGE) and McMaster Office for the Development of English Language Learners (MODEL) to offer an even more comprehensive range of services to both undergraduate and graduate international students. The Bilingualism Lab investigates the underlying linguistic mechanisms of bilingual phenomena and focuses on second language acquisition. In 2018, the lab welcomes a new doctoral student, Rudaina Hamed (co-supervised by Drs. Anna Moro and Victor Kuperman). While MELD Programs are not a research laboratory per se, interesting research on foreign language acquisition is being conducted on a regular basis with the support and guidance of the Bilingualism Lab. In March and April 2018, the MELD research team continued the eye-tracking experiment and reading tests (including phonological processing, expressive and receptive vocabulary knowledge, and reading comprehension) with their 2017-2018 student cohort (who started in September 2017). The results were being compared to the data collected in the year prior to examine the changes in performance. Presentations based on the research findings were presented in the United States and Canada. The same testing procedure was implemented again with the 2018-2019 student cohort of 360. The continuity of these research activities aims to bring steady improvement to the MELD programs.

> Daniel Schmidtke (left), postdoctoral fellow at Dr. Anna Moro's MELD Bilingualism Lab, prepares the eye-tracking experiment for students enrolled in the MELD program. Photo by Nathan Nash.

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Neurotechnology and Neuroplasticity Lab



Director of the **Neurotechnology and Neuroplasticity Lab**, Dr. Sue Becker.

The Neurotechnology and Neuroplasticity Lab is directed by Dr. Sue Becker whose research focuses on the neural bases of learning and memory. The lab employs a variety of methodologies including computational modelling, behavioural and neuroimaging studies to investigate questions such as how the hippocampus codes episodic and spatial memories, the role of neurogenesis in memory and mood regulation, how stress, binge drinking, exercise and neurofeedback affect hippocampal memory functions and intrinsic brain networks, and how the auditory cortex re-organizes after hearing loss. Applications of this research include the development of novel algorithms for EEG-based neurofeedback and brain-computer-interfaces. In 2018, Lauren Smail and Sara Jamil from the lab successfully completed their master's degree, and Craig Hutton as well as Laura Keating completed their doctoral degree. Dr. Becker also received infrastructure operating fund from the Canadian Foundation for Innovation for her research on hearing technology. Members of Dr. Becker's lab disseminated their research findings at various local and national conferences including the 15th Conference on Computer and Robot Vision, and published their findings on automated neurofeedback training in IEEE Transactions on Neural Systems and Rehabilitation Engineering.

Teaching and Learning Lab



Dr. Catherine Anderson, an Associate Professor in the Department of Linguistics and Languages, directs the Teaching & Learning Lab. The lab's research, all of which is conducted in collaboration with undergraduate student partners, focuses on students' experiences in a variety of undergraduate learning contexts. In 2018, the undergraduate student partners continued their project: Dana Tucci completed another round of data collection for the Team-Based Learning in the Active Learning Classroom project; Paige McKenny and Dr. Anderson submitted a paper on working in partnership to conduct a program review to International Journal of Students as Partners. Also in 2018, with support from McMaster University and a \$15,000 grant from eCampusOntario's Open Textbook initiative, Dr. Anderson published an open-access Linguistics textbook entitled Essentials of Linguistics to address the affordability and accessibility of course materials. In the context of the calls to action in the Truth and Reconciliation Commission's report in 2015, Dr. Anderson also included a chapter on how linguistics can help Indigenous communities preserve their languages in Canada.

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The Language, Reading and Cognitive Neuroscience Lab



Director of the Language, Reading and Cognitive Neuroscience Lab, Dr. Marc Joanisse

The Language, Reading and Cognitive Neuroscience Lab is directed by Dr. Marc Joanisse, and is housed in The University of Western Ontario's Brain and Mind Institute. Dr. Joanisse's Lab examines the cognitive and neural foundations of language and reading across the lifespan. This includes studying reading and language disorders in children, as well as language learning and processing in adults. A wide variety of experimental techniques including eye-tracking and event-related potentials measured with EEG are used, along with resting-state and task-based functional magnetic resonance imaging. In 2018, the Language, Reading and Cognitive Neuroscience lab received funding from Canada Foundation for Innovation for its infrastructure development. While the lab continued its multi-year project in examining the influence of reading remediation on brain markers of reading impairment in school-aged children, Dr. Marc Joanisse also received the Canada First Research Excellence Fund to study the neurocognitive, genetic and environmental risk factors of learning disorders in children. In addition to this, Dr. Joanisse's continued collaboration with another ARiEAL member, Dr. Lisa Archibald, resulted in three journal article publications and two presentations in 2018.

The Syntax Lab



The Syntax Lab is directed by Dr. Ivona Kučerová and it investigates syntactic structures, including combinatorial properties of natural languages from the general-cognition perspective. Both traditional fieldwork and experimental methods are used to collect data from cross-linguistically diverse languages, including Indigenous languages of Canada, in order to identify and model universal and language-specific structural properties human languages have. The primary focus of the lab is on modelling features at the syntax-semantics interface. In 2018, Dr. Kučerová's student, Cassandra Chapman, successfully completed her doctorate degree, and Dr. Nicholas Welch completed his postdoctoral fellowship. The groundwork started in 2017 on creating a formal research collaboration with the communities of the Six Nations of the Grand River led to a successful grant application. Dr. Kučerová received an Indigenous Research and Reconciliation Connection Grant from Social Sciences and Humanities Research Council to study the rigor of Indigenous pedagogy regarding language revitalization and the possible pathways for collaboration with university-based research. The lab continued its participation in several experimental projects on sentential processing with international partners in the United States of America, the United Arab Emirates, and the Czech Republic. Dr. Kučerová was invited to speak at various seminars and conferences across the world, including serving as the keynote speaker at the Stanford University Formal Approaches to Slavic Languages Conference.

The Reading Lab



The Reading Lab is directed by Dr. Victor Kuperman and it targets a range of areas in psycholinguistics and corpus linguistics. More specifically, the Reading Lab focuses on the visuo-oculomotor and cognitive predictors of reading, the processing of printed morphologically complex words, and the effects of emotion on language production and comprehension. Eye-tracking is the key research paradigm at the Reading Lab. In 2018, the Reading Lab welcomed one new master's student, Sean McCarron. Members of the Reading Lab had a successful year presenting their work at various international conferences including the 11th International Conference on the Mental Lexicon, and the 59th Annual Meeting of the Psychonomic Society. Lab members also published their work in a number of prestigious journals including: Scientific Reports, Behavior Research Methods and PLoS ONE. In particular, the "Twitter" Study which examines differences in the language used in nearly 40-million tweets in the United States of America and Canada went viral and led to a range of media coverage. Through Dr. Kuperman's collaboration with "Words in the World (WoW)", a Social Sciences and Humanities Research Council Partnered Research Training Initiative, the Reading Lab continued to host many researchers from around the world to conduct workshops and/or present at the lecture series at ARiEAL.

An eye-tracking experiment demonstration for students from Hamilton Christian High School. Photo by Colin Czerneda.

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Imaging Research Centre



Director of the Imaging Research Centre, Dr. Michael Noseworthy

Dr. Michael Noseworthy is the director of the Medical Imaging Physics and Engineering at the Imaging Research Centre at St. Joseph's Healthcare Hamilton, which provides the research community with access to imaging technology (including the GE Healthcare 3T Discovery MR7503T MRI scanner, and a Siemens Biograph-16 PET/ CT scanner). In 2018, two of Dr. Noseworthy's students, Diana Harasym and Nicholas Simard (co-supervised by Drs. Michael Noseworthy & Aimee Nelson), successfully completed their master's degree, and Alejandro Santos-Diaz and Evan McNabb completed their doctoral degree. Dr. Noseworthy's team has built MRI hardware and written new pulse sequences for rapidly assessing the high energy phosphates and intra/extracellular sodium levels within the brain, as well as continuing to develop novel technology for non-proton based MRI scanning. Recently his group has been developing machine learning approaches to better understand medical images that depict brain diseases and various cancers. Dr. Noseworthy was invited by the Universidad Nacional Autónoma de México and Congreso Médica Campestre in Mexico on different occasions to present the clinical applications of advanced MRI methods. Members of his team also participated in a number of conferences during 2018 including one for the International Society for Magnetic Resonance in Medicine in France. Their work was also published in several highly regarded journals including Magnetic Resonance Imaging, as well as Physics in Medicine and Biology.

The Phonetics Lab



The Phonetics Lab is directed by Dr. Daniel Pape, and it focuses on experimental phonetics, the link between speech production and speech perception, and the relationship between phonetics and neurolinguistics. More specifically, the research at the Phonetics Lab examines the use and interplay of acoustic cues (i.e., cue-weighting) for (1) speech production and perception and (2) articulatory and biomechanical constraints in speech perception. 2018 marked many great milestones in the Phonetics Lab. Dr. Pape officially accepted a tenure-track position in the Department of Linguistics and Languages at McMaster University. As San-Hei Kenny Luk (co-supervised by Drs. Daniel Pape and Elisabet Service) successfully completed his master's degree, the lab welcomed its first PhD student, Sara Pearsell, in 2018. Dr. Pape also received the Early Researcher Discovery Grant from Natural Sciences and Engineering Research Council to maintain and enhance the lab's research facility to further investigate subphonemic cue-weighting and prosodic categories as they pertain to speech production and speech perception. The study on the articulatory settings and their relationship to the produced speech sounds for Polish retroflexes, and the study on the cueweighting of Canadian English stops both started in 2017 and are steadily underway in 2018. A new experimental research stream examining the importance and interplay of several acoustic cues on the production and perception of lexical stress and focus started in 2018.

The Reilly Lab



Dr. Jim Reilly works at the interface of machine learning and signal processing applied to health-related problems, particularly in neuroscience and psychiatry. Specific projects in this area include the development

of improved machine learning algorithms, diagnosis and treatment of psychiatric illness, prognosis for coma outcome, and the assessment of infant motor movement relating to neurological deficit. In 2018, one of the students (Phil Chrapka) from the Reilly Lab successfully completed their doctoral degree. The Reilly Lab also continues the collaboration with other ARiEAL members, including Dr. Connolly's Language, Memory and Brain Lab, on the coma project. Together, they were awarded with a Collaborative Health Research Projects grant by Canadian Institutes of Health Research and Natural Sciences and Engineering Research Council to develop a point of care system for automated coma prognosis. Dr. Reilly takes the lead on advising the machine learning aspect of this funded project. Research conducted at the Reilly Lab were disseminated in manuscripts published in reputable journals including: IEEE Journal of Biomedical and Health Informatics and IEEE Transactions on Neural Networks and Learning Systems.



ARIEAL Research Centre is housed at the L.R. Wilson Hall which was funded through a \$10-million gift from McMaster University Chancellor Lynton (Red) Wilson and a \$45.5-million investment from the provincial government. Photo by Chia-Yu Lin.

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The Turkstra Lab



Dr. Lyn Turkstra's research examines links between cognitive function and social communication in individuals with traumatic brain injury (TBI), with the goal of improving clinical practice and long-term patient outcomes. The Turkstra lab had a productive 2018. In the spring, undergraduate students Noel Kim, Emily MacIntyre, and Jonathan Jin were awarded third place for their poster on everyday adolescent language, at the Hamilton Health Sciences 25th Annual Conference on Neurobehavioural Rehabilitation in Acquired Brain Iniury. In the summer, the lab launched a collaborative study with Drs. Sheila Sprague and Mohit Bhandari in the McMaster Orthopaedic Surgery Department, to determine the prevalence of TBI and intimate partner violence among female patients. In the fall, the lab welcomed a new Neuroscience master's student. Reihaneh Ahmadi. Dr. Turkstra and her colleagues also successfully received funding from the US Department of Defense to develop a brief cognitive rehabilitation intervention for Service Members and Veterans with mild TBI.

The Language and Working Memory Lab



Director of the Language and Working Memory Lab Dr. Lisa Archibald

The Language and Working Memory Lab is directed by Dr. Lisa Archibald, and is part of the School of Communication Sciences and Disorders at The University of Western Ontario. The Language and Working Memory Lab focuses on investigating how language and memory processes interact in both children learning at a typical rate and those with learning disabilities. In 2018, Dr. Archibald was successful in receiving a Social Sciences and Humanities Research Council (SSHRC) Partnership Development Grant to fund the development of a new research model targeting language and literacy learning in primary school children. Using a practicebased research approach, Dr. Archibald and her students have established partnerships with 3 area school boards to address questions arising from practice by educational speech-language pathologists promoting language and literacy. In addition to this, Dr. Archibald and her colleague received a SSHRC Insight Grant for their research regarding early interventions in writing. The initial study in this project has examined oral narrative language intervention for promoting written language outcomes in grade 1 students. A number of Dr. Archibald's students successfully completed their degree during 2018 including Nicolette



Noonan, Laura Pauls, Areej Balilah, and Renata Lohemann. Students working under the supervision of Dr. Archibald at the Language and Working Memory Lab also contributed to a number of articles published in well-regarded journals including the *Canadian Journal of Speech-Language Pathology* as well as *Audiology and Language, Speech, and Hearing Services in Schools.* Research conducted at the Language and Working Memory Lab was presented at various conferences including the *Symposium on Research in Child Language Disorders.* 2018 also saw the continued collaboration between Dr. Archibald and her fellow ARiEAL member, Dr. Marc Joanisse, which resulted in three journal article publications and two conference presentations.

The MTBI Research Program



Director of the MTBI Research Program, Prof. Carol DeMatteo

As a clinician scientist, Professor Carol DeMatteo has led many research studies in the area of childhood neurotrauma, specifically all severities of acquired brain injury including concussion. Professor DeMatteo is based at *CanChild* Centre for Childhood Disability Research and the School of Rehabilitation Science, and in 2018, she continued collaboration with researchers across Canada to study the diagnosis and treatment of children presenting with concussions in pediatric emergency departments. Professor DeMatteo also coauthored several articles about this research, some of which are published in the *Journal of Emergency Medicine* and the Journal of Neurotrauma. During 2018, Professor DeMatteo and the team (including ARiEAL members, Drs. John Connolly and Michael Noseworthy, and ARiEAL manager, Ms. Chia-Yu Lin) were completing the data analyses for the Canadian Institutes of Health Research funded Back to Play study on evaluating the effectiveness of Return to Activity (RTA) and Return to School (RTS) Guidelines in the pediatric population. While manuscript preparation is still underway, Professor DeMatteo presented the interim results, both nationally and internationally, at the Third International Conference on Paediatric Acquired Brain Injury, as well as the Annual Meeting of Pediatric Academic Societies. She was also invited to share the Canadian lessons learned on managing pediatric concussion in Liverpool, UK. Professor DeMatteo with the Brain Smart Hamilton Team received funding from the Hamilton Community Foundation to attempt to learn about the current practices regarding concussion protocols in organized youth sports in Hamilton. Final analyses and dissemination are currently underway. Professor DeMatteo, alongside the Concussion Research Team with internal funding from CanChild, updated and revised the CanChild Pediatric RTA and RTS concussion management guidelines, in accordance to the 2017 Berlin Consensus Statement on Concussion, a recently completed systematic review on the effects of guidelines on RTA and RTS, and the results from the Back to Play study.

The Performance Lab



The Performance Science Lab is directed by Dr. Ranil Sonnadara, and it studies the way that people learn new skills. The lab is particularly interested in how information flow across the motor and perceptual systems changes with practice, and how feedback and assessment can be effectively implemented to support skill acquisition. The lab also studies ways to optimize performance in high-stakes environments, and how performance can be measured in meaningful ways. In 2018, The Performance Science Lab continued to explore the role of competence committees in competency-based medical education, how we learn through observation, the transition from clerkship to residency, and how we can use machine learning as a teaching aide in healthcare. Research was presented at a number of distinguished conferences including the World Summit on Competency-Based Medical Education, the International Conference of Residency Education and the 15th Conference on Computer and Robot Vision. In 2018, Dr. Sonnadara and his team successfully received six research grants, published nine research articles/book chapters, and shared their work through 23 presentations across the globe. Several of Dr. Sonnadara's students successfully completed their master's degree in 2018 including: Lauren Smail, Sara Jamil, Dr. Laura Vanderbeek, and Dr. Christine Orr.

BY THE NUMBERS

ARiEAL Researchers have been active in dissemination through publishing articles and delivering presentations, and were also incredibly successful in securing research funding during 2018.

Publications

ARiEAL researchers published 63 articles, 8 book chapters, and 2 books during 2018. Broadly, the research topics included neuroimaging, word recognition, and applications in acquired brain injury and speech language pathology.

ARTICLES

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The Twitter Study conducted by Dr. Victor Kuperman (right), ARiEAL postdoctoral fellow, Dr. Daniel Schmidtke (centre), and ARiEAL PhD student, Bryor Snefjella (left) confirmed Canadians' and Americans' Twitter language mirrors national stereotypes. Photo by JD Howell.

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Mueller, K.D., Hermann, B., Mecollari, J., & Turkstra, L.S. (2018). Connected speech and language in mild cognitive impairment and Alzheimer's disease: A review of picture description tasks. Journal of Clinical and Experimental Neuropsychology, 40(9): 917-939.

Mueller, K.D., Koscik, R.L., Hermann, B.P., Johnson, S.C., & Turkstra, L.S. (2018). Declines in connected language are associated with very early mild cognitive impairment: Results from the Wisconsin Registry for Alzheimer's Prevention. Frontiers in Aging Neuroscience, 9: 1-14.

Ong, F.J., Ahmed, B.A., Oreskovich, S.M., Blondin, D.P., Haq, T., **Noseworthy, M.D.**, . . . Morrison, K. (2018). Recent advances in the detection of brown adipose tissue in adult humans: A review. Clinical Science, 132(10): 1039-1054. Rabi, R., Joanisse, M.F., Zhu, T., & Minda, J.P. (2018). Cognitive changes in conjunctive rule-based category learning: An ERP approach. Cognitive, Affective, & Behavioral Neuroscience, 18(5): 1034-1048.

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Santos-Díaz, A., Obruchkov, S.I., Schulte, R.F., & Noseworthy, M.D. (2018). Phosphorus magnetic resonance spectroscopic imaging using flyback echo planar readout trajectories. Magnetic Resonance Materials in Physics, Biology and Medicine, 31(4): 553-564.

Schmidtke, D., Gagne, C., **Kuperman, V.**, & Spalding, T. (2018). Language experience shapes relational knowledge of compound words. Psychonomic Bulletin and Review. 25(4): 1468-1487.

Schmidtke, D., Gagne, C., Kuperman, V., Spalding, T., & Tucker, B. (2018). Conceptual relations compete during auditory and visual compound word recognition. Language, Cognition, and Neuroscience, 33(7): 923-942.

Schmidtke, D., Van Dyke, J.A., & **Kuperman**, V. (2018). Individual variability in the semantic processing of English compound words. Journal of Experimental Psychology: Learning, Memory and Cognition, 44(3): 421-439.

Snefjella, B., Schmidtke, D., & **Kuperman**, V. (2018). National character stereotypes mirror language use: A study of Canadian and American Tweets. PLoS ONE, 13(11): e0206188.

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Thompson, E., Beauchamp, M., Hearps, S.J., Hearps, S.J.C., Brown, A., Charalambous, G., . . . **Turkstra, L.S.** (2018). Protocol for a prospective school-based standardization study of a digital social skills assessment tool for children: The Paediatric Evaluation of Emotions, Relationships, and Socialisation (PEERS) study. BMJ Open, 8(2): 1-11.

Turkstra, L.S., Norman, R.S., Mutlu, B., & Duff, M.C. (2018). Impaired theory of mind in adults with traumatic brain injury: A replication and extension of findings. Neuropsychologia, 111, 117-122.

Wang, J., Joanisse, M.F., & Booth, J. (2018). Reading skill related to left ventral occipitotemporal cortex during a phonological awareness task in 5-6-year old children. Developmental Cognitive Neuroscience, 30: 116-122.

Welcome, S.E., & Joanisse, M.F. (2018). ERPs reveal weaker effects of spelling on auditory rhyme decisions in children than in adults. Developmental Psychobiology, 60(1): 57-66.

Whitford, V., & Joanisse, M.F. (2018). Do eye movements reveal differences between monolingual and bilingual children's first- and second-language reading? A focus on word frequency effects. Journal of Experimental Child Psychology, 173: 318-337.

Wszalek, J.A., & Turkstra, L.S. (2018). Comprehension of legal language by adults with and without traumatic brain injury. Journal of Head Trauma Rehabilitation, 1-9.

Yeates, K., Tang, K., Barrowman, N., Freedman, S. B., Gravel, J., Gagnon, I., Sangha, G., Boutis, K., Beer, D., Craig, W., Burns, E., Farion, K. J., Mikrogianakis, A., Barlow, K., Dubrovsky, A. S., Meeuqisse, W., Gioia, G., Meehan, W. P., Beauchamp, M., Kamil, Y., Grool, A., Hoshizaki, B., Andrson, P., Brooks, B. L., Vassilyadi, M., Klassen, T., Keightley, M., Richer, L., **DeMatteo, C.**, Osmon, M., & Zemek, R., for the Pediatric Emergency Research Canada (PERC) Predicting Persistent Post concussive Problems in Pediatrics (5P) Concussion Team. (2018, epub ahead of print). Derivation and initial validation of clinical phenotypes of children presenting with concussion acutely in the Emergency Department: Latent class analysis of a prospective cohort, multicentre, observational study. Journal of Neurotrauma.

Zhu, H., Wagner, N., & **Sonnadara, R.R.** (2018). Developing effective recruitment strategies for young infants. Meducator, 1(34): 13-16.

BOOK CHAPTERS

Balilah, A., & Archibald, L.M.D. (2018). The measurement of language ability and impairment in Arabic-speaking children. In S. Hidri (Ed.), Revisiting the assessment of second language abilities: From theory to practice (pp. 65-84). Heidelberg, Germany: Springer International.

Cao, B., & Reilly, J.P. (2018). Major challenges and limitations of big data analytics. In I. Cavalcante Passos, B. Mwangi, & F. Kapczinski (Eds.), Personalized psychiatry (pp. 15-36). Basel, Switzerland: Springer Nature.

Ciucci, M., Montgomery, E.B. Jr., & **Turkstra, L.S.** (2018). Neurophysiology. In B. Rousseau & R. Branski (Eds.), Anatomy and physiology of speech and hearing (pp. 171-190). New York, NY: Thieme.

Joanisse, M.F. (2018). Model-based approaches to understanding child language disorders. In R.G. Schwartz, The handbook of child language disorders (2nd ed., pp. 274-294). New York, NY: Routledge.

Kučerová, I. (2018). On the lack of φ-feature resolution in DP coordinations: Evidence from Czech. In D. Lenertová, R. Meyer, R. Šimík, & L. Szucsich (Eds.), Advances in formal Slavic linguistics (pp. 169-191). Berlin, Germany: Language Science Press.

Kučerová, I. (2018). The double life of gender and its structural consequences: A case study from Standard Italian. In E. Mathieu, M. Dali, & G. Zareikar (Eds.), Gender and noun classification (pp. 119-135). Oxford, UK: Oxford University Press.

BOOK CHAPTERS (CONTINUED)

Montgomery, E.B. Jr., Turkstra, L.S., & Ciucci, M. (2018). Suprasegmental motor control. In B. Rousseau & R. Branski (Eds.), Anatomy and physiology of speech and hearing (pp. 191-232). New York, NY: Thieme.

Wagner, N., McQueen, S., & **Sonnadara**, **R.R.** (2018). Bridging the gap: Theoretical principles behind surgical boot camps. In O. Safir, **R.R. Sonnadara**, P. Mironova, & R. Rambani (Eds.), Boot camp approaches to surgical training (pp. 1-11). Amsterdam, Netherlands: Elsevier.

BOOKS

Anderson, C. (2018). Essentials of Linguistics. eCampus Ontario.

Safir, O., **Sonnadara, R.R.**, Mironova, P., & Rambini, R. (2018). Boot camp approaches to surgical training. Amsterdam, Netherlands: Elsevier.

Presentations

ARiEAL researchers presented 26 invited talks and 73 peer-reviewed conference presentations across continents in 2018.



Acai, A., Cupido, N., Weavers, A., Kelly, S., & Sonnadara, R.R. (2018, April).
Ready or not, here they come: Early perceptions and experiences of competence committee implementation at a Canadian postgraduate medical training centre.
12th Annual Canadian Conference on Medical Education. Halifax, Canada.

Acai, A., Dhindsa, K., Wagner, N., Bosnyak, D., Kelly, S., Bhandari, M., . . . Sonnadara, R.R. (2018, June). What does the brain look like when it's not paying attention? Identifying a neural signature of mind wandering. Geoffrey Norman Education Research Day. Hamilton, Canada.

Acai, A., Kelly, S., & **Sonnadara**, **R.R.** (2018, May). Insights from the North: Implementation, structure, and function of competence committees in Canadian surgical training. 38th Annual Meeting of the Association for Surgical Education. Austin, TX.

Acai, A., **Sonnadara**, **R.R.**, & O'Neill, T.A. (2018, October). Getting with the times: Group decision making in virtual environments and implications for competence committees. International Conference of Residency Education. Halifax, Canada.

Akbari, A., **Noseworthy, M.D.**, & Scholl, T.J. (2018, March). Density-adapted 3-dimensional radial multiple gradient-echo acquisition scheme for 23Na MRI. Imaging Network of Ontario Conference. Toronto, Canada.

Akbari, A., **Noseworthy, M.D.,** & Scholl, T.J. (2018, April). Three-Dimensional Projection-Reconstruction (3DPR) multiple gradient-echo acquisition scheme for 23Na MRI. International Society for Magnetic Resonance in Medicine: Workshop on MR Imaging of nX-Nuclei. Dobrovnik, Croatia.

Anderson, C. (2018, October). Essentials of Linguistics. McMaster Open Access Day. Hamilton, Canada. (Invited).

Anderson, C. (2018, December). Gettin' Air with Terry Greene podcast (https:// www.spreaker.com/user/10100518/catherine-anderson). eCampus Ontario, Canada. (Invited).

Archibald, L.M.D. (2018, January). The how and why of executive functions in school aged children: Implications for intervention. Child and Parent Resource Institute. London, Canada. (Invited).

Archibald, L.M.D. (2018, March). The multiplicity of cognitive paths and learning outcomes in development. University of Waterloo Department of Psychology. Waterloo, Canada. (Invited).

Archibald, L.M.D. (2018, May). Developmental language disorder: A persistent language disorder of unknown aetiology. Annual Conference of Speech-Language Pathology & Audiology. Edmonton, Canada.

Archibald, L.M.D. (2018, September). The how and why of executive functions in school aged children: Implications for intervention. SpeechHearBC Conference. Victoria, Canada. (Invited).

Becker, S. (2018, March). Harnessing neuroplasticity for a healthy brain. McMaster MSU STEM Fellowship Research Competition Research Presentation Day. Hamilton, Canada. (Invited Keynote Speaker).

Becker, S. (2018, October). Opposing effects of binge drinking and exercise on the brain. Memory Disorders Research Society Annual Meeting. Toronto, Canada. (Invited).



Dr. Catherine Anderson (L7) and ARiEAL trainees, Chelsea Whitwell (L4), Cassandra Chapman (L6), and Karen Tucker (R1), provided their linguistics expertise at a consensus meeting at CanChild Centre for Childhood Disability Research. Photo provided by CanChild.

Becker, S. (2018, November). Neurotechnology: Bridging the gap between academia, clinic and industry (panel discussion). NeurotechHA Hackathon. Hamilton, Canada.

Becker, S. (2018, November). The neuroscience of daily life: Protecting your brain from a stressful, toxic world. McMaster Neuroscience Colloquium Series. Hamilton, Canada. (Invited).

Boshra, R., Ruiter, K., Doughty, M., **Noseworthy, M.**, & **Connolly, J.F.** (2018, June). Attention, expectation, and awareness: contributions from MMN. The 8th Annual Mismatch Negativity Conference. Helsinki, Finland. (Poster).

Boutis, K., Gravel, J., Freedman, S., Craig, W., Tang, K., **DeMatteo, C.**, . . . Zemek, R. (2018, May). The diagnosis of concussion in pediatric emergency departments: A prospective multicenter study. The Annual Meeting of Pediatric Academic Societies. Toronto, Canada. (Poster).

Colic, S., Richardson, J.D., **Reilly, J.P.**, & Hasey, G.M. (2018, July). Using machine learning algorithms to enhance the management of suicide ideation. Engineering in Medicine and Biology Conference. Honolulu, HI.

Colling, K., Stanbrook, D., **DeMatteo, C.**, Bain, J., & Gjertsen, D. (2018, November). Children and adolescents who had primary repair of OBPI: Does how they move impact occupation and how they feel? Lorna Ramos Course on Care of the Pediatric Brachial Plexus Patient. New York City, United States. (Poster).

Connolly, J.F. (2018, January). Utilization of the neurophysiology of cognition in brain injury research and applications. McMaster Interdisciplinary Research Exposition (MIREx). Hamilton, Canada. (Invited).

Connolly, J.F. (2018, June). MMN changes in brain injury: From coma to concussion. The 8th Annual Mismatch Negativity Conference. Helsinki, Finland. (Invited). **Connolly, J.F.** (2018, September). ERP components, the mismatch negativity and the assessment of consciousness and its disorders. Machine Learning for Brain Health Symposium. Hamilton, Canada. (Invited).

Connolly, J.F., & Boshra, R. (2018, May). Beyond the brain. Pint of Science Festival. Hamilton, Canada. (Invited).

Cross, A.M., Joanisse, M.F., & Archibald, L.M.D. (2018, June). Mathematical difficulties in children with developmental language disorder: A scoping review. Symposium on Research in Child Language Disorders. Madison, United States. (Poster).

Cross, A.M., Thornley, E., King, C., Skirving, E., Archibald, L.M.D., & Schwean, V. (2018, June). First steps in developing an interdisciplinary child and youth development clinic. Symposium on Research in Child Language Disorders. Madison, United States. (Poster).

DeMatteo, **C**. (2018, February). Lesson from Canada: Improving outcomes in children with concussion – Evidence-based protocols for return to work and school. Mild Traumatic Brain Injury and Concussion in Children Conference. Liverpool, United Kingdom. (Invited).

DeMatteo, C. (2018, March). Returning to life following concussion. Traumatic Brain Injury and Concussion Toronto Rotman Research Institute Conference. Toronto, Canada. (Invited).

DeMatteo, C., Noseworthy, M., Connolly, J.F., Bock, N., Giglia, L., Lin, C.-Y., . . . Timmons, B. (2018, September). Fact or fiction – What is the true story of return to activity protocols for youth recovery post-concussion: Accelerometry versus self-report. The Third International Conference on Pediatric Acquired Brain Injury. Belfast, Ireland.

PRESENTATIONS (CONTINUED)

DeMatteo, C., Randall, S. (2018, May) The role of the occupational therapist: Safe return to meaningful activity and full participation after pediatric concussion. World Federation of Occupational Therapists (WFOT) Congress. Cape Town, South Africa. (Poster).

Dhindsa, K., Smail, L.C., McGrath, M., Braga, L.H., **Becker, S.**, & **Sonnadara, R.R**. (2018, May). Grading prenatal hydronephrosis from ultrasound imaging using deep convolutional neural networks. 15th Conference on Computer and Robot Vision. Toronto, Canada.

Dunn, K., Kalun, P., Wagner, N., Pulakunta, T., & **Sonnadara, R.R.** (2018, October). Current evidence on spatial reasoning in surgical education. International Conference of Residency Education. Halifax, Canada.

Fahim, C., & **Sonnadara, R.R.** (2018, October). Evaluation fatigue in surgical education: Implications for competency based medical education. International Conference of Residency Education. Halifax, Canada.

Fahim, C., Acai, A., McConnell, M., Wright, F.C., **Sonnadara**, **R.R.**, & Simunovic, M. (2018, December). Use of the theoretical domains framework and behavior change wheel to develop an intervention to improve multidisciplinary decision-making among cancer specialists. 11th Annual Conference on the Scientific Dissemination and Implementation. Washington, DC. (Poster).

Fahim, C., McConnell, M.M., Wright, F.C., **Sonnadara**, **R.R.**, & Simunovic, M. (2018, April). Evaluation of the KT-MCC strategy to improve the quality of decision making for Ontario Multidisciplinary Cancer Conferences (MCCs). Canadian Society of Surgical Oncology 19th Annual Scientific Meeting. Toronto, Canada.

Fahim, C., McConnell, M.M., Wright, F.C., **Sonnadara, R.R.**, & Simunovic, M. (2018, June). Use of 'Progressive Knowledge Translation' to improve the quality of decision making by cancer specialists: A case study of the KT-MCC Strategy. Organizational Theory in Health Care Annual Conference. Baltimore, MD. (Poster).

Fahim, C., McConnell, M.M., Wright, F.C., **Sonnadara, R.R.**, & Simunovic, M. (2018, December). Implementation and evaluation of the KT-MCC Strategy: A knowledge translation strategy to improve the quality of multidisciplinary decision-making among cancer specialists. 11th Annual Conference on the Scientific Dissemination and Implementation. Washington, DC. (Poster).

Fahim, C., Wagner, N., Nousiainen, M.T., & **Sonnadara**, **R.R.** (2018, October). Assessment of technical skills competence in the operating room: A systematic and scoping review. International Conference of Residency Education. Halifax, Canada.

Fahim, C., Wagner, N., Nousiainen, M.T., & **Sonnadara, R.R.** (2018, August). Assessment of technical skills competence in the operating room: A systematic and scoping review. 3rd World Summit on Competency-Based Medical Education. Basel, Switzerland.

Gentile, D., Imbault, C., Rentfrow, Gosling, S., Potter, J. & Kuperman, V. (2018, November). Predicting Personality Profiles: The Case of

International Migration. The 59th Annual Meeting of the Psychonomic Society, New Orleans, LA, United States. (Poster).

Harasym, D., Santos-Diaz, A., & **Noseworthy, M.D.** (2018, March). Undersampling and reconstruction effects in 31P- MRSI using flyback-EPSI with compressed sensing. Imaging Network of Ontario Conference. Toronto, Canada.

Hutton, C., Lemon, J., Sakic, B., Rollo, D., Boreham, D., Fahnestock, M., Wojtowicz, J.M., & **Becker, S.** (2018, May). Early intervention with a multi-ingredient dietary supplement improves mood and delays spatial memory decline in a triple transgenic mouse model of Alzheimer's disease. The 12th Annual Canadian Neuroscience Meeting. Vancouver, Canada.

Imbault, C., & **Kuperman, V.** (2018, September). How Does Text Interest Interact with Benchmark Predictors and Semantic Variables While Reading? The 11th international conference on the Mental Lexicon, Edmonton, AB, Canada. (Poster).

Kalun, P., Wagner, N., Cupido, N., Petrisor, B., & **Sonnadara, R.R.** (2018, May). Implementation of a competency-based assessment framework in orthopedics. 38th Annual Meeting of the Association for Surgical Education. Austin, TX.

Kalun, P., Wagner, N., Yan, J., Nousiainen, M.T., & **Sonnadara, R.R.** (2018, October). From simulation to practice: A scoping review on skill transfer. International Conference of Residency Education. Halifax, Canada.

Kalun, P., Zering, J.C., Cyfko, J., Smail, L.C., & **Sonnadara, R.R.** (2018, June). Learning with Lego: Observational learning of a complex motor task. Geoffrey Norman Education Research Day. Hamilton, Canada.

Kalun, P., Zering, J.C., Smail, L.C., & Sonnadara, R.R. (2018, June). Learning with Lego: Observational learning of a complex motor task with partially occluded field of vision. North American Society for the Psychology of Sport and Physical Activity Conference. Denver, CO.

Kalun, P., Zering, J.C., Wagner, N., Cupido, N., Petrisor, B., & Sonnadara, R.R. (2018, August). Development of a comprehensive assessment framework to enhance feedback provision. 2nd World Summit on Competency-Based Medical Education. Basel, Switzerland.

Kučerová, I. (2018, February). Associative number at the syntax semantics interface. Syntax Semantics Seminar. Abu Dhabi, United Arab Emirates. (Invited).

Kučerová, I. (2018, April). Anaphors and logophors differ in timing: Evidence from comitative constructions. Pronouns in competition Workshop. Santa Cruz, CA. (Poster).

Kučerová, I. (2018, April). Phi-features at the syntax-semantics interface. Princeton Symposium on Syntactic Theory. Princeton, NJ. (Invited).

Kučerová, I. (2018, May). Comitative constructions as a window into derivational timing of anaphors and logophors. 28th Colloquium on Generative Grammar. Tarragona, Spain. (Poster).

Kučerová, I. (2018, May). Toward distributed semantics: Evidence from associative constructions. Stanford University Formal Approaches to Slavic Languages Conference. Stanford, CA. (Invited Keynote Speaker).

Kučerová, I. (2018, June). Associative plurals are phase-bound. Olomouc Lingusitic Colloquium. Olomouc, Czech Republic.

Kučerová, I. (2018, June). Gender at the interface. University of Humboldt Theoretical and Experimental Approaches to Gender Conference. Berlin, Germany. (Invited).

Kuiack, A., & Archibald, L.M.D. (2018, June). Investigating label use by Canadian speech-language pathologists. Symposium on Research in Child Language Disorders. Madison, WI. (Poster).

Kuperman, V. (2018, February). Word learning and word representation. Keynote Address at the Fourth Night Whites Workshop on Experimental Studies of Speech and Language. St. Petersburg, Russia. (Invited).

Kuperman, V., Bertram, R., Erlinghagen, C., & Pieczykolan, A. (2018, September). Individual Variability in Processing Words in L1 and L2. The 11th international conference on the Mental Lexicon, Edmonton, AB, Canada.

Kyröläinen, A-J., Ginter, F., Bertram, R., & **Kuperman, V.** (2018, November). Orthographic Representation in Flux: A Large-Scale Analysis of Spelling Errors of Finnish Nominal Compounds. The 59th Annual Meeting of the Psychonomic Society, New Orleans, LA, United States. (Poster).

Kyröläinen, A.-J., & Kuperman, V. (2018, February). It's all about the base: Age effects on morphological processing. Fourth Night Whites Workshop on Experimental Studies of Speech and Language. St. Petersburg, Russia.

Kyröläinen, A.-J. & **Kuperman**, **V**. (2018, September). Forty years of experience and counting. The 11th international conference on the Mental Lexicon, Edmonton, AB, Canada.

Lemus, O.D.M., Konyer, N.B., & **Noseworthy, M.D.** (2018, June). Micro-strip surface coils using fractal geometry for 129Xe lung imaging applications. International Society for Magnetic Resonance in Medicine Conference. Paris, France. (Poster).

Lorenc, A., Żygis, M., Mik, L., & **Pape, D.** (2018, June). Articulatory variation in Polish palatalized retroflexes. International Conference on Laboratory Phonology. Lisbon, Portugal.

McKinnon, V., Kalun, P., McRae, M., **Sonnadara, R.R.**, & Fahim, C. (2018, June). A shift on the horizon: A systematic review of assessment tools for plastic surgery trainees. Canadian Society of Plastic Surgeons 72nd Annual Meeting. Jasper, Canada. (Poster).

McNabb, E., Wong, R., & **Noseworthy**, **M.D.** (2018, March). Differentiating brachytherapy and gold fiducial markers with varying off-resonant frequency offsets. Imaging Network of Ontario Conference. Toronto, Canada. (Poster).

McNabb, E., Wong, R., & **Noseworthy**, **M.D.** (2018, June). Differentiating brachytherapy and intraprostatic gold fiducial markers with varying off-resonant frequency offsets. International Society for Magnetic Resonance in Medicine Conference. Paris, France. (Poster).

Mik, L., Lorenc, A., **Pape, D.**, & Żygis, M. (2018, June). Articulatory and acoustic variation in the realization of Polish retroflexes. International Conference on Laboratory Phonology. Lisbon, Portugal.

Nakua, H., & **Becker, S**. (2018, May). The impact of alcohol binge drinking and exercise on cognition, mood and memory: Does one mitigate the other? Annual Ontario Psychology Undergraduate Conference. Toronto, Canada. (Invited).

Nisbet, K., **Kuperman**, V., Siegelman, N., & Frost, R. (2018, November). Writing Systems Are Optimized to Maintain a Constant Decoding Effort: Evidence from Hebrew, English, Finnish, and Dutch. The 59th Annual Meeting of the Psychonomic Society, New Orleans, LA, United States.

Noonan, N.B., Joanisse, M.F., & Archibald, L.M.D. (2018, June). Examining the relationship between statistical learning and language abilities in school-aged children. Symposium on Research in Child Language Disorders. Madison, WI.

Noseworthy, M.D. (2018, May). Advanced Imaging of mild traumatic brain injury (mTBI). Universidad Nacional Autónoma de México. Mexico City, Mexico. (Invited).

Noseworthy, M.D. (2018, May). Clinical applications of advanced MRI methods. Tecnologico de Monterrey. Mexico City, Mexico. (Invited).

Noseworthy, M.D. (2018, May). Magnetic resonance imaging (MRI) acceptance testing. Instituto Nacional de Neurología y Neurocirugía. Mexico City, Mexico. (Invited).

Noseworthy, M.D. (2018, October). Aplicación clínica de métodos avanzados de la RNM. Congreso Médica Campestre. Leon, Mexico. (Invited).

Noseworthy, M.D. (2018, October). Métodos avanzados de RMI en lesión cerebral traumática leve. Congreso Médica Campestre. Leon, Mexico. (Invited).

Pham, T., Kang, J., Johnson, A., & Archibald, L.M.D. (2018, June). Implicit learning of semantic information depends on contextual cues. Symposium on Research in Child Language Disorders. Madison, WI. (Poster).

Polak, P., & **Noseworthy**, **M.D.** (2018, March). Compressed sensing reconstruction with 23Na MRI. Imaging Network of Ontario Conference. Toronto, Canada. (Poster).

Rana, F., Yousuf, H., **Connolly, J.F.**, & **Service, E.** (2018, July). P600: A response to syntactic anomalies or learning? The Canadian Society for Brain, Behaviour and Cognitive Science Conference. St. John's, Canada. (Poster).

Reilly, J.P. (2018, July). Machine learning for brain health research. Canadian Institute for Advanced Research (CIFAR)/Vector Deep Learning Summer School. Toronto, Canada. (Invited).

Santos-Diaz, A., & **Noseworthy, M.D.** (2018, June). Accelerated in vivo phosphorus magnetic resonance spectroscopic imaging combining flyback-EPSI and compressed sensing. International Society for Magnetic Resonance in Medicine Conference. Paris, France. (Poster).

PRESENTATIONS (CONTINUED)

Santos-Diaz, A., Harasym, D., & **Noseworthy, M.D.** (2018, March). Dynamic phosphorus spectroscopic imaging of muscle using flyback echo planar imaging trajectories. Imaging Network of Ontario Conference. Toronto, Canada. (Poster).

Schmidtke, D., & **Moro, A.** (2018, November). Word reading development in EFL university students. Annual Meeting of the Psychonomic Society. New Orleans, LA. (Poster).

Schmidtke, D., Warriner, A.B., **Kuperman**, V., & Moro, A. (2018, October). Reading development in EFL students: A within-participant eyemovement study. Second Language Research Forum. Montréal, Canada.

Schmidtke, D., Warriner, A., & **Moro, A.** (2018, September). Determinants of successful reading development in L2 English learners: A within participant eye-movement study. 11th International Conference on the Mental Lexicon. Edmonton, Canada. (Poster).

Service, E., Lahti-Nuuttila, P., Smolander, S., Arkkila, E., Porokuokka, I., & Laasonen, M. (2018, May). Nonverbal STM for order in developmental language disorder. International Meeting of the Psychonomic Society. Amsterdam, Netherlands.

Service, E., Lahti-Nuuttila, P., Smolander, S., Arkkila, E., Porokuokka, I., & Laasonen, M. (2018, August). Working memory for temporally structured episodes in typical and atypical language acquisition. European Working Memory Symposia. Pavia, Italy.

Shaw, S., Heisz, J, McKinnon, M & **Becker**, S. (2018, May). EEG signatures of DMN, CEN and SN network activity in simultaneous EEG-fMRI during multiple memory tasks. Toronto Area Memory Group Annual Meeting. Toronto, Canada.

Shekari, E., & **Service**, **E**. (2018, May). Processing and cognitive demands of complex structures containing sequential temporal order. Annual Conference of the Canadian Association of Applied Linguistics. Regina, Canada. (Poster).

Simard, N., Nelson, A.J., & **Noseworthy, M.D.** (2018, March). Correlations between DB0, B1+ and physiological noise in the spinal cord for MRS approaches. Imaging Network of Ontario Conference. Toronto, Canada. (Poster).

Simard, N., Nelson, A.J., & **Noseworthy, M.D.** (2018, June). The effect of B0 and B1+ inhomogeneities on spinal cord MRS. International Society for Magnetic Resonance in Medicine Conference. Paris, France. (Poster).

Smail, L.C., Dhindsa, K., McGrath, M., Braga, L.H., **Becker, S.**, & **Sonnadara, R.R.** (2018, June). Developing an interactive machine learning based teaching aid to increase diagnostic accuracy in prenatal hydronephrosis. Geoffrey Norman Education Research Day. Hamilton, Canada.

Smail, L.C., Dhindsa, K., McGrath, M., Braga, L.H., Becker, S., & Sonnadara, R.R. (2018, October). Developing an interactive machine learning based teaching aid to increase diagnostic accuracy in prenatal

hydronephrosis. International Conference of Residency Education. Halifax, Canada.

Snefjella, B., Genereux, M., & Kuperman, V. (2018, September). Generating a Historical Concreteness Lexicon. The 11th international conference on the Mental Lexicon, Edmonton, AB, Canada. (Poster).

Torshizi, N., & **Service**, **E**. (2018, September). The structure of Persian compound words in the mental lexicon. The 11th International Conference on the Mental Lexicon. Edmonton, Canada. (Poster).

Virji-Babul, N., Gagnon, I., & **DeMatteo, C.** (2018, September). New approaches in the management of paediatric concussion. Third International Conference on Paediatric Acquired Brain Injury. Belfast, Ireland.

Vollebregt, M., Archibald, L.M.D., Theurer, J., & Cardy, J.O. (2018, June). A scoping review to examine practice-based clinical-research partnerships. Symposium on Research in Child Language Disorders. Madison, WI. (Poster).

Vollebregt, M., Leggett, J., Raffalovitch, S., & Archibald, L.M.D. (2018, June). Reading for all: Implementation of a tier 1 reading intervention. Symposium on Research in Child Language Disorders. Madison, WI. (Poster).

Wagner, N., Amin, N., Kelly, S., & **Sonnadara, R.R.** (2018, May). Do summative and formative assessments tell the same story? Comparing resident performance in a surgical foundations boot camp. 38th Annual Meeting of the Association for Surgical Education. Austin, TX.

Wagner, N., Amin, N., Kelly, S., & **Sonnadara, R.R.** (2018, October). Are OSCE scores a good predictor or clinical performance: A pilot study. International Conference of Residency Education. Halifax, Canada.

Grants

ARiEAL researchers started 15 new research grants as Principal Investigator or Coinvestigators in 2018. Funding totaled over 7.2 million dollars across these newly commenced projects.

Funding sources include Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council (NSERC), Social Sciences and Humanities Research Council (SSHRC), and the Canadian Foundation for Innovation (CFI), as well as various institutions.



Archibald, L.M.D. (Principal Investigator). Collaboration knowledge generation: A new research model targeting language and literacy learning in primary school children. Social Sciences and Humanities Research Council Partnership Development Grant: \$177,676, 2018-2021.

Becker, S. Hearing Technology Research Lab. Canadian Foundation for Innovation Infrastructure Operating Fund: \$63,000, 2018-2020.

Connolly, J.F. (Nominated Principal Investigator), **Reilly, J.P.**, Fox-Robichaud, A., Blain-Moraes, S., **Sonnadara, R.R.** (Co-Principal Investigators), Britz, P. (Principal Knowledge User), Hamielec, C. (Knowledge User), & Boshra, R. (Co-Investigator). Development of a point of care system for automated coma prognosis. Canadian Institutes of Health Research & Natural Sciences and Engineering Research Council, Collaborative Health Research Projects Grant: \$592,724, 2018-2021.

Connolly, J.F. Conference Attendance & Representational Activities Grant. McMaster Arts Research Board, Social Sciences and Humanities Research Council Exchange Funding: \$1,060, 2018.

Eapen, B., Bowles, A. (Co-Principal Investigators), & Turkstra, L.S. (Co-Investigator). Implementation of a brief cognitive rehabilitation intervention to enhance efficiency of service delivery for service members and veterans with mTBI: core-SCORE. US Department of Defense: \$1,470,000, 2018-2020.

Goodale, M.A. (Principal Investigator), & **Joanisse, M.F.** (Co-Investigator). Canada Foundation for Innovation Leaders Opportunity Fund Program & Ontario Research Foundation Large Infrastructure Fund: \$3,690,306, 2018-2020.

Joanisse, M.F. (Principal Investigator). Neurocognitive, genetic and environmental risk factors of learning disorders in children. BrainsCan/ Canada First Research Excellence Fund: \$97,209, 2018-2020.

Klein, P. (Principal Investigator), & Archibald, L.M.D. (Co-Investigator). Early intervention in writing. Social Sciences and Humanities Research Council Insight Grant: \$238,307, 2018-2023.

Kučerová, I. (Principal Investigator), DeCaire, R., & Maracle, B. (Co-Investigators). Identifying the rigor of Indigenous pedagogy in language revitalization and possible pathways for collaboration with university-based research. Social Sciences and Humanities Research Council Indigenous Research and Reconciliation Connection Grant: \$62,500, 2018-2019.

Pape, D. (Principal Investigator). The link between speaker-specific accuracy in speech production and listener-specific acuity in speech perception: From subphonemic cue-weighting to prosodic categories. Natural Sciences and Engineering Research Council Grant: \$132,500, 2018-2023.

Sonnadara, R.R. (Principal Investigator), & Bosnyak, D. (Co-Investigator). Synaptic rodeo standard research and research creation grant. Social Sciences and Humanities Research Council: \$4,803, 2018.

Sonnadara, R.R. (Principal Investigator), & Acai, A., Kelly, S., Amin, N., Reid, D. (Co-Investigators). Establishment of a Software Development Team for Research Support. CANARIE Research Software Local Support Initiative: \$463,000, 2018.

Sonnadara, R.R. (Principal Investigator). Collective/group decision making process: How do competence committees make decisions? Royal College of Physicians and Surgeons of Canada: \$35,000, 2018.

Sonnadara, R.R. (Principal Investigator). Establishing an lastic secure cloud for research data. Compute Ontario: \$200,000, 2018.

Sonnadara, R.R., Kelly, S. (Principal Investigators), & Acai, A. (Co-Investigator.) What are we 'weighting' for? Data use in competence committee decision-making processes. McMaster Surgical Associates Education Research Grant: \$24,453, 2018.

IMPACT

ARIEAL aims to broaden the research reach beyond what is possible using traditional means in order to engage the global community. In 2018, we have continued to showcase our research excellence through our website, Twitter and open access repository (MacSphere). Various talks and workshops were hosted during 2018 to provide opportunities for interdisciplinary, experiential, and problembased learning for our trainees and community.



Engagement

On February 1, 2017, ARiEAL officially launched its website as a platform to share our research knowledge with a broader community beyond borders. During the calendar year of 2018, the ARiEAL website welcomed over 6,500 visitors from 97 distinct countries. This map highlighted the TOP 20 countries where our website visitors come from. Our official Twitter account brings the engagement to an even higher level. In 2018, the number of our followers doubled from the inaugural year. We've reached over 100,000 impressions with 165 tweets and exceeded 2,300 engagement counts.

Student-initiated ARiEAL Learning Series session on LaTex. Photo by Chia-Yu Lin.

Learning Series

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September 2018 also marked the beginning of the ARiEAL Learning Series which aims to offer various opportunities for trainees (from undergraduate to postdoctoral fellowship) to develop and refine their research skills. The topic of each learning series session reflects the interests that were expressed by the trainees. Antonella Masciantonio & Diane Potvin, Scholarship Liaison Officers, School of Graduate Studies, McMaster University: Hamilton, Canada. School of Graduate Studies – Scholarships Presentation. September 21, 2018.

Chia-Yu Lin, Manager (Development and Research), ARiEAL Research Centre, McMaster University: Hamilton, Canada. Tips and Tricks for Successful Scholarship Application. September 21, 2018.

Frederico Prado, Graduate Student, Department of Linguistics & Languages, McMaster University: Hamilton, Canada. LaTeX Workshop. November 9, 2018.

Janice Sancan, Research Ethics Officer, Hamilton Integrated Research Ethics Board (HiREB): Hamilton, Canada. HiREB FAQ. November 16, 2018.

Michael Wilson, Research Technology Analyst, McMaster Research High Performance Computing Support (RHPCS), McMaster University: Hamilton, Canada. McMaster Research Ethics Manager (MacREM) Information Session. November 23, 2018.

Lecture Series

In 2018, ARiEAL co-hosted eight "Cognitive Science of Language Lecture Series" talks with the Department of Linguistics and Languages (McMaster University). For these events, we invited renowned researchers in their respective fields to share their expertise with us.

Dr. Aline Godfroid, Associate Professor, Department of Second Language Studies, Michigan State University: East Lansing, USA. Attention in second language acquisition: Towards an explanatory model. January 24, 2018.

Dr. Nicholas Welch, Postdoctoral Fellow, Department of Linguistics & Languages, McMaster University: Hamilton, Canada. Linguistic fieldwork on threatened languages. February 7, 2018.

Dr. Lance L. Hawley, Co-Director of Training, Frederick W. Thompson Anxiety Disorders Centre, Sunnybrook Health Sciences Centre: Toronto, Canada. Mindfulness based interventions for obsessive compulsive disorder. March 14, 2018.

Dr. Joe Kim, Associate Professor, Department of Psychology, Neuroscience & Behaviour, McMaster University: Hamilton, Canada. Motivating durable learning: Focused attention through instructional design. September 21, 2018.

Dr. Yana Meerzon, Professor, Department of Theatre, University of Ottawa: Ottawa, Canada. 'Speaking in tongues': Staging hospitality of (non)translation. October 12, 2018.

Dr. Athulya Aravind, Postdoctoral Fellow, Harvard Lab for Developmental Studies, Harvard University: Cambridge, USA. Learning what to (not) take for granted. October 26, 2018.

Dr. Janet van Hell, Professor, Department of Psychology and Linguistics, Pennsylvania State University: State College, USA. Understanding codeswitched sentences and foreign-accented speech. November 2, 2018.

Dr. Benjamin Munson, Professor and Chair, Department of Speech-Language-Hearing Sciences, University of Minnesota: Minneapolis, USA. The sociophonetics of gender: Acquisition and processing across the lifespan. December 7, 2018.

Open Access

ARiEAL endeavours to support Open Access in research. In addition to publishing in Open Access journals, ARiEAL started archiving representative publications from our researchers at MacSphere (McMaster University's Institutional Repository). This Open Access initiative commenced in 2017 and is continually progressing. In addition, with support from McMaster University and eCampusOntario's Open Textbook initiative, ARiEAL Researcher Dr. Catherine Anderson published an open-access Linguistics textbook entitled *Essentials of Linguistics* to address the affordability and accessibility of course materials.

Symposium

The inaugural Machine Learning for Brain Health Symposium was made possible as a joint venture by McMaster's faculties of Health Sciences, Science, Engineering and ARiEAL Research Centre. Five distinguished researchers in the field of computational biology and biomedical engineering were invited as keynote speakers, including Dr. Sylvain Baillet, the ARiEAL Scientific Advisory Committee member.

Dr. Sylvain Baillet, Professor, School of Computer Science, McGill University: Montreal, Canada. Perception as prediction: Using neural network architectures to study brain perceptual inference. September 7, 2018.

Dr. Martin M. Monti, Associate Professor, Department of Psychology, UCLA: Los Angeles, USA. Disappearing into nothingness: Graphs, shapes, and advanced analysis techniques applied to understanding disorders of consciousness. September 7, 2018.

Dr. Klaus-Robert Müller, Professor and Chair, Machine Learning Department, Institute of Software Engineering and Theoretical Computer Science: Berlin, Germany. Toward brain computer interfacing: Algorithms for on-line differentiation of neuroelectric activities. September 7, 2018.

Dr. Jose C. Principe, Distinguished Professor, NeuroEngineering Lab, University of Florida: Gainesville, Florida. The importance of point process models to quantify the electroencephalogram. September 7, 2018.

Dr. Stephen Strother, Professor, Department of Medical Biophysics, University of Toronto: Toronto, Canada. Big data variety and veracity in brain-Code: 80% quality curation and 20% analysis. September 7, 2018.



Volunteer Research Assistants, Kiera DiLeonardo (centre) & Alec Fernback (left), and the Hamilton Health Sciences High School Bursary recipient, Caryn Qian (right) at Dr. John Connolly's Language, Memory and Brain Lab in summer 2018. Photo by Chia-Yu Lin.

Workshops

ARiEAL co-hosted two hands-on workshops with the Words in the World Partnership Grant in 2018 with experts from USA and Finland.

Dr. Aline Godfroid, Associate Professor, Department of Second Language Studies, Michigan State University: East Lansing, USA. Experimental tasks and paradigms in second-language vocabulary learning. January 25, 2018.

Dr. Raymond Bertram, Senior Lecturer, Department of Psychology and Speech-Language Pathology, University of Turku: Turku, Finland. How to gain insight into reading processes. May 9, 2018.

Youth Outreach

ARiEAL aims to engage youth into the culture of research and higher education through meaningful activities. We hope more young people would be inspired by the exciting research we carry out at ARiEAL and it would also motivate them to be part of the McMaster community one day. In 2018, led by Dr. Victor Kuperman, ARiEAL and the Department of Linguistics and Languages co-hosted a research day featured "Science Behind Language Acquisition" for a group of grades 11 and 12 students from Hamilton Christian High School. Dr. John Connolly from the Language, Memory and Brain Lab also participated as a placement mentor in the Hamilton Health Sciences High School Research Bursary program, a highly competitive summer internship program designed for senior high school students interested in pursuing health and life science postsecondary education. Caryn Qian, a then grade 11 student from Marc Garneau Collegiate Institute, completed the 7-week internship at ARiEAL in 2018. She has since been accepted by the McMaster Health Sciences program to pursue her undergraduate education.

THE CENTRE

Founded in late 2016, the year of 2018 marks the second full calendar year since our inception. We are proud of the high-quality opportunities for collaborative and interdisciplinary research among our members and trainees that ARiEAL has continued to foster.

Members

FOUNDING DIRECTOR

John Connolly (Department of Linguistics and Languages, McMaster University)

ASSOCIATE DIRECTOR

Anna Moro (Department of Linguistics and Languages, McMaster University)

FULL MEMBERS

Catherine Anderson (Department of Linguistics and Languages, McMaster University)

Sue Becker (Department of Psychology, Neuroscience & Behaviour, McMaster University)

Marc Joanisse (Department of Psychology, University of Western Ontario)

Ivona Kučerová (Department of Linguistics and Languages, McMaster University)

Victor Kuperman (Department of Linguistics and Languages, McMaster University)

Michael Noseworthy (Department of Electrical and Computer Engineering, McMaster University)

Daniel Pape (Department of Linguistics and Languages, McMaster University)

Jim Reilly (Department of Electrical and Computer Engineering, McMaster University)

Elisabet Service (Department of Linguistics and Languages, McMaster University)

Lyn Turkstra (School of Rehabilitation Science, McMaster University)

ASSOCIATE MEMBERS

Lisa Archibald (Department of Psychology, University of Western Ontario) Carol DeMatteo (School of Rehabilitation Science, McMaster University) Paul Grunthal (McMaster Industry Liaison Office, McMaster University) Ranil Sonnadara (Department of Surgery, McMaster University)

Trainees

POSTDOCTORAL FELLOWS

- Dr. Stephanie Bouvier* (Supervised by Dr. Ranil Sonnadara)
- Dr. Sinisa Colic (Co-supervised by Drs. Jim Reilly & Gary Hasey)
- Dr. Félix Desmeules-Trudel (Supervised by Dr. Marc Joanisse)
- Dr. Kiret Dhindsa (Supervised by Dr. Ranil Sonnadara)
- Dr. Dobri Dotov (Supervised by Dr. Ranil Sonnadara)
- Dr. Aki-Juhani Kyröläinen (Supervised by Dr. Victor Kuperman)
- Dr. Pan Liu (Co-supervised by Drs. Marc Joanisse & Elizabeth Hayden)
- Dr. Lien Peters (Co-supervised by Drs. Marc Joanisse & Daniel Ansari)
- Dr. Daniel Schmidtke (Supervised by Dr. Anna Moro)
- Dr. Hossein Taghinesuad* (Supervised by Dr. Ranil Sonnadara)
- Dr. Christina Vanden Bosch der Nederlanden (Co-supervised by Drs. Marc Joanisse & Jessica Grahn)
- Dr. Nicholas Welch* (Supervised by Dr. Ivona Kučerová)

PHD STUDENTS

Anita Acai (Supervised by Dr. Ranil Sonnadara) Areej Balilah* (Supervised by Dr. Lisa Archibald) Taylor Bardell (Supervised by Dr. Lisa Archibald) Rober Boshra (Co-supervised by Drs. John Connolly & Jim Reilly) Faculty and Postgraduate Affiliates of Vector Institute for Artificial Intelligence from McMaster University, including ARiEAL researchers, Drs. John Connolly (R3) and Jim Reilly (not pictured), and ARiEAL trainees, Dr. Kiret Dhindsa (L3) and Rober Boshra (R1). Photo provided by Rober Boshra.

> Fiona Campbell (Supervised by Dr. Lyn Turkstra) Phil Chrapka* (Supervised by Dr. Jim Reilly) Cassandra Chapman* (Supervised by Dr. Ivona Kučerová) Melda Coskun (Supervised by Dr. Victor Kuperman) Alexandra Cross (Co-supervised by Drs. Marc Joanisse & Lisa Archibald) Ethan Danielli (Supervised by Dr. Michael Noseworthy) Rudaina Hamed (Co-supervised by Drs. Anna Moro & Victor Kuperman) Adianes Herrera (Supervised by Dr. John Connolly) Craig Hutton* (Supervised by Dr. Sue Becker) Constance Imbault (Supervised by Dr. Victor Kuperman) Aravinthan Jegatheesan (Supervised by Dr. Michael Noseworthy) Portia Kalun (Supervised by Dr. Ranil Sonnadara) Laura Keating* (Co-supervised by Drs. Sue Becker & Margaret McKinnon) Alyssa Kuiack (Supervised by Dr. Lisa Archibald) Bre-Anna King (Supervised by Dr. Elisabet Service) Richard Mah* (Supervised by Dr. John Connolly) Evan McNabb* (Supervised by Dr. Michael Noseworthy) Sydney McQueen (Co-supervised by Drs. Ranil Sonnadara & Carol-Anne Moulton) Joe Nidel (Supervised by Dr. Marc Joanisse) Kelly Nisbet (Supervised by Dr. Victor Kuperman) Nicolette Noonan* (Co-supervised by Drs. Marc Joanisse & Lisa Archibald) Gaisha Oralova (Co-supervised by Drs. John Connolly & Victor Kuperman) Laura Pauls* (Supervised by Dr. Lisa Archibald) Sara Pearsell (Supervised by Dr. Daniel Pape) Theresa Pham (Supervised by Dr. Lisa Archibald) Paul Polak (Supervised by Dr. Michael Noseworthy)

Adam Politis (Supervised by Dr. Lyn Turkstra) Fareeha Rana (Co-supervised with Drs. Elisabet Service & John Connolly) Kyle Ruiter (Supervised by Dr. John Connolly) Alejandro Santos-Diaz* (Supervised by Dr. Michael Noseworthy) Saurabh Shaw (Supervised by Dr. Sue Becker) Edalat Shekari (Supervised by Dr. Sue Becker) Edalat Shekari (Supervised by Dr. Elisabet Service) Lauren Smail (Co-supervised by Dr. Ranil Sonnadara & Sue Becker) Bryor Snefjella (Supervised by Dr. Victor Kuperman) Narcisse Torshizi (Supervised by Dr. Elisabet Service) Karen Tucker (Supervised by Dr. John Connolly) Meghan Vollebregt (Supervised by Dr. Lisa Archibald) Natalie Wagner (Supervised by Dr. Ranil Sonnadara) Chelsea Whitwell (Supervised by Dr. Elisabet Service) Nadia Wong (Co-supervised by Dr. Sue Becker & Hongjin Sun) Bahareh Yousefzadeh (Supervised by Dr. Ivona Kučerová)

INSTITUT

ECTEUR

ECTOR

MASTER STUDENTS

Reihaneh Ahmadi (Supervised by Dr. Lyn Turkstra) Fatemeh Armanfard (Co-supervised by Drs. Jim Reilly & John Connolly) Leah Brainin (Supervised by Dr. Marc Joanisse) Erin Cole* (Supervised by Prof. Carol DeMatteo) Nathan Cupido (Supervised by Dr. Ranil Sonnadara) Erin DeBorba (Supervised by Dr. Elisabet Service) Nathalee Ewers (Supervised by Dr. John Connolly) Michael Fischer (Supervised by Prof. Carol DeMatteo) Davide Gentile (Supervised by Dr. Victor Kuperman) Ashley Gilbank (Supervised by Dr. Michael Noseworthy)



McMaster 2018 MacDATA Fellows, including ARiEAL doctoral students, Rober Boshra (centre) and Bryor Snefjella (R1). Photo made available by McMaster Daily News.

Diana Harasym* (Co-supervised by Drs. Michael Noseworthy & Aimee

MASTERS STUDENTS (CONTINUED)

Nelson) Tess Hudson (Supervised by Dr. Ivona Kučerová) Sara Jamil* (Co-supervised by Drs. Ranil Sonnadara & Sue Becker) Isaac Kinley (Supervised by Dr. Sue Becker) Alish Kocz (Supervised by Dr. Ivona Kučerová) Dr. Richard Kolesar (Supervised by Dr. John Connolly) Natalia Lapinskaya* (Supervised by Dr. John Connolly) Teagan Lauriente (Supervised by Dr. Ranil Sonnadara) Yarden Levy (Co-supervised by Drs. Sue Becker & Margaret McKinnon) Mitchell Locke (Co-supervised by Drs. Michael Noseworthy & Aimee Nelson) Renata Lohemann* (Supervised by Dr. Lisa Archibald) Angie Lopez (Supervised by Dr. Elisabet Service) Neil MacPhee (Supervised by Dr. Michael Noseworthy) Sean McCarron (Supervised by Dr. Victor Kuperman) Olivier Mercier (Co-supervised by Drs. Elisabet Service & Daniel Pape) Christine Moreau (Supervised by Dr. Marc Joanisse)

Omar Nassif (Co-supervised by Drs. Jim Reilly & Vickie Galea)

Jimmy Nguyen (Supervised by Dr. Michael Noseworthy)

Cameron Nowikow (Supervised by Dr. Michael Noseworthy)

Dr. Christine Orr* (Supervised by Dr. Ranil Sonnadara)

Taylor Practile (Supervised by Prof. Carol DeMatteo)

Frederico Prado (Supervised by Dr. Ivona Kučerová)

Alex Rokos* (Co-Supervised by Drs. John Connolly & Stefanie Blain-Moraes)

Natalie Romaniuk (Supervised by Prof. Carol DeMatteo)

Nicholas Simard* (Co-supervised by Drs. Michael D. Noseworthy & Aimee Nelson)

Dr. Laura VanderBeek* (Supervised by Dr. Ranil Sonnadara)

*Completed program in 2018

Research Support

MANAGER, DEVELOPMENT & RESEARCH

Chia-Yu Lin

STUDENT ASSISTANTS

Angie Lopez (January – April, 2018) Kiera DiLeonardo (May – August, 2018) Brittany Gottvald (September – December, 2018)

Scientific Advisory Committee

- Dr. Sylvain Baillet (McGill University)
- Dr. Laurie Feldman (University at Albany)
- Dr. Denise Klein (McGill University)
- Dr. Ken McRae (University of Western Ontario)
- Dr. Lucie Ménard (Université du Québec à Montréal; UQAM)
- Dr. Penny Pexman (University of Calgary)
- Dr. Ken Pugh (Haskins Laboratories)
- Dr. Sid Segalowitz (Brock University)
- Dr. Jon Sprouse (University of Connecticut)

International Collaborators

Haskins Laboratories, New Haven, Connecticut, USA

University of Turku (Department of Psychology and Speech-Language Pathology), Turku, Finland.

Words in the World (WoW), Partnership Grant funded by the Social Sciences and Humanities Research Council of Canada (SSHRC), Canada

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Produced & Designed by Brie Chauncey, Chia-Yu Lin, and Brittany Gottvald. Many thanks to all ARiEAL members and trainees for their contribution to this report.



ARiEAL Research Centre

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