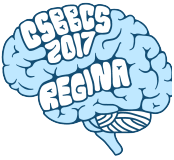# 27th Annual Meeting of the Canadian Society for Brain, Behaviour, and Cognitive Sciences

June 2nd – 4th
University of Regina

Program at a Glance

	Friday, June 2nd
8:30-5	R Workshop on Bayesian Statistics: ED 561
3:30-5	WiCSC Event and Mixer: ED 106.1 (event)/ED Rotunda (mixer)
5-6:30	D.O. Hebb Award Address: ED 106
7-10	CSBBCS Banquet: Rotunda at Innovation Place

|	Saturday, June 3rd			
	ED 106.1	ED 106.2	ED 191	ED 193
8:00 – 9:00	Poster practice – students only!!: CK 185			
9:00 – 9:30	An Analysis of the Canadian Cognitive Science Job Market Over the Last Decade with Gord Pennycook: CK 185			
9:30 – 10:30	Symposium: Basic Processes in Mathematical Cognition	Memory I	Spatial Cognition	Word Recognition
10:30 – 10:45	Coffee break: ED Rotunda			
10:45 – 12:15	Past President's Symposium: ED 106			
12:30 – 1:30	NSERC Luncheon: CK 185			
1:30 – 2:30	Symposium: Embodied/ Embedded Cognition	Cognitive Applications	Perception	Computational Models of Cognitive Processes
2:30 – 4:00	Poster Session I: CK Atrium			
4:00 – 5:00	Symposium: Math Attitudes, Activities, and Achievement	Reasoning and Metacognition	Attention	Psycholinguistics
5:00 – 6:30	Vincent Di Lollo Early Career Award Address: ED 106			
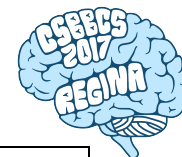
|	ED 106.1	ED 106.2	ED 191	ED 193
Sunday, June 4th				
9:30 – 10:30	Symposium: Sound Symbolism	Memory II	Social Behaviour	Cognitive Development
10:30 – 11:00	Coffee break: ED Rotunda			
11:00 – 12:00		Perception of Action and Motion	Affect and Cognition	Language
12:00 – 1:00	Lunch: ED Rotunda			
1:00 – 2:30	Poster Session II: CK Atrium			
2:30 – 3:30	Business Meeting: ED 191			

Where do I…?

Register?　　　　Education Rotunda, Friday – 2:00 – 6:00; Saturday 8:00 – 5:00; Sunday 8:00 – 1:00

Find internet?　　The wireless network **uofr guest** is an unsecured network available anywhere on campus.
　　　　　　　　If you have access from your home institution, you can login to **eduroam** using your usual credentials.

Charge my phone? There are complimentary charging stations in the rainbow room of the Education Building, Riddell Centre, Lab
　　　　　　　　Building Cafeteria (next to washrooms), and in the Archer Library (main floor)

Eat?　　　　　　Free breakfast and lunch Saturday and Sunday in the Education Rotunda

Eat more?　　　　Global Village, Riddell Centre, Friday 11 AM – 3 PM, 4 PM – 7 PM
　　　　　　　　TOSS Stir Fry, Riddell Centre, Friday 11 AM – 3 PM; Extreme Pita, Riddell Centre, Friday 11 AM – 4 PM
　　　　　　　　Pronto Sushi, Subway, McDonald's, Pita Pit, Trifon's Pizza, Stone's Throw Coffee House in Kramer Mall,
　　　　　　　　just west of campus on Kramer St (also has a gas station, Mac's Convenience Store, hair salon, post office)

Find coffee?　　Free coffee in Education Rotunda at breakfast and during scheduled breaks and poster sessions
　　　　　　　　Self-serve Tim Hortons in Kisik Tower C-Store is open Friday 4-8 PM, Saturday and
　　　　　　　　Sunday 11-2, 3-6 PM
　　　　　　　　Full-serve Tim Hortons in Riddell Centre is open Friday 7 AM – 4 PM
　　　　　　　　Common Ground (serving Starbucks) is open in Riddell Centre Friday 8AM – 2PM
　　　　　　　　Stone's Throw Coffee House in Kramer Mall (off campus, across Wascana Parkway)
　　　　　　　　　　M-Sat. 8 AM – 4 PM, Sun. 10 AM – 4 PM

Find an ATM?　　CIBC: Riddell Centre; RBC: Classroom Building lobby; Conexus Credit Union: College West

Catch the bus?　　Outside main doors of Riddell Centre

Get a cab?　　　Regina Cabs: (306) 994-0543 https://www.reginacabs.com　　　　Capital Cabs: (306) 791-2222
　　　　　　　　Co-op Taxi: (306) 525-2727　http://co-optaxi.com/book-taxi-online/　http://capitalcabs.ca/

Need help?　Find a green shirt!　Volunteers in neon green 'brain' shirts are here to help – just ask!
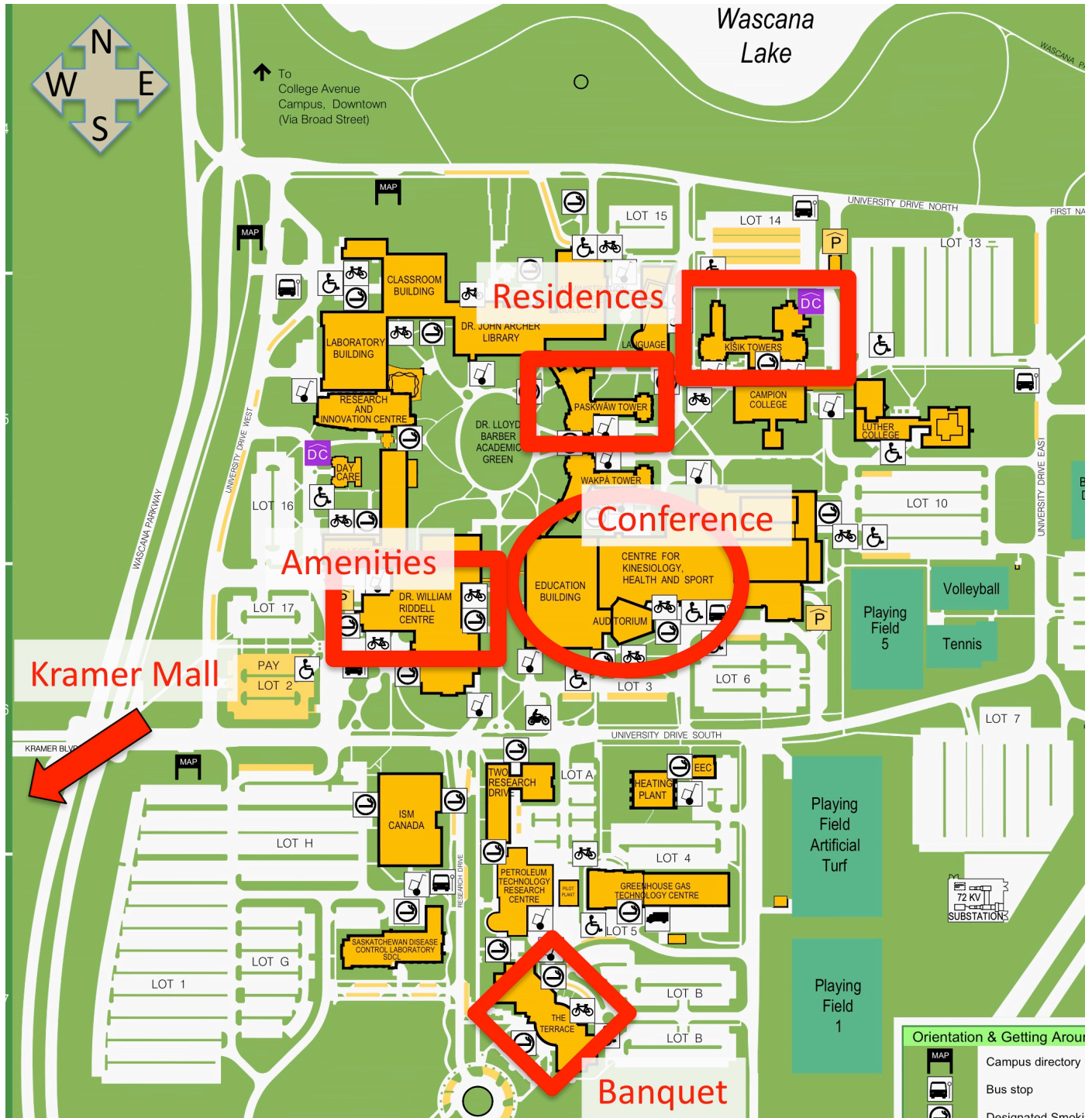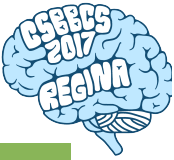
Established in 1974, the University of Regina and its three federated colleges (Campion College, Luther College, and the First Nations University of Canada) are home to some 15,000 students from all over the world and nearly 3000 staff. Both our main campus and our College Avenue campus are located within beautiful Wascana Park, one of the largest urban parks in North America. Regina, the provincial capital of Saskatchewan, is home to the historic Legislative Building, Governor's House, and the world-famous Royal Canadian Mounted Police. Our city is one of the fastest-growing urban centres in Canada, exceeding 215,000 residents in the most recent census. For more information on what to see and do in Regina, please visit Tourism Regina.

Welcome to Regina
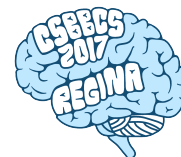
Regina. See for yourself.

Feel the energy of a city on the rise as you revel in the astonishing variety of cultural, entertainment and recreational opportunities that abound in and around the city.

Did you know...

Regina is the sunniest provincial capital with more than 2,365 hours of sunshine each year.

How may we help you?

Our Visitor Information Centre provides visitor counselling services to enhance your destination experience. The Centre includes a variety of visitor information resources including Regina visitor mini-maps, area guidebooks, and materials that highlight Regina's attractions, eateries, and retailers. Visit us Monday to Friday during office hours at 1925 Rose Street or check out tourismregina.com.

Real. Relaxed. Remarkable.

Regina is the heart beat of the province with a long history, and laid back culture. With this year being Canada's 150th Anniversary it's the perfect time to visit the province's capital and see it all for yourself!

Share Your Memories
#SeeYQR

Regina welcomes you, we always do!

Home of the Royal Canadian Mounted Police
RCMP Heritage Centre, 5907 Dewdney Avenue

Regina hosts Canada's only training centre for cadets. Since the establishment of the Force, RCMP Academy, "Depot" Division has trained new recruits who go on to serve throughout Canada and around the world. The RCMP Heritage Centre is dedicated to telling the story of the RCMP and is appropriately located on Depot's doorstep. Don't miss the new virtual reality Musical Ride!

#SeeYQR through the eyes of our Ambassadors

In Regina there are tons of things to see and do, with new shops, events, and attractions popping up all the time. Here, it's the locals who know best, so who better to show the city off? Check out our Regina Ambassadors at SeeYQR.ca and search #SeeYQR to see what they recommend for your next visit. While you're there don't miss the 360° videos of some of the best events in the city.

tourismregina.com   #SeeYQR

What's going on in Regina?

Sergeant Major's Parade
RCMP Heritage Centre, 5907 Dewdney Avenue

Tuesday to Thursday, watch as the drill staff put cadets through their paces. The parade includes a roll call and inspection of the troops, accompanied by the cadet band. Catch the Sergeant Major's Parade Monday to Friday at 12:45 p.m. at RCMP Academy, "Depot" Division. Guests must register at the RCMP Heritage Centre by 12 p.m. in order to take in this one-of-a-kind experience.

Regina Farmers' Market
City Square Plaza, 12th Avenue & Scarth Street

Come and enjoy the local downtown experience of the Regina Farmers' Market. Every Wednesday and Saturday from 9 a.m. until 1 p.m. When you're done taking in all the market has to offer, enjoy lunch from one of the great food trucks in Victoria Park.

Saskatchewan Science Centre
Government House, 4607 Dewdney Ave

BODY WORLDS RX is coming to the Saskatchewan Science Centre this summer! This incredible exhibition of REAL HUMAN BODIES, preserved through Plastination, focuses on the most prevalent contemporary diseases, their causes and effects. *BODY WORLDS RX* is an informative and entertaining presentation of the latest research on top health issues and will inspire visitors to embrace preventive healthcare. From organs to muscles, to the nervous system and to skeletal structures, visitors will have an unprecedented look inside the intricate systems of the most sophisticated mechanism in the world, the human body.

Local nearby coffee shops

Sweet Bakery & Coffee House
1445 Broad Street

33 1/3 Coffee Roasters
1130 15th Avenue

Atlantis Coffee
1992 Hamilton Street

Naked Bean
2505 Broad Street

Hang with the Locals

Willow on Wascana, 3000 Wascana Drive
Upscale eatery with a seasonal menu of Canadian cuisine, carefully selected wines & deck seating.

Cathedral Social Hall, 2062 Albert Street
A Saskatchewan beer experience like no other! Cathedral Social Hall has completely revamped a well-known watering hole into a social beer-hall atmosphere; with next-level pub food that features local ingredients too.

Tangerine Food Bar, 2234 14th Avenue
Salads, sandwiches, baked goods, vegetarian & gluten-free eats are served at this laid-back cafe.

Family Fun

Saskatchewan Sports Hall of Fame – 2903 Powerhouse Drive
Located in the heart of downtown Regina, the SSHF was established to honour outstanding Saskatchewan athletes, championship teams and sport builders as well as preserve the history of Saskatchewan sport through displays of artifacts, memorabilia, inductee portraits and citations.

Royal Saskatchewan Museum – 2445 Albert Street
Travel through the province and enjoy a trip through two billion years of Saskatchewan's geological and early natural history.

Government House – 4607 Dewdney Avenue
Venture through this national historic site and provincial heritage property. Set your own pace with a self-guided tour.
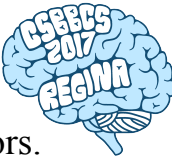
Free to Enjoy

Regina has several great attractions that have free admission. Enjoy these unique options that offer educational, historical and cultural experiences completely free of charge.

- Royal Saskatchewan Museum
- Saskatchewan Legislative Building
- Regina Floral Conservatory
- Wascana Centre

Visit **tourismregina.com** for more activities in Regina.

The organizers of CSBBCS 2017 are extremely grateful for the support of our sponsors.
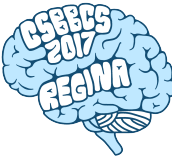
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8

2017 Donald O.Hebb Distinguished Contribution Award Winner
Dr. Gordon Winocur

Keynote Address
Friday, June 2nd 5:00 PM
ED 106

Chemotherapy and Cognitive Impairment: An Animal Model Approach
Gordon Winocur

Rotman Research Institute
University of Toronto
Trent University

A substantial number of cancer survivors who undergo chemotherapy report cognitive disturbances that severely limit daily function (`chemobrain`). Despite supportive neuropsychological evidence, there is controversy over whether cognitive impairment is caused by the chemotherapy, or is the result of potentially confounding factors that include the disease itself, age, and psychological stress. Our research, conducted on rodents, has confirmed that a range of cognitive processes, mediated in particular by hippocampal and pre-frontal brain regions, are affected by anti-cancer drugs and that, while some recovery can occur, many of the effects are long-lasting. Conversely, behavioural (physical activity, environmental enrichment) and pharmacological (donepezil) interventions can be effective in reducing these effects. Investigations into the combined effects of chemotherapy and tumour development on cognitive function, as well as underlying biological mechanisms will also be discussed.

Gordon Winocur, Ph.D., has dedicated his scientific career to advancing the field of cognitive neuroscience by conducting research with a cross-species perspective and by focusing on clinical applications. Dr. Winocur received his B.A. (1962) and M.A. (1964) from the University of Manitoba, and his Ph.D. in 1966 from the University of Waterloo. He subsequently began his first academic position as Assistant Professor at the University of Saskatchewan in 1966. He currently holds positions as Senior Scientist at the Rotman Research Institute, Professor of Psychology and Psychiatry at the University of Toronto, and Professor Emeritus at Trent University.

Dr. Winocur's notable influences on memory research began in the 1970s when he developed animal models of amnesia that showed deficits akin to those observed in humans on analogous tasks; namely, impairments in detailed, context-dependent episodic memory. He resolved a controversy in the field by demonstrating that hippocampal damage can produce both a temporally graded and non-graded retrograde amnesia in animals and humans, depending on the type of memory that is tested. In later years, Dr. Winocur, together with his longtime collaborator, Dr. Morris Moscovitch, put forward the influential Trace Transformation Theory that described how the hippocampus is critical for maintaining lifelong access to specific and detailed episodic memories, but these episodic memories also undergo a transformation, such that detailed information is lost while semantic or gist-like information is maintained through extra-hippocampal structures.

Dr. Winocur developed an innovative rehabilitation program designed to enhance memory and executive function in elderly and brain-damaged individuals. Recently, he developed an animal model for studying the adverse effects of chemotherapy on cognition in cancer survivors, and the interventions that promote cognitive recovery. Through his ground-breaking research and, as a member of the International Cancer and Cognitive Task Force, Dr. Winocur has been instrumental in establishing the legitimacy of 'chemobrain' as a medical condition, stimulating basic and clinical research, and influencing advances in diagnosis and treatment.

As a testament to the importance of his research, Dr. Winocur was named a Fellow of the Canadian Psychological Association (1984), American Psychological Association (1987), International Neuropsychological Society (1988), and American Psychological Society (1989). He received the John Dewan Award for Research Excellence by the Ontario Mental Health Foundation (1984).

Dr. Winocur is a devoted mentor to his trainees and to junior faculty. He has launched the careers of some of today's deepest thinkers and influencers in memory research, and his mentees have obtained prominent research, clinical, and administrative positions in Canada and around the world, including the UK, Europe, Israel, USA, and Mexico.

Dr. Winocur has also been dedicated to service and advocacy throughout his career. He served as the Vice-President of Research for Baycrest (2004 – 2007), and as Director for the Rotman Research Institute (1998). In recognition of his work on the Board of Directors and various committees for the Canadian Psychological Association, Dr. Winocur was awarded the Canadian Psychological Association award for Distinguished Service (1987). Using his platform as Scientific Director for the Alzheimer Society of Canada (2001-2003), Dr. Winocur frequently engages the media regarding the nature of Alzheimer's Disease, including the warning signs and symptoms, and the efficacy of various training regimens, diets and supplements. He developed and broadcast two radio series for CJRT-FM radio in order to educate students across several universities and the lay public about the link between the brain and behavior, and the importance of scientific research.

2017 CSBBCS Vincent Di Lollo Early Career Award Winner
Dr. Morgan Barense

Keynote Address
Saturday, June 3rd 5:00 PM
ED 106

Understanding Memory and Memory Disorders at the Interface of Memory and Perception
Morgan Barense
University of Toronto

A central assumption in most modern theories of memory is that memory and perception are functionally and anatomically segregated. For example, amnesia resulting from medial temporal lobe (MTL) lesions is traditionally considered to be a selective deficit in long-term declarative memory with no effect on perceptual processes. The work I will present offers a new perspective. Through a series of studies using converging methodology (fMRI and neuropsychological studies in patients with MTL damage), I will provide support for the notion that memory and perception are inextricably intertwined, relying on shared neural representations and computational mechanisms.

Dr. Morgan Barense earned her Ph.D. from the University of Cambridge in 2007, remained in Cambridge for her postdoctoral work as a Peterhouse Research Fellow, and joined the University of Toronto as an Assistant Professor of Psychology in 2009. She is presently an Associate Professor and Canada Research Chair of Cognitive Neuroscience at the University of Toronto, as well as an Associate Scientist at the Rotman Research Institute and director of the Toronto Neuroimaging Facility.

Dr. Barense's research program blends computational modelling, neuropsychology, and neuroimaging techniques. Her research program is focused on understanding how memory is organized in the healthy brain, how memory changes through aging or brain damage, and how memory interacts with other cognitive faculties, such as perception. Her work is published in the discipline's top journals including Journal of Neuroscience, Learning and Memory, Cerebral Cortex, Neuropsychologia, Neuron, Cognitive Neuroscience, and the Journal of Experimental Psychology: General.

Dr. Barense has been recognized by a number of other prestigious awards including a James S. McDonnell Foundation Scholar Award, an Early Researcher Award from the Ministry of Research and Innovation of Ontario, and an Early Investigator Award from the Society of Experimental Psychologists.

2017 CSBBCS/CPA CJEP Best Article Award Dr. M. R. P. LaPointe

The Canadian Psychological Association (CPA) and the Canadian Society for Brain, Behaviour and Cognitive Science (CSBBCS) are pleased to announce that the award for the best paper published in the *Canadian Journal of Experimental Psychology* (*CJEP*) in 2016 goes to Mitchell LaPointe, Rachael Cullen, Bianca Baltaretu, Melissa Campos, Natalie Michalski, Suja Sri Satgunarajah, Michelle Cadieux, Matthew Pachai and David Shore, for their article *An attentional bias for LEGO people using a change detection task: Are LEGO people animate?*.

Link to article: http://psycnet.apa.org/journals/cep/70/3/219.pdf

The award will be presented at the 2017 CPA Convention (http://www.cpa.ca/Convention/) and the 2017 CSBBCS Annual Meeting (http://www.csbbcs.org/), and is accompanied by a $1000 prize.

About the Journal

CJEP publishes original research papers that advance understanding of the field of experimental psychology, broadly considered. This includes, but is not restricted to, cognition, perception, motor performance, attention, memory, learning, language, decision making, development, comparative psychology, and neuroscience. CPA publishes *CJEP* quarterly in partnership with CSBBCS.

www.apa.org/pubs/journals/cep/

2017 Richard C. Tees Distinguished Leadership Award Winner
Dr. Colin MacLeod

Dr. Colin MacLeod has made significant contributions at many levels to Canadian Psychology over his 38 years of service (25 years at the University of Toronto and his 13 years at the University of Waterloo). Colin has been a constant presence in CSBBCS from the beginning, serving as President (2009-2010) and also on various other committees throughout the years. In recognition of his career contributions to the advancements of Psychology, he received the CSBBCS Hebb Award (2010), and the CPA Hebb Award (2012). In addition, just this past year he was given the significant honour of being elected as a Fellow of the Royal Society of Canada.

Colin has served as Editor of CJEP (1992-1997) and has been an active member of the editorial board ever since (1997-present). He has also served as Editor of Memory & Cognition (2001-2005) and has been a member of the editorial boards of many of the top journals in our field (e.g., Psychological Review, Journal of Experimental Psychology: Learning, Memory, and Cognition). He has remained closely connected to CPA throughout his career and has worked diligently to keep CPA and CSBBCS working together for common causes. The same is true elsewhere in the world, as his membership on the Governing Board of the Psychonomic Society (2010-2015) attests. Colin has also served on the NSERC grant panel (1997-2000), including as Chair of the panel (1999-2000), and has been involved in NSERC's restructuring exercises. Colin has supervised 17 PhD students, many of whom hold academic positions in Canada (Memorial, Queen's, Western) and in the United States (Lehigh, Maryland, Nebraska, SUNY) and others of whom hold prestigious non-academic research positions (Defense Research and Development Canada, IBM). His students have always been a presence at the annual CSBBCS meeting.

Colin has also been a leader at his institutions. He has served as Chair of the Division of Life Sciences (Psychology and Biology) (1994-1998) and as Vice Principal and Vice Dean (1998-2000) at U of T Scarborough. At Waterloo, he has served as Chair of Psychology (2012-2015, 2016-present), and will continue in this position through 2018. He has also contributed to clinical psychology in North America through his service on the Exam Committee of the Association of State and Provincial Psychology Boards (ASPPB) -- the body responsible for the clinical licensure exam (2012-2016, just reappointed for 2016-2020).

CSBBCS is a proud partner of Women in Cognitive Science - Canada

2nd Annual Meeting of Women in Cognitive Science – Canada
Friday June 2, 2017, at 3:30 pm
ED106.1, University of Regina

Order of Events:

1. Presentation of the first WiCSC **Mentorship Award**
2. Presentation of New Data: **Gender and the Canadian Research Context** (Debra Titone, Mehrgol Tiv, & Penny Pexman)
3. Panel Discussion on **Strategies for Work/Life Balance**:
   Morgan Barense, University of Toronto
   Joël Dickinson, Laurentian University
   Myra Fernandes, Waterloo University
   Mehrgol Tiv, McGill University
4. WiCSC **Mixer**. All Welcome

Questions? Contact Penny Pexman or Debra Titone, WICSC Co-Founders

2017 CSBBCS Past-President's Executive Symposium:
The Impact of Previous Knowledge on Immediate Recall

Organizer: Jean St. Aubin, Université de Moncton   Saturday June 3rd, 10:45 AM – 12:15 PM ED 106

One of the most fundamental functions that memory performs is to allow the past to support and guide our present interactions with the world. Historically, current cognitive operations were modeled by calling upon a dedicated memory system, like the working memory system, and theorizing was largely divorced from work done in other areas of memory. However, over the last two decades, the contribution of previous knowledge to immediate memory has been well documented. This symposium showcases some of the latest research on this topic. In their talks, the three researchers will present models accounting for the influence of previous knowledge on immediate memory as well as recent exciting empirical findings in both the verbal and visual-spatial domains.

Ian Neath, Memorial University of Newfoundland
Explaining lexical/semantic effects on working memory using the Feature Model

Researchers have long taken performance on immediate serial recall tests to be a measure of short-term/working memory; indeed, the concept of "span" relies on this assumption. Yet more than 130 years ago, Ebbinghaus noted a problem with this approach: It is impossible to avoid the influence of previously acquired knowledge. In this talk, I highlight some interactions between lexical/semantic factors, such as orthographic neighbourhood size and frequency, and other working memory manipulations, such as concurrent articulation, and then use the Feature Model to explore a number of possible explanations of the data. Unlike other models of working memory phenomena, the Feature Model does not posit a separate, capacity-limited store. Rather, the Feature Model views the subject's task to be one of using cues to reconstruct the presented items. As a result, it is neither surprising nor problematic that lexical and semantic factors affect immediate recall. The simulations capture the empirical results that while different lexical/semantic factors all affect performance on immediate serial recall tests, they interact differently with other working memory manipulations. These results add further support for the impurity principle (Surprenant & Neath, 2009): tasks are not pure measures of memory.

Maryellen C. Macdonald, University of Wisconsin – Madison
A psycholinguist thinks about verbal working memory

Evidence for the role of long term knowledge in performance on immediate memory tasks has had a substantial effect on theories of temporary memory. In the case of verbal memory, that long term knowledge comes from prior language use and is shaped by the demands of language comprehension and production. These processes rely on detailed knowledge of dependencies across lexical, syntactic, and phonological information, only a fraction of which has been investigated as having a potential role in immediate memory tasks. I'll consider some additional areas of linguistic knowledge that may offer insight into theories of immediate memory. I'll also discuss what we might learn from the temporary memory demands of everyday language production: In order for us to speak, the to-be-uttered words must be ordered and maintained until it is time for them to be spoken, attentional mechanisms inhibit just-uttered words and shift to upcoming ones, and speakers pursue this planning and maintenance while simultaneously encoding what other people are saying. The extent to which analogous processes are vs. are not engaged in serial recall tasks should shed light on the extent to which language knowledge and language use affect immediate verbal memory.

Marie Poirier, City University of London
Knowledge effects on short-term memory for visual items: Do you remember what you see or what you know?

It is well established that factors based on our knowledge of the language - such as lexicality, familiarity, and concreteness""have a sizable impact on immediate memory for verbal material. Recently, a number of studies have also examined the effects of prior knowledge on immediate memory for the visual properties of items. In this talk, I will review studies from our lab that explored the influence of multiple levels of knowledge on visual working memory (VWM). In line with previous findings, our results show an overall central-tendency bias whereby items are remembered as being closer to the overall average or central tokens than they actually are. Moreover, when object-level knowledge is available for the to-be-remembered items, a further object-based bias is apparent in responses. These results extend findings reported for episodic memory to VWM and contribute to the growing literature which illustrates the complexity and flexibility of the representations subtending VWM performance (e.g. Bae, Olkkonen, Allred, & Flombaum, 2015; Hemmer & Steyvers, 2009). The reported results fit well with models that assume that both immediate and long-term memory rely on the same representation and reconstruction mechanisms.

Symposium on Basic Processes in Mathematical Cognition
Organized by Joanne LeFevre, Carleton University
Saturday, 9:30 AM ED 106.1

Canada has a flourishing group of researchers who study basic processes in mathematical cognition. In this symposium, we will hear about the role of fingers in adults' counting strategies (Morrissey et al.) and how counting is not automatically part of adults' simple addition processes (Chen et al.). Campbell will discuss details of how addition and multiplication interfere with one another to provide evidence about how verification problems are solved. Ayesu and Hallett will extend work on procedural and conceptual knowledge to the domain of algebra. Methods range from standard response time analyses to ERP effects. This symposium will provide a sampling of current issues and methods in mathematical cognition.

(9:30) No automatic min counting for adults' simple addition: A behavioural and ERP study of the size congruency effect.
Authors: Yalin Chen, Jamie I.D. Campbell, Josh B. Neudorf, and Janeen Loehr, University of Saskatchewan

(9:45) Finger-counting and adult arithmetic fluency: Fingers may help, calculators may not.
Authors: Kyle Morrissey, Darcy Hallett, Rutanya Wynes, Memorial University of Newfoundland
Jingmei Kang & Ming Han, Northeast Normal University

(10:00) Retrieval-induced forgetting of simple addition by verification of multiplication counterparts.
Author: Jamie Campbell, Josh B. Neudorf, and Yalin Chen, University of Saskatchewan

(10:15) Unmasking the differences: Profiles of conceptual and procedural understanding of algebra.
Authors: Felix Ayesu, Darcy Hallett, and Cheryll L. Fitzpatrick, Memorial University of Newfoundland

Symposium on Embodied and Embedded Cognition
Organized by Evan Risko, University of Waterloo
Saturday, 1:30 PM ED 106.1

Attention in cognitive science has recently turned to trying to provide a deeper understanding of the embodied and embedded nature of human cognition. While researchers have approached this problem from a variety of angles, at its core is a desire to understand how cognitive processes are shaped by the body and its interaction with the physical environment. This symposium will feature researchers at the cutting edge of this effort. Talks will cover research investigating embodied cognition across a number of traditional domains in cognitive psychology including object identification, language processing, memory, and visual perception.

(1:30) Move it or lose (memory of) it: The effects of verb embodiment on memory.
Authors: David M. Sidhu & Penny M. Pexman, University of Calgary

(1:45) Evocation of spatial versus motor representations by handled objects.
Authors: Michael E. Masson, Daniel N. Bub, Maria H. J. van Noordenne, Connor B. MacRae, & Gabriela Marshall, University of Victoria

(2:00) Emotionality effects in lexical conceptual processing.
Author: Paul Siakaluk, University of Northern British Columbia

(2:15) Metacognition of the extended mind.
Authors: Evan Risko, Tim Dunn, Dave McLean, Connor Gaspar, and Derek Koehler, University of Waterloo

Symposium on Math Attitudes, Activities, and Achievement
Organized by Joanne LeFevre, Carleton University
Saturday, 4:00 PM ED 106.1

Acquisition of mathematics is an important topic in both education and cognitive science. In this symposium, LeFevre et al. will explore some of the predictors of early math skill for children in grades 1 to 3, including their parents' skill. Price will provide information about an intervention designed to alleviate children's math anxiety. Robinson will discuss the first year of a longitudinal study of how children acquire math concepts. Fitzpatrick et al. explore the effects of contextualizing math problems and discuss whether that helps children to 'do the math'. These presentations will examine the relations among various predictors of early (and later) performance, showing the relative influences of affective, experiential, and contextual factors on the math learning across a range of ages.

(4:00) How do children learn math? Relations between parents' math skill, home numeracy activities, and children's addition.
Authors**:** Jo-Anne LeFevre, Chang Xu, Feng Gu, Heather Douglas, Courtney Gardner, & Chiara Capparini, Carleton University

(4:15) Interventions for children's math anxiety. Author: Jill Price, University of Regina

(4:30) When a half and a half don't equal a whole: Putting word problems into context.
Authors: Cheryll L. Fitzpatrick, Darcy Hallett, Kyle Morrissey, Nadine R. Yildiz, & Felix Ayesu, Memorial University of Newfoundland

(4:45) A three-year longitudinal study of three arithmetic concepts: The first year.
Author: Katherine Robinson, Campion College at the University of Regina

Symposium on Sound Symbolism
Organized by Penny M. Pexman, University of Calgary
Sunday, 9:30 AM ED 106.1

Sound symbolism refers to associations between language sounds and meaning. In the most well known example, individuals report that nonwords like maluma are good names for round shapes, while nonwords like takete are good names for sharp shapes. The talks in this symposium will sample the wide range of topics that have been investigated in relation to sound symbolism. Stephanie Archer will present research examining the development of this phenomenon and its role in language acquisition. In these studies she examined the effects of sound symbolism on infant word learning, and on parents' infant directed speech. Chris Westbury will ask the fundamental question of what makes some language sounds sound symbolic instead of others? He will describe research that examined semantic associations for thousands of nonwords, in the most large-scale investigation of sound symbolism to date. David Sidhu will discuss the impact of sound symbolism on real language. In particular, he will present corpus analyses that examine why some words have sounds that match their meanings, while others do not. Lastly, Penny Pexman will present research that extends sound symbolism to personality, showing that the sound of a person's name can impact expectations of their personality.

(9:30) Sound symbolism in development: Two possible influences on word learning.
Authors: Stephanie Archer, University of Calgary
Sotara Kita, University of Warwick

(9:45) Sound symbolism cue distributions predict cue strength.
Authors: Chris F. Westbury, Geoff Hollis, University of Alberta
David M. Sidhu, & Penny M. Pexman, University of Calgary

(10:00) What's so special about balloons? Factors that predict the iconicity of concepts' word forms.
Authors: David M. Sidhu & Penny M. Pexman, University of Calgary

(10:15) Extraverted Erica and agreeable Anne: The sound symbolism of first names
Authors: Penny M. Pexman, David M. Sidhu, Kristen Deschamps, and Joshua Bourdage, University of Calgary

A short introduction to Bayesian statistics in R

CSBBCS 2017 workshop
University of Regina
2 June 2017, 9:00 – 5:00

Mark Vanderwel
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Researchers are increasingly recognizing the limitations of frequentist statistics (null hypothesis significance testing) in many scientific disciplines. Bayesian approaches are becoming an increasingly popular alternative, but basic statistical training has not kept up with this emerging shift. Many (most?) researchers remain unfamiliar with the principles of Bayesian data analysis, how it differs from classical statistical inference, or how to execute and interpret a Bayesian analysis using popular statistical software.

This workshop will provide a short introduction to the concepts and implementation of Bayesian statistics in the R programming language. Participants will gain hands-on practice in running Bayesian regression models and in interpreting the resulting output. The goal is to provide an accessible introduction into Bayesian statistics as a starting point for further formal training or independent study.

Background requirements

The workshop is aimed at graduate and senior undergraduate students, postdocs, and faculty. Participants should have prior training in statistics (one or two undergraduate courses), and have at least some experience in analyzing scientific data (running regressions, t-tests, ANOVA, or related statistical models). Participants should also have a working knowledge of R for performing basic data processing (e.g., data input/output, manipulation, visualization).

Location and Schedule

The workshop will be held in ED561(Education Building).

9:00-9:40   Introduction
9:40-10:20   R practice

10:20-10:30   Break

10:30-11:10   Probability and likelihood
11:10-11:50   R practice
11:50-12:30   Bayes theorem

12:30-1:15   Lunch

1:15-1:55   R practice

1:55-2:35	Multi-level modelling
2:35-3:15	R practice
3:15-3:25	Break
3:25-4:05	Markov chain Monte Carlo
4:05-4:45	R practice
4:45-5:00	Wrap-up

Computers

Desktop PCs will be available for participants to use during the workshop. You may bring your own laptop (Windows or Mac) to use if you wish. If you bring your own laptop, please follow the instructions below to install the necessary software before the workshop:

https://github.com/stan-dev/rstan/wiki/Installing-RStan-on-Windows
or
https://github.com/stan-dev/rstan/wiki/Installing-RStan-on-Mac-or-Linux

You will also need to connect to the internet during the workshop (unrestricted wifi access is available from the university). Alternatively, you may bring a USB drive to copy any necessary files to your laptop.

Data

Although we will work on common data sets together, participants are also encouraged to bring their own data, if possible. Any data set that (1) can be analyzed using regression, t-test, ANOVA, or related models; and (2) has already been formatted for input into R, would be suitable.

Advance preparation

Please prepare for the workshop by reading one or more of the resources below. The first is a quick read if you have just a little time. The second gives a longer, non-technical overview of Bayesian statistics. Consider the third if you'd like to invest in a textbook.

Dablander, F. 2014. Bayesian statistics: what is it and why do we need it?
    http://blog.efpsa.org/2014/11/17/bayesian-statistics-what-is-it-and-why-do-we-need-it-2/

Kruschke JK, Liddell TM. 2017. Bayesian data analysis for newcomers. Psychonomic Bulletin Review. DOI: 10.3758/s13423-017-1272-1

Kruschke JK. 2015. Doing Bayesian data analysis, 2ⁿᵈ edition: a tutorial with R, JAGS, and STAN. Academic Press.

Department Representatives

We are grateful for the support of the CSBBCS leaders of the future, our department representatives! Department reps promote CSBBCS and its activities on their campuses and act as a liaison between our society and the universities that carry out research in the brain, behaviour, and cognitive sciences.

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Organizing the annual meeting of CSBBCS takes a tremendous amount of time, commitment, dedication, and perspiration, and would be impossible without the support of the team of volunteers and administrative assistants who have worked so hard to make our conference a success!

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The organizers would thank the following people for their generous contribution of time and expertise:

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Our awesome CSBBCS 2017 logo was designed by **Bianca Hatin**

Extra special thanks to **Peter Graf** for always being there, and always being so helpful!

Symposium on Basic Processes in Mathematical Cognition
Saturday 9:30 – 10:30 ED 106.1

[1] No automatic min counting for adults' simple addition: A behavioural and ERP study of size congruency effect. *Chen, Y., Campbell, J.I., Neudorf, J.B., & Loehr, J.*

A recent study has argued that the sum-counting strategy (i.e., count both operands) of simple addition used in childhood becomes automatized in adults. However, the sum-counting strategy is usually replaced by a more efficient min-counting strategy (i.e., count the min operand) as addition skill develops. Thus, one would expect the min-strategy to become automatized, if automatic counting procedures exist. This study sought evidence of the min-strategy in adults by investigating the size congruency effect (SCE). The SCE is observed when comparing the numerical size of two numbers: RT is slower when the physical and numerical size of the numbers is incongruent compared to when they are congruent. The min-counting strategy inherently requires a number comparison stage, because the min number must be determined before the counting begins. Experiment 1 tested 72 participants and found a robust behavioural SCE for number comparison but not for simple addition. Experiment 2 tested 20 participants and recorded the event-related brain potentials (ERP). The behavioural results replicated Experiment 1 and the ERP results revealed brain signatures in line with behavioural findings. SCE for number comparison but not for addition indicates no number comparison stage for addition; hence, it ruled out the possibility of a fast min-counting strategy for adults' simple addition.

[2] Finger-counting and adult arithmetic fluency: Fingers may help, calculators may not. *Morrissey, K., Hallett, D., Wynes, R., Kang, J., & Han, M.*

The current investigation assessed the cognitive influences of embodied numeracy and culturally acquired finger-counting habits during an arithmetic fluency task. We tested 66 Canadian university students and 60 domestic Chinese university students on simple single-digit arithmetic questions in a single-task/dual-task design, with participants randomly assigned either to a finger-tapping or foot-tapping distraction condition. Michaux, Masson, Pesenti, and Andres (2013) previously observed selective interference effects for arithmetic problem solving when simultaneously tapping one's fingers, but we failed to replicate this result. Instead, results indicated unexpectedly poor mental arithmetic performance among Canadians. This was particularly evident in multiplication and addition questions, with nearly a third of participants exceeding 20% errors even when undistracted. Canadians' accuracy was also independently moderated by two factors: 1) a strong negative relationship between self-reported everyday calculator use and accuracy in answering arithmetic questions, and 2) participants who indicated typically counting on their left hand first outperformed their peers who typically counted first on their right hand. These findings are discussed in light of reports of declining math fluency, as well as possible individual differences in functional lateralization of arithmetic, and what they may mean for our replication attempt.

[3] Retrieval-induced forgetting of simple addition by verification of multiplication counterparts. *Campbell, J.I., Neudorf, J.B., & Chen, Y.*

Does arithmetic verification (3 + 6 = 13 true or false?) require correct answer retrieval or is it based on equation familiarity? We used retrieval-induced forgetting (RIF), a signature of retrieval, as an index of whether memory retrieval is involved in multiplication verification. In two experiments, 144 adults received blocks of multiplication practice either in a production task (2 X 5 = ?) or a verification task (2 X 5 = 15 true or false?) and then were tested on the addition counterparts (2 + 5 = ?) and control problems. Answer production was slower for addition problems whose multiplication counterparts had been practiced in both the verification and production tasks. The current results thereby support a retrieve-and-compare model of arithmetic verification.

[4] Unmasking the differences: Profiles of conceptual and procedural knowledge of algebra. *Ayesu, F., Hallett, D., & Fitzpatrick, C.L.*

Although it is one of the most important areas in mathematics learning, algebra remains one of the most challenging domains for students. To improve algebra learning, several studies recommend focusing on improving student's ability to identify and implement algebraic problems procedures, as well as enhancing students understanding of the fundamental principles behind algebra. However, as children learn algebra, it is not certain whether they are learning both the procedural and conceptual aspects in a balanced way. Instead, students may be learning one of these types of knowledge more than the other. Furthermore, there may not be a consistent pattern across students, such that there are individual differences in how students combine conceptual and procedural knowledge. Previous research with children's understanding of fractions have used cluster analysis to demonstrate that there are some students who rely more on conceptual knowledge, some who rely more on procedural knowledge, and some who rely equally on both (Hallett, Nunes, Byrant, & Thorpe, 2012). Using cluster analysis, this study finds there are individual differences in the understanding of algebra in a sample of 110 Grade 8 students. However, these clusters do not exactly parallel those found in fraction understanding.

Memory I
Saturday 9:30 – 10:30 ED 106.2

[5] Target distinctiveness in lineup and showup identifications. *Fitzgerald, R., & Valentine, T.*

In criminal investigations, eyewitnesses identify targets from lineups (suspect plus fillers) or showups (suspect alone). In two experiments, we examined the effect of target distinctiveness on showup and lineup identifications. Distinctive targets were more likely to be correctly identified than typical targets, but target distinctiveness did not improve decision accuracy on target-absent trials. The accuracy of target-absent decisions was affected, however, by the format of the test. Participants were consistently more likely to make an identification from lineups than from showups and this increased propensity to choose led to lower target-absent accuracy on lineups relative to showups. Before and after the identification decision, participants indicated their prospective and retrospective confidence, respectively. Target distinctiveness increased both pre- and post-identification confidence, but the effect on post-identification confidence was only significant if the identification test included the target. These findings suggest distinctive faces are more strongly represented in memory, but the stronger representation only increases confidence if it can be matched with the distinctive face at test.

[6] Mechanisms underlying children's eyewitness identification decision processes. *Price, H.L., Bruer, K., & Adkins, M.*

When compared to adults, child eyewitnesses choose more from lineups (e.g., Fitzgerald & Price, 2015). However, we know little about the decision processes that underlie children's choosing behavior. We developed an interactive simultaneous (IS) lineup procedure that allows children control over their search strategy (e.g., who they look at and how often) through an interactive touch-screen tool. Children (N = 478) aged 6-12 years (Mage= 9.07), first made a decision when presented with a fuzzy lineup in which they could clearly view only one lineup member at a time, as many times as they wanted. Next, children were shown the same lineup members in a clear lineup (akin to a simultaneous procedure) and either affirmed their original decision or changed their minds. The IS procedure was designed to allow for observation of children's lineup navigation behaviour as a function of two important lineup variables: stimulus set size (number of lineup members presented) and similarity between lineup members (lineup difficulty). Total looking time and number of looks at each photograph were related to accuracy, but only under specific circumstances. A more structured exposure to complex lineup stimuli (larger and more similar stimulus sets) may be beneficial in gathering evidence from children.

[7] Revisiting the list-strength effect in recognition: An output-interference account. *Ensor, T.M., Bancroft, T.D., Surprenant, A.M., & Hockley, W.E.*

Presenting to-be-remembered items multiple times on a study list increases the probability that they will be recalled or recognized on a subsequent memory test – a process known as item strengthening. The list-strength effect (LSE) refers to the finding that, compared to pure lists, lists for which a subset of the items have been strengthened produce enhanced memory for the strong items and depressed memory for the weak items. Although the LSE is found in free and cued recall, it does not occur in old/new recognition (Ratcliff, Clark, & Shiffrin, 1990). This discrepancy has been attributed to two factors: insufficient item strengthening in previous studies, and a failure to separate familiarity from recollection (Norman, 2002). We present a novel interpretation of the null LSE in recognition based on output interference. We show that, when test lists are specifically arranged so that the strong targets are tested before the weak targets, a recognition LSE emerges. In contrast, when probes are presented in a random order, or with weak targets first, the LSE disappears. The output-interference explanation is consistent with results from free and cued recall, and suggests that the dual-process and insufficient-strengthening interpretations are inadequate.

[8] Pushing the boundaries of retrieval-induced forgetting boundary conditions. *Phenix, T., Price, H., Bajwa, S., Stewart, K., Killough, T., & Bruer, K.*

Research examining Retrieval-Induced Forgetting (RIF) using DRM lists (Roediger & McDermott, 1995) have reported a failure to observe RIF when critical lure words were also presented to participants. Bäuml and Kuhbandner (2003) found that DRM list items are highly associated with critical lure words and that the inclusion of these critical lures caused participants to integrate list items and, consequently, eliminate RIF. Our study 1 presented DRM lists to participants. After a 1 or 2 day delay, participants completed retrieval practice and test phases. Integration instructions and associative strength of the DRM lists were also manipulated. In contrast to Bäuml and Kuhbandner's (2003) results, we report substantial RIF across all conditions when critical lure items were included in presented lists. Study 2 was identical to study 1 with the exception that the critical lure items were not included in the presented lists. The removal of a single list item (i.e., critical lure) resulted in dramatically different outcomes that were mediated by interactions between delay and associativity factors. We conclude that RIF is a robust phenomenon that will overshadow boundary conditions in extreme conditions.

Spatial Cognition
Saturday 9:30 – 10:30 ED 191

[9] Individual differences in the allocation of visual attention during navigation. *Keller, M., & Sutton, J.E.*

Individual differences have been observed in the ability to form a mental map-like representation, or cognitive map, of a new environment. The current study used dynamic eye tracking to determine whether differences in cognitive map accuracy are linked to differences in how visual attention is directed during navigation. Participants explored a novel virtual desktop environment, Silcton, while their eye movements were continuously tracked. They were instructed to find and remember the locations of eight target buildings in Silcton. Afterwards, they completed multiple tasks that assessed the accuracy of their memories for the layout of, and landmarks in, Silcton. Based on these assessments, participants were divided into those with strong cognitive map representations of Silcton and those with weak cognitive maps. Eyetracking data showed that the groups looked at the eight target buildings and non-building objects for the same amount of time. Those with weak maps spent less time looking at non-target buildings compared to those with strong maps, however. Deficits in remembering the layout of a virtual environment are not due to failure to attend to the relevant targets.

[10] The effects of age and sex on spatial reorientation. *Siemens, M., & Kelly, D.*

This study examines how age and sex affect the ability to achieve the first step of navigation - orientation. During orientation, featural (e.g., colour or texture) and geometric information (e.g., distance or direction) are used to determine which route to travel. This study used a 3-dimensional Virtual Reality (VR) spatial orientation task to examine how featural and geometric cues are used by older adults. Participants were trained to find a target location in a rectangular VR room (the shape providing geometric cues) with distinctive objects situated at each corner (providing the featural cues). Various tests manipulated the relationship between featural and geometric cues, which included removing either type of cue entirely, and placing the two types of cues in conflict with each other. Preliminary results indicate that older adults incidentally encode geometry and that age does not affect this ability but may affect how geometric cues are used. Sex differences were not expected for geometric encoding, however men and women were expected to differ with regards to how featural information is encoded. Initial results suggest that women use more of a landmark strategy, whereas men use more of a beaconing strategy. The long-term application of the final results will provide necessary information to help older adults learn to use appropriate spatial cues for navigation, allowing for a more independent lifestyle.

[11] Building a cognitive map in the laboratory: Do instructions to participants matter? *Sutton, J.E., Vollebregt, M., & Nantais, M.*

A growing body of research shows broad individual differences in the ability to create a mental map-like representation, or cognitive map, of novel real-world and virtual environments (VEs). In the current study, we investigated factors that may impact how participants form mental representations of a novel virtual environment using the Silcton VE. In a 2 x 2 between-subjects design, half of the 160 participants were explicitly instructed to create a map-like mental representation of eight target buildings in Silcton and half were instructed to simply "remember where" the buildings were. In addition, half directed their own exploration of Silcton and half were constrained to specific routes. All participants completed multiple assessments of Silcton cognitive map accuracy as well as the Spatial Orientation Test (SOT) of perspective taking. A 2 (exploration method) x 2 (instructions) x 2 (sex) between-subjects ANOVA showed main effects of exploration method (better performance for free exploration) and sex (better performance by males) in the cognitive map assessments. Regression analyses showed that SOT scores also predicted cognitive map accuracy and partially mediated the effect of sex. In terms of task factors, self-guided exploration, but not instructions to create a map-like representation, led to better cognitive map representations.

[12] Pick a spot, any spot: Examining spatial habit formation in a naturalistic setting. *Zhu, M.J., & Risko, E.F.*

We are constantly making spatial decisions about where to place ourselves and our objects. Previous research shows that an object's past spatial history can have a strong influence on future spatial decisions such that later object placements tend to match where that object was previously placed (Zhu & Risko, 2016). In the current study, we aim to examine whether this tendency is also present in naturalistic domains. To do this, we tracked students' seating choices in classrooms over the course of 12 weeks for 4 different courses. Consistent with previous findings (e.g., Zhu & Risko, 2016), we found that students' seating choice was constrained by previous seating decisions. Importantly, while students' order of arrival to class placed a constraint on available seats (i.e., the later students, arrived, the more likely they are to pick a seat away from where they last sat), we also found a significant relation between seating choice and time such that seats that are chosen towards the start of the course were more varied than those near the end. Implications of this study for understanding spatial habit formation will be discussed.

Word Recognition
Saturday 9:30 – 10:30 ED 193

[13] Does neighbourhood size really cause the word-length effect? *Guitard, D., Saint-Aubin, J., Tehan, G., & Tolan, A.*

In immediate serial recall, participants are better at recalling lists of short than long words (e.g., dog, blue vs. giraffe, subway). This word length effect has been the cornerstone of the working memory model, and a benchmark effect that all models of immediate memory must account for. There is no consensus as to what determines the word length effect. Jalbert and her colleagues (2011a, 2011b) have recently suggested that neighbourhood size is one causal factor. In six experiments, we examined their suggestion. In Experiment 1, with multiple word lengths, and a large pool of English words controlled for neighbourhood size, the typical word length effect was present. In Experiment 2 and 3, we used words with many or few neighbours and in Experiment 5 and 6 we also controlled for the frequency of the orthographic structure. We found the word length effect in all experiments. Finally, in Experiment 4, we tested the hypothesis that Jalbert's et al. results were due to a confounded factor: frequency of the orthographic structure. As predicted, we abolished the word length effect when controlling for neighbourhood size while using short words with a less frequent orthographic structure as in Jalbert's et al. studies.

[14] On the joint effects of stimulus quality and masked repetition priming. *McPhedran, M.J., & Lupker, S.*

Typically, in a lexical decision task, stimulus quality has an additive relationship with frequency, but interacts with stimulus repetition when the first presentation of the stimulus is visible and, hence, is able to create a lasting episodic memory trace. To test whether the interaction will remain when the initial presentation of the target stimulus is not available to consciousness, three masked repetition priming experiments were conducted with degraded versus clear targets. Experiment 1, in which the targets were degraded by reducing their contrast, produced an effect of repetition but no interaction. However, unfortunately, there was only a weak and nonsignificant effect of stimulus quality. In Experiment 2, targets were degraded using a case alteration technique (e.g., scope - sCoPe). A highly significant effect of stimulus quality emerged with the additive relationship between stimulus quality and repetition (i.e., no interaction) remaining. In a third experiment, the degradation manipulation was applied to both the primes and the targets. The main effect of stimulus quality was significant. However, there was, once again, no significant interaction. The implications of these results for single- vs. multiple-mechanism models of visual word recognition are discussed.

[15] Intention and performance: The case of reading aloud. *White, D., & Besner, D.*

It is widely assumed that intention plays no role in generating a pronunciation. Instead, print is typically presumed to trigger processing regardless of the reader's intent. There is little experimental evidence for the role of intention when reading aloud. We address this gap in the literature in a series of experiments in which participants, on a trial-by-trial basis, are cued to either read a word aloud, or withhold a response. The cue appears in advance, allowing participants to prepare for the task in advance, or at the same time as the word. The results of these experiments are counter-intuitive, and reveal the role of intention in generating a phonological code.

[16] Semantic priming effects and lexical processing. *Taikh, A., & Lupker, S.*

Word recognition is influenced by activated semantic and orthographic information. For example, visible semantically related primes facilitate target processing in a lexical decision task, although the locus of this effect is unclear (i.e., do related primes automatically activate the target's lexical representation or are they used strategically during a post-lexical process?). As a second example, orthographically similar masked word primes inhibit target processing while orthographically similar masked nonword primes facilitate processing (e.g., Davis & Lupker, 2006) with both effects presumably arising at the lexical level. Our previous experiments (CSBBCS, 2016) examined the interaction between these priming effects by having visible semantically related or unrelated primes precede orthographically similar or dissimilar masked primes. Findings indicated that strategic use of the semantic primes eliminates masked orthographic priming effects. The present experiments, using a similar paradigm, examined the effects of automatic semantic activation on masked orthographic priming effects. In Experiment 1, strategic use of visible semantic primes was restricted by shortening the prime-target SOA. In Experiment 2, the visible primes were related to the masked primes rather than the targets. In both cases, the visible prime failed to modulate the lexically-based orthographic priming effects, suggesting that semantic priming effects arise post-lexically.

Symposium on Embodied and Embedded Cognition
Saturday 1:30 – 2:30 ED 106.1

[17] Move it or lose (memory of) it: The effects of verb embodiment on memory. *Sidhu, D.M., & Pexman, P.M.*

Verbs vary continuously in the extent to which their meanings involve the human body. This relative embodiment can have important effects on how they are processed. This is ostensibly because simulating high vs. low embodiment verbs elicits a greater amount of associated bodily information. Here we considered the possibility that this might make high embodiment verbs more memorable. We found that high embodiment verbs had a higher rate of recognition (Experiments 1a and 1b) and recall (Experiments 2a and 2b), as compared to low embodiment verbs. Interestingly, while verb embodiment affected hit rate, it did not affect false alarm rate. We also examined how this interacted with the imagined enactment effect: the tendency to have a better memory for actions that one imagines performing vs. observing. While we did observe an enactment effect, it did not interact with relative embodiment (Experiment 3b). We explore the possibility that this might suggest different kinds of simulation are at play: a deliberate simulation in the enactment effect and a more automatic simulation in the relative embodiment effect.

[18] Evocation of spatial versus motor representations by handled objects. *Masson, M.E., Bub, D.N., van Noordenne, M.H., MacRae, C.B., & Marshall, G.*

Many demonstrations of the apparent evocation of motor representations by pictures of manipulable objects are susceptible to a very different interpretation that does not depend on the concept of embodied representations. A striking example is the handle alignment effect, where left- and right-handed key-press responses made in the context of handled objects are faster if the position of the handle is aligned with the response hand. We show that a prototypical instance of this alignment effect, still widely accepted as evidence of object perception leading to activation of motor representations, instead is a product of a correspondence between the spatial coding of the object's perceptual form and spatial coding of the required response. We also demonstrate an example of a handle alignment effect that constitutes valid evidence for motor representations being evoked by viewing handled objects. This evidence is based on the demonstration of qualitative dissociations between an alignment effect arising from spatial correspondence versus one that is produced by evoked action representations. These experiments demonstrate that whether perception of an object elicits associated action representations depends on the observer's ongoing action intentions.

[19] Emotionality effects in lexical conceptual processing. *Siakaluk, P.*

During the past several years, research efforts in my lab have focused on better understanding how emotion knowledge, as measured by emotional experience, valence, and arousal, influences lexical conceptual processing. In this talk I will present research that examined the effects of these emotionality dimensions on the processing of pain-related words and highly valenced (negative or positive) words in lexical decision (LDT) and semantic categorization (SCT) tasks. In the LDTs and the pain-related SCT ("is the word pain-related or not?"), we observed facilitatory effects of emotional experience (i.e., higher emotional experience ratings were associated with faster response latencies), but no effects of valence or arousal. In the negative SCT ("is the word negative or not?") and the positive SCT ("is the word positive or not?"), we observed facilitatory effects of valence and arousal (i.e., more negative, more positive, and higher arousal ratings were associated with faster response latencies), but no effects of emotional experience. I will attempt to delineate how these findings may help inform our understanding of the differences in representational structure of emotional experience, valence, and arousal, and how the influences of these emotionality dimensions interact with task demands in lexical processing.

[20] Metacognition of the extended mind. *Risko, E., Dunn, T., McLean, D., Gaspar, C., & Koehler, D.*

The ability to monitor our cognitive performance (i.e., metacognitive monitoring) is central to efficient functioning. Research investigating this ability has focused largely on tasks that rely exclusively on internal processes. However, our day-to-day cognitive activities often consist of mixes of internal and external processes. For example, we can offload memory demands onto external media (e.g., computers, paper). In the present investigation, we expand research on the metacognitive monitoring of performance to this domain. Specifically, we examine participant's ability to accurately monitor their performance in tasks that require them to rely on only their internal processes (e.g., short term memory to remember a series of letters) and tasks that require them to rely on both (e.g., paper and pencil to remember a series of letters). Results suggest that the former results in superior monitoring relative to the latter. Implications for understanding metacognition in more distributed cognitive domains will be discussed.

Cognitive Applications
Saturday, 1:30 – 2:30 ED 106.2

[21] Interventions for children's mathematics anxiety. *Price, J.*

The acquisition of mathematics skills in elementary school has an important role in future academic and professional success. These skills depend not only on cognitive abilities but also on emotional factors. Mathematics anxiety (MA) is defined as "feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematics problems in a wide variety of ordinary life and academic situations" (Richardson & Suinn, 1972). Once formed, MA is difficult to change and can persist well into adulthood. MA is also negatively correlated with math performance (MP). Very little research, however, explores this relationship or interventions for MA in elementary school children. The proposed study will assess the impact of three emotion regulating interventions (i.e., expressive drawing, relaxation exercises, and cognitive reappraisal) on Grades 2, 4, and 6 children's MA and MP. It is expected that (a) children with higher MA will show weaker performance, confidence, motivation, and perceived efficacy in mathematics compared to children with lower MA, (b) children in the relaxation breathing intervention will show lower MA and higher MP compared to children in the expressive drawing intervention, and (c) children in the expressive drawing intervention will show lower MA and higher MP compared to children in the cognitive reappraisal intervention. Overall, studying children's MA is important because deficits with mathematics in elementary school can have long-term implications for both learning and cognitive development.

[22] Does the precision of numbers and numerical statements in advertisements have any impact on judgments of product gender, or likeability? *Alards-Tomalin, D., Bernier, D.E., Leboe-McGowan, J.P., Leboe-McGowan, L.C., & Mondor, T.A.*

A recent consumer-based article (Yan, 2016), found that the precision of numbers used in advertisements (e.g., either imprecise/rounded "10% discount!", or precise/decimal numbers "33.6% of respondents preferred product A") significantly influenced participants' perceptions of the product's gender. The author theorized that implicitly held stereotypes regarding gender-differences in arithmetical achievement (e.g., men are better at math than women), would impact assessments about product gender, and the perceived gender of the numbers themselves. Specifically, that a product would appear more masculine when the advertisement included precise numerical statements, and more feminine with imprecise numerical statements. One confound was that, for all judgments, participants used the same 7-point Likert scale, with "feminine" and "imprecise" labels always allocated to the left side and "masculine" and "precise" labels always allocated to the right side. To address this, we counterbalanced the scale/label assignments across participants to include all possible mappings. Firstly, the numerical precision of the advertising statement had no impact on the perceived gender of the product. Secondly, numbers containing decimals were perceived of as gender neutral, not masculine, while some rounded numbers (e.g., 20) were rated as marginally feminine. The current results suggest that the original study's findings may largely be a methodological artifact.

[23] A Canadian national panel study investigating the role of memory associations and problem gambling. *Russell, G., Williams, R., & Sanders, J.*

Traditional assessment instruments often rely strictly on self-reported accounts of behaviour, which face such issues as forgetting, self-justification, deception, and social desirability. Measures that assess implicit memory associations are thought to assess processes unavailable to conscious introspection and be less sensitive to these issues. Over the past 30 years, research on alcohol and other substance use has demonstrated a significant relationship between these implicit processes and behaviours, however very little research has explored these processes in the context of behavioural addictions such as problem gambling. In the present work we evaluate two brief associative measures in a large population-based sample of Canadian adults (N=3078). A word association task involving 10 gambling homographs provided an index of lexical knowledge; this task used ambiguous cue words that included: situations associated with gambling; outcomes of gambling engagement; and, associated paraphernalia. The second measure evaluated behaviour associations using 10 phrases based on common motives for gambling engagement (i.e., to have fun, make money, etc.); tapping into more than lexical knowledge and tapping into the underlying associative processes. The findings revealed that those with greater gambling engagement (as measured by frequency of gambling, average monthly spending, and number of gambling formats) and more problematic gambling (as measured on the PPGM) responded with greater numbers of gambling-related responses to ambiguous words and behaviour associations.

[24] Neural integration of perceptual and conceptual object information. *Martin, C.B., & Barense, M.D.*

A fundamental question in cognitive neuroscience is whether the visual and conceptual features that define an object concept are integrated in the brain. Progress toward answering this question remains limited by the fact that visual and conceptual features are often confounded across objects (e.g., horse - donkey). The importance of this point is underscored by findings that link perirhinal cortex (PRC) to both visual and conceptual object processing. Here, we independently varied visual and conceptual feature overlap across a set of object concepts (e.g., hairdryer - gun; hairdryer - comb) to systematically test for evidence of integrative coding in the absence of feature-based confounds. We first generated behaviour-based models that captured the visual and conceptual similarities among the objects. These orthogonalized models were then compared to measures of neural similarity obtained while an independent group of participants completed property verification tasks that encouraged either visual or conceptual processing of the objects. Representational similarity analyses revealed that PRC was the only region in the brain to show sensitivity to visual and conceptual object similarity - an effect that was observed across property verification task contexts. These results suggest that visual and conceptual features are indeed integrated in the brain, likely at the level of PRC.

Perception
Saturday, 1:30 – 2:30 ED 191

[25] A sad pot never boils: Time perception and valence. *Fergusson, J., Maslany, A., & Graf, P.*

Does the saying "time flies when we're having fun" really hold true? If it is the case that time perception is influenced by the perceived enjoyability of a task, several possible explanations arise. One such possibility is that the valence of the secondary task influences time perception, with positively valenced tasks resulting in shorter perceptions of time, and negatively valenced tasks resulting in longer perceptions of time. Two studies were conducted to investigate whether the valence of a secondary task influences time perception of intervals from 2-4 minutes. Participants completed a secondary task with positive, negative, or neutral pictures while engaged in a prospective time estimation or production task. Time production and estimation accuracy in the positively and negatively valenced groups are reported.

[26] Generalization of perceptual learning following extensive training. *Hashemi, A., Sekuler, A.B., & Bennett, P.J.*

We investigated perceptual learning in a texture identification task using textures that contain diagnostic information (Target) in one orientation band and non-diagnostic information (Context) in a perpendicular orientation band. We previously found that, compared to Target-alone (i.e., no Context) textures, training in a 1-of-6 identification task with Target+Context textures resulted in lower accuracy, less learning, but greater generalization of learning. However, generalization was always to familiar targets in novel contexts, never to novel targets. Here we investigated whether broader generalization could be obtained by significantly increasing the amount of training from 960 to 4200 trials. Before and after training, we assessed identification accuracy on trained and novel Targets with and without Context. We also tested accuracy on textures where the Target and Context orientations were swapped, using both novel and trained Targets. Amount of learning and degree of generalization varied across observers, but critically, some observers did generalize learning to novel targets. Our results indicate that perceptual learning of orientation-filtered textures varies significantly across individuals, but that it can be generalized to novel targets and contexts. These findings may have implications for perceptual learning in applied settings in which generalization of learning is a critical component of training.

[27] Local motion integration determines global kinetic pattern perception. *Ho, A.*

A new way to study the ambiguous percepts of a rotating ellipse in the fronto-parallel plane is reported here. The border of an 11 deg high x 9.5 deg wide ellipse is broken down into sixteen separated short segments of 12 min arc in thickness, and separated from its two immediate neigbhours by an angle of 22.5 degree apart around the clock face. Each segment can only move in two fixed opposing directions brought by the perpendicular movement of the rotating ellipse from its center of rotation within the segment. By putting tangentially moving random dots of two frame life cycles inside each border segment and systematically varying their speed over different test trials, we were able to differentiate the conditions under which the visual system combined local velocity signals over the stimulus space to produce different global percepts.

[28] Exposure to three images of the same Caucasian or East Asian person improves face matching but does not eliminate the other-race effect. *Sandford, A., Simec, R., & Arora, A.*

Reliable evidence highlights problems with encoding other-race faces and matching unfamiliar faces. Taken together, this poses a significant problem for identity verification. Here, we investigated a possible solution by providing multiple images to support matching of own-race and other-race faces. We asked participants to match up to three photographs of three Caucasian and three East Asian faces with a different photograph of the same target person in a deck of 30 photo cards. We observed improved matching performance with increasing number of photographs of each target person. This was evidenced for both own-race and other-race faces. There continued to be an other-race effect when the same number of photographs were presented to participants (i.e., one, two, and three photographs of Caucasian or East Asian faces). Some evidence suggests matching performance with three photographs of an East Asian identity reaches similar accuracy as with one photograph of a Caucasian identity. The evidence supports the literature on the other-race effect and previous findings of better matching of faces with more images of the same person's face. We will discuss these results in relation to recent advances in psychological research and possible applications to issues of identity verification.

Computational Models of Cognitive Processes
Saturday, 1:30 – 2:30 ED 193

[29] A cognitively-inspired search engine. *Jamieson, R.K., Aujla, H., & Cook, M.*

For the past 50 years, computational psychologists have worked to deduce formal expressions for how people learn, remember, think, and know. That effort has led to impressive progress for understanding human cognition. But, the theories have rarely been applied outside the aim of a contrived task analysis. In this talk, we present an example of our work that leverages computational expressions of human cognition to build cognitive technologies. To suit time constraints, we focus on a cognitively-inspired search engine that finds journal articles based on the psychological match between a search term's meaning and the content of articles in the psychological record.

[30] Response modality, response frequency and response deadline in the «Same»-«Different» task. *Cousineau, D., Durand, G., Turgeon, A., Harding, B., & Goulet, M.*

The "Same"-"Different" task is characterized by a fast-"Same" phenomenon by which response times (RTs) to answer "Same" are much faster than to answer "Different"   . This effect goes against many views of processing because "Same" responses should be exhaustive whereas "Different" responses can be exhaustive or self-terminating, predicting that "Different" responses should never be slower than "Same" responses. One proposal, brought forth by Krueger (1978) assumes that there is a motor response bias for positive responses and therefore "Same" responses are faster to execute, even though the decision many not be faster. A second proposal from Ratcliff et al. (1981), extending the previous one, is to assume decision biases for "Same". Therefore, we decided to explore decisional and post-decisional factors to the matching task, namely: response deadlines, response modality and response frequency. The results show that although these factors impact accuracy and response times significantly, none are strong enough to explain the fast-"Same" phenomenon. We conclude by arguing that the locus of the fast-"Same" phenomenon is more likely located in pre-decisional factors, as suggested by Proctor (1981).

[31] Information transmitted in a simple reaction time game. *Dixon, P., Glover, S., & Prinsen, R.*

It has long been theorized that simple reaction time varies as a function of uncertainty of the response-signal foreperiod. We demonstrate that this relationship holds across trials within a distribution of foreperiods, and, in particular, that simple response time is a linear function of temporal information, quantified as the log of the empirical hazard rate. Further, this relationship is intuitively obvious to joint actors. Here, one actor generates a response signal and a second attempts to make a rapid response. When the first actor attempts to facilitate rapid responses, he or she spontaneously generates a distribution of foreperiods that minimizes the temporal information; when the first actor attempts to thwart rapid responses, he or she generates a distribution that maximizes the temporal information.

[32] Meaning and release from PI. *Mewhort, D., & Shabahang, K.D.*

We implemented the interface between semantic and episodic memory as a hologram populated by subject's active lexicon (a dynamic distributed store containing 10,000 words and their 99,990,000 pair-wise associations). Studying a word reinforces it in the hologram and alters the strength of all other words in proportion to their similarity to the studied word. When studying a list of words, subjects create inter-item associations, as a full or partial chain. Recall is prompted by a start instruction or by the word just recalled. Momentary strength of words is the item's simple strength plus a value contributed from associations with that item when the report is made. Using a BEAGLE vector to represent each word's meaning (see Jones & Mewhort, 2007),, the model captures archival data for meaning-based PI and Release from PI. It also captures related phenomena including Keppel and Underwood's (1962) study of PI, Hebb's (1961) repeated-list experiment, and Gardiner, Craik, & Birtwistle's (1972) study locus of release from PI.

Symposium on Math Attitudes, Activities, and Achievement
Saturday, 4:00 – 5:00 ED 106.1

[33] How do children learn math? Relations between parents' math skill, home numeracy activities, and children's performance. *LeFevre, J., Xu, C., Gu, F., Douglas, H., Gardner, C., & Capparini, C.*

For kindergarten children, home numeracy experiences are related to their early numeracy skills. We extended this work to children entering grades 1 - 3. Seventy children completed various early numeracy measures. Their parents also completed an arithmetic fluency task (designed for adults) and filled out a questionnaire about home activities. Children's arithmetic performance was predicted by grade and by parents' education. However, the effect of education on children's skill was mediated by parents' own arithmetic skill. The extent to which parents reported encouraging children to practice arithmetic at home also predicted unique variance in addition performance. In contrast, performance on a number line task was predicted only by grade. Parents' familiarity with number games similarly did not predict children's early numeracy skills. These results provide further information about the various factors that are related to children's early mathematical development.

[34] Undergraduates' mathematics attitudes and mathematics performance: The role of teachers and parents. *Price, J.*

Mathematical skills primarily depend on cognitive abilities. Or, so we thought. Research now shows that cognitive abilities only account for approximately 50% of mathematics performance variance (Suinn & Edwards, 1982). Mathematics performance is also highly influenced by our attitudes. Negative mathematics attitudes have a greater impact on mathematics performance than positive mathematics attitudes (e.g., Ganley & Vasilyeva, 2011). Little research explores from where or whom these mathematics attitudes stem. This study investigated undergraduates' perceptions of their teachers' and parents' mathematics attitudes and how these perceptions impact their own mathematics attitudes and mathematics performance. The results of this study are three-fold. First, they support the validity of Fennema-Sherman Mathematics Attitudes Scales with adult participants. Second, they support previous findings on the negative relationship between mathematics anxiety and mathematics performance as well as the impact of low confidence, motivation, and perceived efficacy on mathematics performance. Third, and most importantly, they show that undergraduates' perceptions of their mothers' and teachers' mathematics attitudes had a greater impact on their own mathematics attitudes and mathematics performance compared to undergraduates' perceptions of fathers' mathematics attitudes. Overall, this study highlights the role of teachers' and parents' mathematics attitudes in the development and maintenance of their students' and children's mathematics potential.

[35] When a half and a half don't make a whole: Putting word problems into context. *Fitzpatrick, C., Hallett, D., Morrissey, K., Yildiz, N.R., & Ayesu, F.*

Research regarding realistic word problems - math word problems that require the consideration of real world knowledge - have notoriously found that children in European and Asian countries have difficulty with these problems. This talk details the attempt of 3 different manipulations aimed at increasing the use of realistic knowledge in word problems such as these, and, in addition, test to see if students in North America perform similarly on them. Study 1 asked children to report their mathematical answer in a full sentence, while Study 2 provided children with an example of how to approach and answer a realistic word problem. Finally, in Study 3, students were given word problems paired with a series of multiple-choice style questions aimed at making sure students are actually reading the problem and not simply picking out numbers and key words to solve the problem. In general, we found children are reluctant to use real world knowledge in these problems, even when prompted to do so, although there were some gender differences. Boys actually performed worse on word problems when given an example of how to solve these problems. Overall, these findings have implications for what word problems in general are really testing.

[36] A three-year longitudinal study: The first year. *Robinson, K.M.*

Children's understanding of arithmetic concepts are critical for the development of later more complex arithmetic skills and knowledge. However, very few longitudinal studies have been conducted to examine how children's knowledge of concepts changes and develops across time and no study has tracked children's conceptual knowledge of both additive and multiplicative concepts. In the current study, 50 Grade 4 students were asked to solve three types of arithmetic problems assessing three arithmetic concepts: inversion (e.g., 3 + 25 - 25 and 2 x 24 / 24), associativity (3 + 25 - 22 and 1 x 24 / 12), and equivalence (3 + 5 + 2 = 3 + ? and 2 x 4 x 3 = 2 x ?). Accuracy and immediately retrospective problem solving strategy report data was collected. Results from the first (November 2016) and second (May 2017) data collection phases will be discussed.

Reasoning and Metacognition
Saturday, 4:00 – 5:00 ED 106.2

[37] Prior exposure increases perceived accuracy of fake news. *Pennycook, G., Cannon, T.D., & Rand, D.G.*

Discerning real from unreal is central to individuals' formation of accurate beliefs, and to the functioning of democratic societies. Yet during the 2016 US Presidential Election, many people came to believe false "fake news" stories that were widely shared online. Here we demonstrate one cognitive mechanism that underlies the believability of fake news: familiarity. We show that a single exposure to a highly implausible and partisan fake news story makes it subsequently seem more believable, both within the same session and a week later. This effect persists even when the story is labeled as contested by fact checkers, or is incongruent with the reader's political ideology - implicating a persistent low-level cognitive process. Familiarity is used heuristically to infer accuracy, which makes people susceptible to believing patently false information.

[38] Do smart people have better intuitions? *Thompson, V.A., Pennycook, G., Trippas, D., & Evans, J.S.*

Dual Process Theories of reasoning propose that Type 1 processes deliver autonomous answers and Type 2 processes require working memory. A key pillar of support for this theory is the robust relationship between cognitive capacity and reasoning performance, which assumed to arise from Type 2 processes. We tested this hypothesis in two large (N=224) experiments in which people were instructed to respond to base rate neglect or deductive reasoning problems based either on their beliefs or based on logic/probability. As predicted by Dual Process Theories, for low capacity reasoners, conflicting beliefs interfered with their ability to give logic/ probability responses. In contrast, for high capacity reasoners, the reverse was true, such that logic and probability interfered with their ability to make belief judgements. This suggests that high capacity reasoners may have intuitions that are based on probability or logic, challenging the Dual Process account of the capacity-reasoning relationship.

[39] I Believe in a Thing Called Emotion: Effects of valence on memory monitoring and performance. *Churchill, L.A., & Hourihan, K.L.*

The influence of emotion on memory is commonly examined. It is generally well known that emotional information benefits memory, relative to neutral information; however, not much is known about how emotion influences metamemory. The purpose of the current study was to examine how list composition affects whether emotion influences individuals' metamnemonic judgments and memory performance in a free recall task. In two experiments, participants studied lists of words that varied in emotional valence (positive, neutral, and negative) and made immediate judgements of learning (JOLs) after each word. Valence was manipulated in a mixed-list design in Experiment 1, and a pure-list design in Experiment 2, while the dimension of arousal was held constant. It was expected that valence would affect participants' JOLs and subsequent recall performance, but only in the mixed-list design. Consistent with this prediction, emotional words (both negative and positive) were given higher JOLs and were recalled more than neutral words in Experiment 1, while no such differences were observed in Experiment 2. Results are discussed in terms of the relative distinctiveness of emotional words compared to neutral words, such that that the metamemorial effect of emotion is likely dependent on participants' conscious beliefs about how emotion influences memory.

[40] Exploring memory states for general knowledge: A non-trivial pursuit. *Pereverseff, R.S., Jalava, S.T., Blanchette, T.D., & Bodner, G.E.*

According to the classic distinction between semantic and episodic memory, people answer general-knowledge questions by accessing their semantic memory. However, an appeal of trivia games is the variety of memory and metamemory experiences they arouse"”which sometimes include recollection of episodic detail. We report the first in-depth exploration of subjective memory states for general knowledge. Participants classified their answers for general-knowledge questions as recollection of a learning memory, recollection of a related memory, feels familiar, just know, or a guess. Participants often reported learning memories or related memories for their answers, and their accuracy was equally high for these two types of episodic recollection. Interestingly, accuracy was equally high for the just know state, and all three were higher than for familiarity and guess states. The accuracy difference for familiarity and just know suggests these states are qualitatively different, even though researchers often use them interchangeably. Thus, people also access episodic memory when answering general-knowledge questions, perhaps because experiencing recollection is diagnostic of accuracy. We also report on prospective memory states for unanswered questions, and on how memory states for general knowledge shift with answer feedback and over time.

Attention
Saturday, 4:00 – 5:00 ED 191

[41] Investigating the cognitive factors affecting hearing. *Cerisano, S., Crukley, J., Humphreys, K.R., & Watter, S.*

Sensory hearing loss and decline in cognitive processing both naturally occur as we age. Together, these factors make hearing more attentionally demanding, especially in difficult listening conditions; there is competition for the cognitive resources that are available. This suggests that cognitive approaches can be used to enhance the fitting and use of current hearing aids. The current work explores these ideas in a dual-task experiment using healthy young adults. Participants performed an auditory word recognition task with varying degrees of listening difficulty, along with a secondary cognitive task to manipulate resource/capacity limits. We discuss trade-offs between spoken word recognition performance and secondary task performance, and compare these data with measures of working memory capacity, and subjective and objective measures of listening effort. These results support the findings that individual cognitive ability and differences in cognitive load affect hearing ability. When applied to hearing aids, these effects should be considered in conjunction with physical causes of hearing loss. Future directions include working with older adults and introducing a variety of other physiological measures that can be applied in the fitting/use of hearing aids.

[42] *Attraction of attention from the visual periphery. LaPointe, M., Ortiz-Tudela, J., & Milliken, B.*

When viewing scenes for change, attention is attracted to semantically incongruent objects. Whether this attraction is due to the perceptual or semantic features of the object has been an issue of debate. Moreover, whether this attraction occurs for objects in the near or far visual periphery remains an open question. In the present experiment, participants performed a change detection task while maintaining their eye gaze at the centre of the image. Half of the participants were required to report the location of the changing object and the other half were required to report its identity. If the semantic features of an object can capture attention from the visual periphery, there ought to be no difference in the size of the congruency effect across our two groups of participants. Further, if objects in the far visual periphery are as likely to capture attention as objects in the near periphery, we ought to find no relation between response time and target eccentricity. Both groups showed response time benefits for incongruent targets. Moreover, although target eccentricity did not predict response time for those who localized the target object, target eccentricity did predict response for incongruent targets for those who identified the target object.

[43] The influence of stimulus integration and co-occurrence on contingency learning. *MacLeod, C.M., Forrin, N.D., Lauzon, S., & Lin, O.Y.*

Humans are highly adept at learning associations between stimuli or between dimensions of stimuli, and often do so quite implicitly (without the intention to learn). In a very simple task, you might be responding on each trial by identifying which of three colours is shown, unaware that the irrelevant word carrying that colour information is either usually (high contingency) or not usually (low contingency) presented in that colour. High contingency instances are responded to faster than low contingency instances, a pattern that develops remarkably quickly and that does not require awareness of the contingencies. We will present evidence concerning the roles that integration and co-occurrence of stimulus dimensions, within a single modality or across modalities, play in learning these contingencies, and consider what this evidence tells us about the processes underlying contingency learning.

[44] A triple threat: Approach, avoidance and attention. *Maslany, A., Morar, N., Osman, M., & Graf, P.*

The relationship between affect and the scope of attention is complicated than previously thought. A new theory suggests that attention scope is determined by motivational intensity: the strength of the tendency you have to move towards or away from a stimulus. In this study, motivational intensity was manipulated with NAPS affective pictures, which were high in approach, neutral or high in avoidance. We showed undergraduates picture sequences, with all pictures in a sequence from the same approach/avoidance group, but the approach/avoidance group varied across sequences. To assess attentional scope, after each sequence, participants completed Erikson flanker trials. We expected more flanker interference following low approach/avoidance picture sequences. Results show evidence for the typical flanker effect. Participants are slower to respond to incongruent than congruent trails, but there was no interaction between flanker trials and approach/avoidance ratings. Implications of the results and the relationship between affect and the scope of attention will be discussed.

Psycholinguistics
Saturday, 4:00 – 5:00 ED 193

[45] The roles of heads and modifiers in noun-noun metaphors. *Park, J., Sana, F., Gagne, C., & Spalding, T.*

Metaphors are expressions whose intended meaning is different from the literal meaning. In most cases, metaphors have the form X is Y (e.g., lawyers are sharks). However, in some cases, metaphors can take the form of noun-noun phrases (e.g., shark lawyers). We evaluated the processing of noun-noun metaphors through the conceptual combination theoretical framework, which states that the second noun (i.e., head) denotes the main category (lawyers), and the first noun (i.e., modifier) specifies the sub-category (lawyers that are aggressive). In Experiment 1, we used a sense/nonsense task; we demonstrated that metaphors for which the head is used figuratively (e.g., relationship patch) take longer to be processed than metaphors for which the modifier is used figuratively (e.g., bandaid solution). In Experiment 2, we demonstrated that metaphors (relationship patch) take longer to process when preceded by a literal prime (jean patch) than when preceded by a figurative prime (soul patch). Taken together, these results suggest that heads play a critical role in denoting the metaphorical category, and that there is a cost associated with switching categories from literal to metaphorical.

[46] Comparing the metacognitive and psycholinguistic accounts of the tip-of-the-tongue state. *Oliver, K., Li, T., Harley, J.J., & Humphreys, K.R.*

Psycholinguistic and memory researchers disagree on what constitutes a tip-of-the-tongue (TOT) state. Psycholinguists argue that TOT states occur when there is a transmission of activation failure between the lemma and phonology levels of word production (e.g. Burke, MacKay, Worthley, & Wade, 1991). Metacognition researchers argue that the TOT state is better described as a subjective experience caused by a mechanism that assesses the likelihood of recall from memory. The cue familiarity hypothesis suggests that a TOT state may occur when cues elicit a feeling of familiarity (Metcalfe, Schwartz, & Joaquim, 1993). We conducted two experiments to evaluate the psycholinguistic versus metacognitive account of TOT states. Experiment 1 included a test-retest TOT task with identical definitions (i.e., cues that should elicit familiarity) versus alternative definitions. TOTs were as likely to repeat for alternative definitions across test and retest as identical definitions, which is inconsistent with the cue familiarity hypothesis. Experiment 2 included the same task layout as Experiment 1, but we used very different cues (pictures versus descriptions for famous people). Again, we found that TOTs tended to repeat regardless of whether or not prompts were identical. We argue that the primary mechanism underlying the TOT state is specifically a lemma-to-phonology mapping failure.

[47] Nominal word structure and its impact on grammatical gender identification. *Robidoux, R., & Desrochers, A.*

French common nouns often contain a nominal root, whose grammatical gender may converge or diverge with that of its derived noun. This study used grammatical gender identification in order to investigate whether root gender is involved in derived noun gender processing. It was hypothesized that high-frequency roots especially would facilitate convergent identification, but also hinder divergent gender identification. Fifty young adults were asked to quickly and accurately judge word gender by pressing one of two buttons. Preliminary results (N=26) show that convergent nouns yielded faster reaction times, $F(1,22) = 14.60$, $p < 0.001$, $\eta^2 = 0.73$. An interaction between convergence and grammatical gender appeared, $F(1,22) = 4.49$, $p = 0.008$, $\eta^2 = 0.45$, with both genders linked to a divergent speed decrease, but only feminine nouns associated with a convergent speed increase. Root word frequency did not have a significant effect. Results suggest that both genders may not be perceived equally. Masculine may be the default gender, and as such its detection may not be advantaged by additional cues. Feminine words may benefit from cue redundancy. Yet results also suggest that not all contextual gender cues are used. Overall, the current results provide an enhanced understanding of grammatical gender identification.

[48] Did you say something? Infants perceive names but not sentences in a naturalistic multi-talker background. *Bernier, D.E., & Soderstrom, M.*

Infants, like the rest of us, frequently encounter situations in which speech from one individual occurs simultaneously with that of others. Previous work has shown that while age of the infant matters for successful segregation, so do other factors such as the number of background speakers (Newman, 2005; 2009). This research has shown that at a 10dB signal-to-noise ratio (SNR), both 5- and 9-month-olds are able to perceive their own name in a multi-talker background, but not a single-talker background; the opposite pattern we find with adults. We attempted to extend these findings to a more naturalistic multi-talker background (adult-to-adult conversation), as well as to more naturalistic target stimuli (sentences). Using a head-turn preference procedure, we found that our naturalistic multi-talker background did not significantly impede 5-, 9-, and 12-month-olds' perception of their own name at a 10dB SNR. However, a preliminary assessment of 9- and 12-month-olds' perception of longer sentences in this same background at the same SNR, suggests that these are more challenging than unfamiliar names, even at 12 months. This indicates that while infants' selective attention to single words (unfamiliar names) is fully online by 5 months, selective or sustained attention to longer sentences is not.

Symposium on Sound Symbolism
Sunday 9:30 – 10:30 ED 106.1

[49] Sound symbolism in development: Two possible influences on word learning. *Archer, S., & Kita, S.*

Conventional linguistic thought dictates that the form of a word is arbitrarily linked to its referent (Hockett, 1960), though current research shows that humans are sensitive to non-arbitrary word-referent links (sound symbolism). I will present two studies that demonstrate that sound symbolic audio-visual stimuli can influence both infant perception and parent production. First, can the presence of sound symbolic words help infants learn 'difficult' non-sound symbolic words? We pre-exposed English-learning 13-month-olds to sound symbolic word-object pairs to predict whether infants would accept non-sound symbolic, phonologically non-optimal words (ptak, svet) as labels for objects during habituation and test phases. Results from 32 infants participating in a modified Switch Task (Werker et al. 1998) showed that, when pre-exposed to congruent sound symbolic word-object pairs (n=16), infants accepted non-optimal words as object labels (p<.05), but not when pre-exposed to incongruent pairs (n=16; p>.05). Second, in an infant-directed speech (IDS) study, we presented objects (differing by one property, e.g., size) on a screen to mother-infant dyads. We then analyzed mothers' IDS prosody (pitch, loudness, duration). Preliminary results show that mothers' mean pitch is non-arbitrarily matched with size (e.g., high pitch - small object; n=20). Thus, sound symbolism might be a facilitating factor in word learning.

[50] Sound symbolism cue distributions predict cue strength. *Westbury, C.F., Hollis, G., Sidhu, D., & Pexman, P.*

It is well-established that there are relationships between word meaning and certain letters or phonemes, a phenomenon known as sound symbolism. We used a novel research approach designed to allow us to assign weights to sound symbolic cues. Participants made binary yes/no judgments about thousands of randomly-generated nonwords, deciding if they were good examples for each of 18 different semantic categories. Formal cues reliably predicted membership in many of those categories. Using binomial regression over the sets of possible cues, we show that there is a strong inverse relationship between the average beta weight assigned to a phonological feature, phoneme, or letter, and the logged frequency of that cue. We discuss the implications of this finding for sound symbolism.

[51] What's so special about balloons? Factors that predict the iconicity of concepts' word forms. *Sidhu, D.M., & Pexman, P.M.*

Words vary in the extent to which their sound is related to their meaning (i.e., in how iconic they are; Perry, Perlman, & Lupyan, 2015). One way for this to occur is through indirect iconicity, in which words' phonemes have a sound symbolic relationship with their meanings. For instance, the phonemes /b/, /l/ and /n/ have a sound symbolic association with roundness. Thus, a word like balloon would be considered iconic. But not all words are like balloon. Here we explore two factors that might explain why some meanings have iconic words while others do not. In particular, we tested the predictions that: 1) concepts with less dense semantic neighbourhoods (ARC; Shaoul & Westbury, 2010) can afford to have more iconic forms (without risking ambiguity), and 2) that concepts with a greater amount of sensory features (SER; Juhasz & Yap, 2013) would be more mappable, and thus have more iconic forms on average. We found evidence for both of these predictions. Interestingly, these results were observed for adjectives and verbs, but not nouns. Overall these results demonstrate that iconicity is a general property of the lexicon, and that it behaves in systematic ways.

[52] Extraverted Erica and agreeable Anne: The sound symbolism of first names. *Pexman, P.M., Sidhu, D.M., Deschamps, K., & Bourdage, J.*

Research on sound symbolism has demonstrated that sonorants (e.g., /l/, /m/ and /n/) are associated with round shapes, while voiceless stops (e.g., /p/, /t/ and /k/) are associated with sharp shapes (Köhler, 1929). It has also been shown that these different kinds of phonemes are associated with different connotations. For instance, sonorants are rated as being more mellow, delicate and passive, while voiceless stops are rated as being more harsh, rugged and active (Greenberg & Jenkins, 1966). We examined how these connotations impact personality judgments for names containing these phonemes. In Experiment 1 we presented participants with gender-matched pairs of names containing either sonorants or voiceless stops. The participants' task was to decide which name was more likely to belong to someone who possessed certain traits. These trait descriptors were derived from the dimensions of the HEXACO model of personality. In Experiment 2, we went beyond this constrained forced choice task and presented participants with single names and a rating scale for each trait descriptor. Across both experiments, we found that names containing either sonorants or voiceless stops were differentially associated with several personality factors. These results suggest that sound symbolism extends beyond perceptual qualities to more abstract associations.

Memory II
Sunday 9:30 – 10:30 ED 106.2

[53] The impact of mnemonic interference on memory for visual form. *Li, A.Y.*

How does interference impact memory? Previous work has found that the type of distracting information can differentially alter how visual representations are forgotten. For example, a recent series of experiments found that highly dissimilar interfering items erase the contents of memory, while highly similar and variable interfering items blur representations. Though these effects have been shown for colour memory, it is unclear if they extend to other object features such as shape. To assess this, we developed a novel "Shape Wheel" in which the similarity of 360 shapes varied incrementally around a circular space. We then used these shapes to assess how shape memory was impacted by distracting information that varied in similarity relative to the target shape. We found that when interfering shapes were similar to the target, a numerical but non-significant benefit to memory accuracy was observed. However, when interfering shapes were dissimilar to the target, accuracy was reduced. In contrast, memory precision was reduced only when interfering shapes were similar or perceptually variable. To validate these findings, we ensured that our Shape Wheel was sufficiently circular using multidimensional scaling (MDS), a statistical technique that can visualize the similarity between observations. Overall, these findings may offer a set of general principles regarding how interference impacts high-level object representations and all features therein.

[54] Drawing benefits in episodic memory: Too much of a good thing? *Meade, M.E., Klein, M., & Fernandes, M.A.*

We have previously demonstrated that drawing pictures of, relative to writing out, to-be-remembered words at study benefits later memory performance (Wammes, Meade, & Fernandes, 2016). Here, we examine the effect that drawing has on false alarm performance to non-studied critical lures using the Deese-Roediger-McDermott (DRM) paradigm (Deese, 1959; Reodiger & McDermott, 1995). Participants either drew, wrote, or imagined representations of to-be-remembered words selected from DRM sets; they were later given an RKN recognition test for both studied words and critical lures. Drawing increased hit rate to studied words, relative to writing (Experiments 1 & 3) and imagining (Experiment 2) during encoding, replicating the drawing effect. Notably, drawing also led to an increase in false alarm rate to critical lures. Findings suggest that the memorial benefit offered from drawing may in-part stem from a spreading of activation to related items which has the unintended consequence of increasing false alarms to semantically related information.

[55] An ERP investigation into the physiological correlates of conjunctive rule category learning. *Rabi, R.R., Joanisse, M.F., Zhu, T., & Minda, J.P.*

When people learn new rule-based categories, research suggests that working memory and executive function are recruited to search for rules, to maintain the currently active rule in memory, to update rule information following feedback, and to select a new rule if necessary. In order to understand more about the physiological correlates to these behaviours, we asked a group of 38 university students to learn a set of two categories of Gabor patch stimuli that were defined by a conjunctive rule. On each trial, a stimulus was presented on the screen, participants made a response, and they were given corrective feedback on their decision. Event-related potentials (ERPs) were recorded while participants performed the task. Correct categorization responses resulted in a larger stimulus-locked late positive complex compared to incorrect responses, indexing the updating of rule information in memory. As well, incorrect trials elicited a more pronounced feedback-locked P300 ERP compared to correct trials, suggesting a participant's confidence in their rule-based strategy. Among strong learners only, differential processing of easy and hard categorization stimuli was examined. A large late positive slow wave emerged for difficult compared to easy categorization stimuli, suggesting differential processing of category items even though strong learners performed quite well on the conjunctive category set. Overall, our results suggest that ERP can be used to better understand the cognitive processes involved in rule-based category learning.

[56] Adding latent semantic analysis to the SIMPLE memory model. *Gabel, A.J., Jamieson, R.K., Hourihan, K.L., & Neath, I.*

The von Restorff effect (von Restorff, 1933) is the finding that an item that is placed among a list of items that share a common feature (e.g., words in black), but does not possess that feature (e.g., a word in red), will be better remembered. SIMPLE (Brown, Neath, & Chater, 2007) predicts human memory performance based on local distinctiveness of items in logarithmically-compressed time. Surprenant and Neath (2009) fit SIMPLE to a color-based von Restorff effect by adding a second dimension corresponding to the color of the words. But von Restorff effects are also observed when the distinct item differs in psychological dimensions, such as semantic differences. We use Latent Semantic Analysis (Landauer & Dumais, 1997), a method of enumerating semantic differences amongst a set of terms, as the second dimension to fit SIMPLE to semantic von Restorff data. In particular, we assess the accuracy of SIMPLE+LSA to predict the magnitude of the semantic von Restorff effect for specific lists.

Social Behaviour
Sunday 9:30 – 10:30 ED 191

[57] The interaction of personality, group membership, and task difficulty on cooperative behaviour in humans. *Chadwick, L., & Karl, J.*

The extent to which individual traits versus situational context influence human behaviour is a long-standing debate in psychology. The current study explored how the individual factor of personality interacts with the situational factors of group membership and task difficulty to influence cooperative behaviour in humans. Participants completed a personality questionnaire and then a joint cup-passing task with a partner from the same (Congruent) or a different (Incongruent) group. To complete the task, participants had to move a mug from a starting position to an intermediate position; their partner then moved the cup to a final goal position, by which time the cup's handle was to be rotated to by a specific amount (135° = easy, 180° = medium, 225° = difficult). The results show that participants performed a higher degree of cup rotation when working with a congruent compared to incongruent partner, especially as the degree of required cup rotation increased. These results support the view that cooperative behaviour is more strongly influenced by the situational factors of group membership and task difficulty than the individual factor of personality.

[58] Social control and behavioural coordination in humans. *Olarewaju, E., Leboe-McGowan, J., & Hare, J.F.*

In humans, the complex interplay between self and others enables a wide range of behaviours. These interdependent factors are integral to the development of sociality and thus their effects on behaviour are testable given the appropriate design. To that end, I formulated a social paradigm in which the mechanism driving behavioural control were examined experimentally. In this paradigm, there are two interacting sources exerting control over behavioural output: an internal source (self) and an external source (other). The interaction between these two sources can either promote, inhibit, or have a neutral effect on behaviour. This "interaction effect" is subject to measurement and manipulation during observation mediated motor coordination between adjacently seated dyads. The results of the experiment are as follows: mirroring interactions (ipsilateral motor coordination) between participants assigned to the roles of leader and follower proceeded significantly faster and with greater accuracy than matching interactions (contralateral motor coordination). Further, an increased cognitive demand significantly reduced the difference between mirroring and matching interactions for leaders and not followers. These findings suggest a model describing the parameters of this "interaction effect" could provide critical insight into how visual information concerning the behaviours of others exerts proximate control over the behaviours of oneself.

[59] Reporting more motor empathy traits is associated with making more memory errors for observed actions. *Tanguay, A.N., Lindner, I., Hoenen, M., Renoult, L., & Davidson, P.S.*

The repeated observation of other people's mundane actions is robustly associated with increased memory errors: we often report having done the action ourselves when it was only performed by another person. The strength of the "Observation Inflation effect" varies between people, which may be explained in part by interindividual differences in empathy traits. Empathy refers to taking the perspective of another person (i.e. cognitive empathy), feeling the same emotion as another person (i.e. affective empathy), and understanding non-verbal communication or mimicking people (i.e. motor empathy). Thirty-five participants (10 males) took part in the study (M age = 23.2, SD = 4.44). Participants read, observed, and performed actions, and filled out the Interpersonal Reactivity Index (Davis, 1980) and the Action and Feelings Questionnaire (Williams, Cameron, Ross, Braadbaart, & Waiter, 2015) at the end of the study. Higher motor-empathy scores were associated with a larger Observation Inflation effect (r = .36, p = .03), but no significant relationship was found with the cognitive or affective empathy scales (p > .6). Our study provides a novel perspective on the relationship between empathy traits and episodic memory.

[60] Does sociality influence the ability to infer mental states of other individuals? *Vernouillet, A., & Kelly, D.*

Understanding which factors permit the emergence of complex cognitive abilities in nonhuman animals allows us to infer how those abilities evolved in humans. The "social brain hypothesis" argues complex cognition has arisen in social species as it allows individuals to track relationships among members of the same social group, and hence predict actions of others. We used a food-storing (caching) paradigm to directly compare pinyon jays, a highly social corvid, and Clark's nutcrackers, a relatively non-social corvid, on the ability to infer mental states of individuals from the same, and from a different, species. Birds cached in two visually distinctive sand-filled trays under three conditions: Observed by a conspecific, Observed by a heterospecific, and Alone. After caching, the observing bird was given an opportunity to pilfer from only one of the trays. Our results suggest that pinyon jays could identify all observers as a threat, unlike nutcrackers who could only perceive other nutcrackers as a threat. This is the first study to investigate whether corvids identify a heterospecific as a potential threat. Our results suggest not all species can do the latter, rekindling the question of the importance of sociality in complex cognition.

Cognitive Development
Sunday 9:30 – 10:30 ED 191

[61] What's a tibble? Experience impacts toddlers' processing of other children's speech. *Bernier, D.E., & White, K.S.*

Toddlers are sensitive to the properties of adult speech, detecting even slight mispronunciations of familiar words (Swingley & Aslin, 2000; Morgan & White, 2008). However, adult speech constitutes only a portion of the input learners receive. Infants and toddlers are also exposed to the speech of other children, including children who make obvious phonological errors (e.g., saying sip for ship). Using a preferential looking paradigm, we tested 21- to 23-month-olds' perception of familiar words spoken by a 7-year-old female that were additionally produced with 1-, 2-, and 3-feature mispronunciations (e.g., foo for shoe, pock for sock, sall for ball, respectively). We found that while toddlers recognized the correct pronunciations, they did not recognize any of the mispronunciations. However, only toddlers who had more experience with child speech showed sensitivity to the degree of mispronunciation. In addition, in response to completely novel labels, only toddlers who had experience with child speech successfully mapped them to novel objects. In a follow-up experiment, we replicated the findings for correctly pronounced familiar object and novel object labels, and extend these findings to adult speakers. These results point to the role of experience in toddlers' processing of both child and adult speech.

[62] Evidence that young children use structural features to solve matrix reasoning problems. *Hannon, B.*

This study uses eye-tracking technology to assess the online strategies that young children use as they complete complex matrix reasoning problems. More specifically, we recorded the eye movements of children, ages 6-8, as they completed a series of matrix reasoning problems taken from Lohman's Cognitive Abilities Test (i.e., CogAT, 2012). Our results showed that children who scanned rows and columns (as opposed to scanning randomly) answered more matrix problems correctly; a finding that is consistent with the adult literature which shows that using the underlying structural features to solve matrix reasoning problems is one hallmark of expertise in problem solving (Novick, 1990). Of course the unique and indeed extraordinary finding here is that we show 6-8 year olds are using the same problem solving strategies that adult problem solvers use.

[63] Does Parental Spatial Talk Differ during iPad® and Toy Play? *Lee, J., Hodgins, S.,Douglas, E., & Wood, E.*

Early exposure to spatial language supports spatial development. Despite increasing use of interactive technological devices, little is known about the impact this play context has on the production of spatial language - both amount and diversity - by parents. Spatial talk was coded during play by 36 parents with their preschoolers (19 girls, 17 boys; mean age = 65.42 months, S.D. = 9.52), in the context of 3D spatial play using blocks and puzzles and virtual 2D spatial play using an iPad® in two separate home visits. Our repeated-measures ANCOVA revealed that parents did not differ in the amount of spatial talk [$F(1, 32) = 1.162$, $p= .289$, $\eta^2= 3.5\%$] and diversity of spatial words [$F(1,32)= 2.170$, $p= .151$, $\eta^2= 6.4\%$] in both play contexts, after accounting for child's gender, age and socioeconomic status. However, significant differences in diversity of words did arise in the specific types of spatial categories. Specifically, in the 3D play contexts, parents produced more diverse words related to spatial dimensions, shapes, and continuous amount than in the 2D play contexts. In contrast, in the 2D play contexts, they produced more diverse words associated with orientations and transformations as well as deictics than in the 3D play contexts.

[64] Using 3D printing workshops in informal learning spaces to promote children's cultural and digital literacy. *Dubé, A.K., McEwen, R., Southwick, D., Record, I., Turner, H., & Resch, G.*

North America libraries and museums are purchasing 3D printers in hopes of promoting children's cultural and digital literacy. To assess the efficacy of this practice, we held 3D printing workshops in Toronto's Bata Shoe Museum in which children (n = 32) ages 8 to 13 listened to a multimedia presentation about an artifact, learned how to use 3D design software, and designed their own artifact on a PC or iPad. Following the workshop, children's cultural understanding was uniformly high but their 3D printing ability varied. 3D printing ability was assessed by participants identifying errors in preexisting 3D designs and by evaluating participants' 3D designs for errors and complexity. Children were adept at identifying errors in preexisting 3D designs but not at avoiding them in their own designs. Every participant identified overhang errors in the preexisting designs but missed them in their own designs. For complexity, children's PC designs contained far more individual elements but far fewer customizations of those elements than iPad designs. For example, 40% of PC designs contained 10+ elements (cf., <10% iPads) but 75% of PC designs contained only 1-2 scaling customizations while 92% of iPad designs contained 3+. The workshops promoted children's cultural literacy but their digital literacy may depend on the interface affordances of the 3D design software.

Language
Sunday 11:00 – 12:00 ED 193

[65] How do readers process collective nouns during a lexical decision task? *Carson, R., & Desrochers, A.*

In English, noun number is based on two sources of information: 1) grammatical number, the written representation of singular or plural; and 2) notional number, the number a communicator wants to convey. Typically, grammatical and notional number align (Corbett, 2006). An exception is found in singular collective nouns. They can be notionally singular (e.g., The crew is tired) or notionally plural (e.g., The crew are tired; Corbett, 2006); without context, their notional number is ambiguous. This experiment examines how noun collectivity, grammatical number, and noun animacy interact using a lexical decision task. Noun animacy was investigated because collective can refer to living entities (e.g., crew) and non-living entities (e.g., bouquet; Levin, 2001). Participants were 68 university students (59 female) with a mean age of 19 (SD = 1.4). Generalized linear mixed modelling results indicated that accuracy was significantly lower for collective nouns and plural nouns. Cross-classified linear mixed modelling results indicated that response latency was significantly slower for collective nouns, plural nouns, and animate nouns. In addition, the 3-way interaction between these variables was significant. These results demonstrate that collective nouns do differ from non-collective nouns and that more research is needed on how collective nouns are processed in isolation.

[66] A test of the symbol interdependency hypothesis with both concrete and abstract stimuli. *Malhi, S.K., & Buchanan, L.*

In Experiment 1, the symbol interdependency hypothesis (Louwerse, 2007) was tested with both concrete and abstract stimuli. Symbolic (i.e., semantic neighbours) and embodied (i.e., iconicity) factors were manipulated in two tasks - one that tapped symbolic relations (i.e., semantic relatedness judgment) and another that tapped embodied relations (i.e., iconicity judgment). Results supported the symbol interdependency hypothesis in that the symbolic factor was recruited for the semantic relatedness task and the embodied factor was recruited for the iconicity task. Across tasks, and especially in the iconicity task, abstract stimuli resulted in shorter RTs. This finding was in contrast to the concreteness effect where concrete words result in shorter RTs (Paivio, 1991). Experiment 2 followed up on this finding by replicating the iconicity task from Experiment 1 in an ERP paradigm. Behavioural results continued to show a reverse concreteness effect with shorter RTs for abstract stimuli. However, ERP results paralleled the N400 and anterior N700 concreteness effects found in the literature, with more negative amplitudes for concrete stimuli.

[67] Cross-language syntactic activation during natural reading: Evidence from adjective-noun constructions. *Vingron, N., Gullifer, J., Whitford, V., Friesen, D., Jared, D., & Titone, D.*

Cross-language lexical activation is well established, however, it is unclear whether bilinguals activate non-target language syntax during natural reading. We investigate this question using adjective-noun constructions. English exclusively places adjectives before nouns (the red truck), whereas French typically places adjectives after nouns (le camion rouge), though some adjectives have more flexible placement (grande). We monitored eye movements of 27 bilinguals (French=L1, English=L2) as they read sentences with adjective-noun constructions that were intact or violated in a manner that was consistent or inconsistent with French ("He saw the truck red parked on the street" vs. "He saw red the truck parked on the street"). First pass gaze durations on the constructions themselves (the red truck) were similar for French-consistent violations and intact sentences, though bilinguals who rarely mix languages read French-inconsistent violations more slowly. In contrast, total reading times for intact sentences were shorter than French-consistent sentences, although both were shorter than French-inconsistent sentences. Finally, these effects occurred for all adjectives, including those that have flexible placement in French. Taken together, these data suggest that bilinguals access non-target L1 syntax to some degree during L2 reading. We now investigate whether similar adjective-noun effects occur during bilingual L1 reading.

[68] Text validation: Analyzing the consistency effect. *Singer, M., & Spear, J.*

Comprehension requires the monitoring of message accuracy and coherence; processes called "validation." Validation can be diagnosed by the consistency effect: i.e., greater reading times for text segments that are incongruent versus congruent with antecedent text. This study evaluated the prevalence of validation in routine reading. Two experiments (n's > 70) each interwove two story sets that presented different categories of inconsistency (O'Brien, Plewes et al., JEP:LMC, 1990; Singer, JML, 2006).Experiment 1 replicated the inconsistency effect for both sets. In Experiment 2, subjects judged the consistency of each sentence against all preceding text. In both sets, accuracy was much greater for crucial target sentences that matched versus mismatched their antecedents; but "inconsistent" replies uniformly took at least 500 ms longer than "consistent" replies. Two prominent conclusions are offered: (a) The relatively low correct-detection rate for inconsistent targets (53%) diagnoses moderate but imperfect validation. (b) Detecting real or spurious mismatches is costly in reading time. The familiar consistency effect reflects a weighted average of reading times of detecting versus not detecting message inconsistencies. Overall greater mean reading time for mismatching targets results, sensibly, from their higher proportion of inconsistency detection. We are further evaluating our critical assumption that reading while making consistency judgments resembles ordinary reading.

Perception of Action and Motion
Sunday 11:00 – 12:00 ED 106.2

[69] Top-down and bottom-up feature integration influence the speed of decision-making in the dorsal stream. *Fallah, M., & Perry, C.J.*

Using the direction repulsion illusion, we investigated how bottom-up processing and top-down attentional task demands affect feature integration in the dorsal stream. When two superimposed surfaces are differentiated by color, we found that color and motion integration only occurred with active binding through top-down attentional mechanisms. This allowed for selection of the surfaces by color, significantly reducing motion processing time without reducing the perceptual illusion. Bottom-up processing of contrast and speed automatically integrated them into dorsal stream object representations, significantly reducing processing time. But only bottom-up differences in speed decreased direction repulsion magnitudes, resulting in more veridical perception. Since cross-stream feature integration did not affect the direction illusion, we hypothesize that these object-based selection mechanisms operate at the later evidence-accumulation stage reducing the other surface's impact on the "noisy walk"   to the direction decision threshold. Therefore, feature integration in the dorsal stream produces intermediate object representations at its later stages that can be used to improve processing time through object-based selection mechanisms. These results suggest that bottom-up processing automatically integrates dorsal stream features into dorsal stream object representations, but top-down attention is necessary to integrate a purely ventral stream feature, such as color, into the dorsal stream.

[70] Speed perception is enhanced for human actions. *Loucks, J.*

Observers of human action selectively encode various perceptual dimensions in action for the purposes of identification and goal inference. One dimension which has received little empirical attention is the speed of action. Although much is known about the perception of speed for non-biological motion, no research to date has investigated whether such perception differs for human action. Across two experiments, we compared observers' sensitivity to detecting changes in speed for human actions against two different non-biological controls. In Experiment 1, observers' sensitivity to 500 and 1000 ms speed changes was measured for videos of human object-directed actions, inverted versions of these videos, and a control stimulus of animated shapes yoked to the identical motion trajectories. Observers were significantly more sensitive to both speed changes for the human actions, regardless of orientation. In Experiment 2 the same action videos were compared to videos of inanimate objects (e.g., a metre stick) executing the same object-directed movements as the human. Observers were again more sensitive to both speed changes with human actions. These results are consistent with the hypothesis that observers recruit a specialized system for processing human actions (or biological movements) that is more sensitive to changes in the speed of motion.

[71] Dissociation between cortical thickness and mirror system responses across the age span: a magnetic resonance imaging investigation of structure and function. *Sachdeva, M., Parker, S.M., & Lawrence-Dewar, J.M.*

Observational learning is believed to involve Mirror Neuron Systems (MNS). Two regions classically associated with these responses are the Inferior Frontal Gyrus (IFG) and Inferior Parietal Lobule (IPL). Our lab has recently found increased fMRI signal change in these areas in right handed middle aged adults compared to younger and older adults. In an extension of this study, the relationship of cortical thickness to this fMRI response is examined. We hypothesize that cortical thickness in the left IFG and IPL will decrease with age and thus, demonstrate a different pattern of change across the age span from the functional activity. A cortical thickness analysis was performed on these regions of interest using the T1-weighted MRIs of the participants from our fMRI study (Parker, under review). Mean thickness of the left IFG and IPL were compared between the three age groups using a one-way ANOVA. As anticipated, cortical thickness decreased with increasing age group. This trend was not found in our previous examination of functional activity. This offers support to our hypothesis that an inverse-U response of functional response may be due to a trade of the demand and supply of neural response with increasing age.

[72] Lateral biases on aesthetics in fashion: The influence of directional motion and native reading direction. *Flath, M.*

Directionality bias has been proposed to influence individuals' aesthetic preference for dynamic stimuli. There are two theories attempting to account for this bias. One theory states that this bias occurs due to the right hemisphere's specialization in visuospatial processing, while the other theory speculates that the bias is based on scanning habits due to one's native reading/writing direction. The current study assessed the aesthetic preference bias present when native left-to-right (LTR) and right-to-left (RTL) readers evaluated fashion garments on the runway in LTR or RTL motion. The aim of the study was to determine whether this aesthetic preference bias occurred due to biological or cultural factors. Native LTR and RTL readers viewed two blocks of 20 mirror-reversed video pairs with models wearing dresses on a runway. Participants indicated which dress within the mirror-reversed pair they preferred. LTR readers displayed a significant leftward aesthetic preference bias indicating a preference for dresses moving LTR. RTL readers did not display a significant aesthetic preference bias for dresses moving in either direction. These results further support the notion that aesthetic preference bias may occur due to a combination of hemispheric dominance and one's native reading/writing direction.

Affect and Cognition
Sunday 11:00 – 12:00 ED 191

[73] Effects of distraction, reappraisal, and rumination on anger following re-exposure. *Chadwick, L., & Ortner, C.*

The ability to manage one's own emotional experience consists of the use of cognitive strategies, including distraction (diverting attention away from an emotional event), reappraisal (changing the way one thinks about an emotional event), and rumination (focusing attention on aspects of the emotional event). The current study explored the immediate and delayed effects of these regulation strategies. Participants recalled a personal event involving unresolved anger before regulating their emotions with either distraction, reappraisal, or rumination and were then re-exposed to the initial negative stimulus. Participants completed self-report measures, an implicit measure of emotion, and had their skin conductance and heart rate levels recorded. It was expected that the three strategies would result in differential changes in anger immediately after emotion regulation and upon re-exposure to the anger-inducing event. Analyses revealed significant changes in self-reported anger over three time points (post memory recall, post emotion regulation, and post re-exposure) under conditions of distraction. There was a decrease in anger post emotion regulation but an increase to initial levels of anger with re-exposure, suggesting that the benefits of distraction are short-lived. These findings will advance our understanding of the immediate and delayed effects of different regulatory strategies on angry emotions.

[74] Are there age differences in attention to emotional images following a sad mood induction? Evidence from a free viewing eye tracking paradigm. *Speirs, C., Belchev, Z., Fernandez, A., Korol, S., & Sears, C.*

Two experiments examined age differences in the effect of a sad mood induction (MI) on attention to emotional images. Younger and older adults viewed sets of four images while their eye gaze was continuously tracked and recorded throughout an 8-second presentation. Images were viewed before and after a sad MI to assess the effect of the sad mood on attention to positive and negative images. Consistent with previous research (e.g., Isaacowitz et al., 2008), in both experiments older adults exhibited positively biased attention following the sad MI, significantly increasing their attention to positive images. Contrary to the findings of some investigators, younger adults also exhibited positively biased attention following the sad MI, and there was no evidence of an age difference in attention to positive images in either experiment. A test of participants' recognition memory for the images indicated that older adults had poorer memory for the images relative to younger adults, and that the sad MI reduced memory accuracy for sad images for both younger and older adults. The results suggest that younger and older adults' heightened attention to positive images following the sad MI reflects an affect regulation strategy related to mood repair. The implications for socioemotional selectivity theory (Lockenhoff & Carstensen, 2004) and for theories of the positivity effect (Reed & Carstensen, 2012) are discussed.

[75] Does familiarity breed attraction or revulsion? *Pestonji, N., Molina, G., Ibrahim, M., Graf, P., & Huang, F.*

The mere exposure effect is the finding that being repeatedly exposed to a stimulus is sufficient to make us like, or feel attracted to, that stimulus. In a 1989 meta-analysis, Bornstein showed that the effect is larger with relatively brief than with longer stimulus pre-exposures; he also showed that the effect had been investigated mostly with affectively neutral stimuli, but not with pre-experimentally negative or repulsive stimuli. For the present study, participants rated the attractiveness or repulsiveness of pictures that were either affectively neutral or negative/repulsive. Prior to rating the pictures, they were displayed (pre-exposed) either subliminally or supraliminally. The results showed that supraliminal pre-exposures had no influence on participants' ratings. By contrast, the subliminal pre-exposures made the neutral pictures more attractive and the repulsive pictures more repulsive. These results highlight the limits of the mere exposure effect, and provide preliminary support for a new theoretical account of the relationship between familiarity and affective evaluation.

Posters I: Saturday, 2:30 – 4:00 PM
Centre for Kinesiology, Health, and Sport Atrium

[76] Conditioned stress-eating and stress non-eating in rats and their choice in isocaloric formulas of palatable food. *Colangelo, G., & Emond, M.*

Stress has been shown to affect bodily mechanisms including eating and digestion, resulting in a bidirectional effect on food intake. While animals characteristically decrease their food intake when stressed, increases have been observed, especially when palatable foods are present. Palatable foods interact with the stress response by depressing the activity of the HPA axis, reducing stress. The relationship between stress and eating is complex; what is left to uncover are the factors that dictate the division between stress-eaters and non-eaters. The current study specifically examined different learning histories in relation to stress and food intake. In other words, stress-induced eating and non-eating could be due to different learned associations between a stressor and food. The current study used 17 male Sprague-Dawley rats to create a model of stress-eating and non-eating using operant conditioning. This model examined subjects' preference between 2 isocaloric formulas of palatable food. These formulas (10% & 60% sucralose) were available to them individually or together, while a stressor (high-frequency noise) was present or absent. While ongoing, the results could provide further support for why these populations of stress-eaters exist, and where the divergence occurs, thus deepening current understandings of stress-induced eating/non-eating and food choice.

[77] Understanding the confusion between anger and disgust expressions in individuals with elevated contamination fears. *Ferguson, R., & Perron, M.*

Research on emotional facial expression recognition has focused on the confusion between expressions of fear and surprise, and anger and disgust. Individuals with elevated contamination fears (CF); a common symptom of Obsessive-Compulsive Disorder, are suggested to demonstrate a disgust-specific attentional bias. To the author's knowledge, no study has examined the confusion between anger and disgust in individuals with elevated CF. The current study's goal was to inspect the disgust-specific attentional bias in individuals with elevated CF, while investigating the confusion between expressions of anger and disgust in high and low CF. 36 undergraduate students completed the OCI and were categorized into high and low CF groups using the washing subtest. Participants viewed 4 encoders displaying 5 prototypes of anger and 6 of disgust. Results revealed no accuracy differences for anger prototypes as a function of group. Meanwhile, the high CF group displayed greater accuracy for 2 prototypes of disgust than the low CF group. Comparing the current study's results to previous literature, divergence appears, as the high CF group had greater accuracy than the general population for these prototypes. Results support previous literature in that those with elevated CF demonstrate superior achievement for recognizing disgust-related stimuli, potentially preserving OCD symptoms.

[78] Emotional and intoxicated. *Jobson, D., & Giffin, C.*

Research has suggested a link between emotional well-being and alcohol consumption patterns. The purpose of this study was to determine if levels of emotional well-being increased or decreased alcohol consumption (based on frequency or volume) in undergraduate students. Sixty-five undergraduate students between the ages of 18-24 (43 women and 22 men) took part in this study. Two questionnaires were used. The Khavari Alcohol test (KAT) was used to measure alcohol consumption based on volume and frequency and the Oxford Happiness Questionnaire was used to measure well-being. Results revealed no differences between men and women based on volume of alcohol consumed but men reported drinking more frequently than women. However, no significant differences were observed in alcohol consumption based on frequency or volume regardless of level of emotional well-being. While level of emotional well-being was expected to impact alcohol consumption. Results indicated that level of emotional well being does not increase, nor decrease alcohol consumption. These results can be interpreted in line with current research for discovering motives behind drinking in university-aged individuals. Future research should explore gender differences and whether emotional well-being is a predictor of alcohol abuse and whether emotional well-being is a predictor of future alcohol abuse.

[79] Psychometric analysis of mathematics assessment tools used with French-speaker children. *Lafay, A., & Cattini, J.*

According to DMS-5, the evaluation of a child with mathematical difficulties has an important step of quantitative assessment to highlight that the schooled skills are below the level for chronological age. Until now, no study was interested to investigate the psychometric characteristics of French clinical tests to assess the mathematical abilities of French-speaker children. However, professionals of mathematical assessment must choose a tool for this. The present study has two goals: 1) to update the recension of French clinical tools for the assessment of mathematical abilities realized by Lafay, St-Pierre, & Macoir (2014); 2) to analyze these tools with regards to their psychometric qualities. The results showed that, although many test tools are available, few of them answers however the psychometric standards. By the way, our study thus represents help for clinicians to adopt a reflexive practice during the choice of the diagnostic tests in an approach of Evidence-Based Practice.

[80] Lost in Translation: The discrepancies between animal & human studies of anhedonia. *Lamontagne, S.J., Olmstead, M.C., & Harkness, K.*

Anhedonia, a deficit in reward processing, exists in approximately 37% of individuals with Major Depressive Disorder (Pelizza & Ferrari, 2009) and remains one of the most difficult symptoms to treat. Despite decades of research, the underlying neurobiological mechanisms of anhedonia remain poorly understood. In this review, we attribute the lack of progress on anhedonia research to a failure in translational research in the field. Specifically, we outline drawbacks in the current literature that impede the ability to properly translate anhedonia research from preclinical animal models to human clinical models. We highlight the problems associated with the DSM-5 classification of the disorder, the validity of animal and human measures to assess anhedonia, as well as a differential emphasis placed on specific neurotransmitters (e.g., dopamine) and hormones (e.g., glucocorticoid) in rodent and human literature. Moreover, we propose alternative solutions and novel tests to change the way that anhedonia is conceptualized, as well as how it is assessed. In doing so, we aim to bridge the gap between preclinical and clinical research to allow greater progress in understanding this debilitating condition.

[81] Do Duchenne smiles lead to greater prosocial outcomes? *Gagnon, M.*

The smile is a universal facial expression that communicates the smiler's emotional state and traits such as trustworthiness. However, not all smiles are created equal. Indeed, researchers distinguish between Duchenne and Non-Duchenne smiles. More precisely, Duchenne smiles - which involve a coactivation of muscles that raise the lip corners and the cheeks - are interpreted as more genuine than Non-Duchenne ones (which involve only the curling of the lips). However, researchers have yet to demonstrate the impact of both smiles on a social partner's behavior. In this study, we focused exclusively on helping behavior and hypothesized that participants would agree to help a Duchenne smiler more often than a Non-Duchenne one. Seventy undergraduate students read a series of scenarios in which an individual asked them for a favor. After each story, participants saw a random series of 12 faces (Duchenne smiles, non-Duchenne smiles and neutral faces) which they rated based on their willingness to help the protagonist (using an 8 point Likert scale). A repeated measures ANOVA showed that Duchenne smiles were associated with greater willingness-to-help ratings, compared to the other faces. Such results suggest that the increased genuineness typically associated to Duchenne smiles, impacts prosocial behaviors such as helping.

[82] Inferring cognitive appraisals from facial expressions. *Gagnon, M.*

The face plays a central role in the interpersonal communication of emotions. Indeed, research has shown that individuals can recognize facial expressions in terms of broad emotional categories like happiness, sadness, anger, fear, surprise, and disgust. However, recent appraisal theories suggest that one may infer more detailed information from the face. For example, Scherer's component process model (2009) claims that facial expressions communicate patterns of cognitive appraisals about the physical and social environment. We tested this possibility with 70 undergraduate students, who rated a series of 12 facial expressions (each of the six categories mentioned above, repeated for each gender) in terms of 5 specific appraisal dimensions: novelty, intrinsic pleasantness, goal conduciveness, control potential and normative significance (Scherer, 2001). Repeated measures anovas showed differences in ratings for each expression, for any given appraisal category. This suggests that participants' answers were not randomly produced. Additionally, the data reveals that some expressions communicate more than one appraisal. For instance, happiness was associated to greater ratings on intrinsic pleasantness, control potential and goal conduciveness. Overall, this study provides the impetus to explore humans' ability to infer emotional cognitions from non-verbal behavior.

[83] Female online dating preferences differ from male expectations. *Rich, C., & Woloszyn, M.*

This study examined online dating preferences in heterosexual females, and the extent to which those preferences were predicted by heterosexual males. Female participants indicated their interest in dating each of a set of randomly generated Caucasian male dating profiles that orthogonally varied along three dimensions previously found to be influential: Looks (low/high), Warmth (low/high), and Income (four levels ranging from <$25k to $250k). Males were asked to rate the same profiles in terms of how they believed a heterosexual female might respond. Female short-term dating interest (flings, one-night-stands) was influenced primarily by physical attractiveness (Looks), whereas for long-term relationship interest, Looks and Warmth were equally influential. Males were accurate at predicting female responses for short-term interest, however they differed along several dimensions for long-term interest. First, males tended to overestimate the impact of Income on female ratings, believing that women would be more attracted to the higher-income profiles than they actually were. Second, males underestimated the impact that Looks would have on female ratings, believing females would show greater interest in the less physically attractive male faces than they ultimately did. This occurred despite males being able to accurately classify the photos as 'attractive' or 'unattractive'.
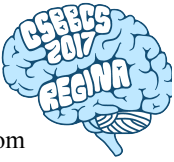
[84] Detection of emotions from facial microexpressions. *Chamberland, J., & Gosselin, P.*

With the knowledge that people can voluntarily manipulate their own facial expressions, it is interesting that very little work has explored how well individuals can recognize brief displays of emotion (i.e. microexpressions). The study of microexpression recognition is important because they are believed to be brief leaks of an individual's true emotions. As a result, the current study sought to test how well participants performed during a modified Japanese and Caucasian Brief Affect Recognition Test (JACBART). Results indicate that participants can recognize facial expressions of disgust, fear, happiness, sadness, and surprise at very brief display times (25 ms), while more time (67 ms) was needed for expressions of anger.

[85] Sex differences in the effects of stress on emotion recognition. *Ennis, A.C., Sykes Tottenham, L., & Cameron, A.J.*

Research suggests that females are generally better at emotion recognition than males, but emotion type may moderate this difference. Stress responses may also be moderated by sex, and may affect emotion recognition. Minimal research has examined the effect of stress on sex differences in emotion recognition. The present study examined the moderating effects of sex, stress (high/low), cortisol reactivity (responders/non-responders), and emotion type (threat/non-threat) on auditory and visual emotion recognition accuracy and reaction time (RT). A psychosocial stress task was used to effectively induce stress, as demonstrated by significant stress group differences in subjective stress, cortisol, and heart rate increase. For facial emotion, a significant interaction showed that females who demonstrated a cortisol stress response were slower than non-responders, whereas male responders were faster than non-responders. An interaction trend emerged for facial emotion when controlling for RT, in which females were faster than males in the low stress condition, but slower than males in the high stress condition. For auditory emotion, cortisol responders demonstrated increased accuracy and decreased RT for threat emotions, but sex did not moderate these effects. Collectively the results suggest that stress and cortisol reactivity may improve emotion recognition, but only in males on facial tasks.

[86] Examining the ability to perceive action tendencies from facial expressions. *Faltacas, A., & Gosselin, P.*

According to Frijda (1986, 2010), facial expressions communicate information regarding imminent behaviours called action tendencies. While several studies have provided support for the idea that people are likely to behave in certain ways when experiencing a given emotion, little attention has been paid to the second part of the communication process: the ability to perceive action tendencies from facial expressions. This was the objective set forth in this study, which we accomplished by asking participants to perform a choice-from-an-array task. Forty undergraduate students were shown 36 facial expressions selected from the Pictures of Facial Affect (Ekman & Friesen, 1976), with the corresponding emotion labels outlined. After viewing each facial expression, they were required to choose, among an array of six action tendencies, the one that best corresponded to the action the stimulus person was likely to perform. The results of the present study yielded some support for Frijda's theory since the predicted action tendencies were chosen more frequently than the unpredicted ones for each of the six expression types: happiness, fear, anger, surprise, sadness, disgust. Results also revealed that judgment accuracy was higher for expressions of happiness than for the other types of expressions.

[87] Understanding educational caregivers' accuracy in detecting facial expressions of pain in children: An eye-tracking study. *Foglia, V., Foster, K., Pelot, A., Malette, J., Roy-Charland, A., & Perron, M.*

Pain expressions communicate to others that we are in need of care. These expressions are adaptive as they should result in pain being managed. Previous studies have found that doctors, nurses and parents have difficulty in distinguishing various pain expressions in children. The goal of the current study was to examine a different caregiver group's, educational professionals, abilities and learn possible strategies to improve at this task. The current study examined 17 education professionals and their ability to recognize genuine, suppressed, and faked pain expressions in children while their eye-movements were tracked. The participants viewed 63 videos, were asked to identify the condition, rate their confidence and the pain level experienced by the child. Results indicated that participants were more accurate for suppressed than fake expressions, and more for fake than genuine expressions. Results from eye movement patterns offer information on how to improve accuracy upon recognition. For genuine and suppressed expressions, participants must attend to the eye zone longer than the mouth zone. For fake expressions, the mouth zone needs more attention to increase accuracy. Also, when participants spent more time in the eye zone than the mouth zone, their levels of accuracy decreased.

[88] Emotion recognition: Dynamic versus static images. *Macdonald, J.C., & Sykes Tottenham, L.*

In real life, recognition of emotional facial expressions typically requires assessment of dynamic visual information. Laboratory tasks, however, often employ static images of emotional expressions, on which females typically demonstrate more accurate recognition than males. When comparing static and dynamic images, dynamic images have been found to significantly increase facial emotion mimicry in women but not men, but to our knowledge no study has yet examined the effect of dynamics on sex differences in facial emotion recognition. The present study is using computerized static and dynamic images of emotional expression to determine if male and female accuracy is differentially affected by stimulus type. Data collection is nearing completion and results will be available by the time of the conference. The findings of this study will help to inform future research in this area, while also shedding light on the ecological validity of past studies employing static images.

[89] Subjective judgements of randomness: is 0.05 significant or arbitrary? *Smith, B.C., & Vokey, J.R.*

Amidst the controversy surrounding the use of the 0.05 threshold as a standard for statistical significance, one common complaint is that it is arbitrary. Is it, or is 0.05 a reasonable approximation for the threshold at which participants and investigators would naturally attribute results to a cause, rather than to random chance? Participants were shown series of simulated coin flips and spinner spins with varying degrees of probability and then were asked to judge whether the coin or spinner series was fair. The results suggest that their subjective threshold is reasonably close to the 0.05 threshold. Additional research investigated whether there was a bias to attribute non-randomness to clustering. Results showed a significant clustering bias, but one that was less influential in decision-making than previously reported. Finally, a redundancy analysis based on information theory showed a significant effect only in conditions where the coin proportions were approximately even.

[90] Adaptive memory: Investigating the survival processing of faces. *Todorovic, D., & Stolz, J.*

It has been consistently found that words exhibit a mnemonic benefit when processed according to their relevance to a survival scenario (Nairne, Thompson, & Pandeirada, 2007). However, when Savine, Scullin, and Roediger (2011) tested this survival processing effect for faces, they were unable to obtain the effect. If memory evolved to aid survival, then memory for threatening individuals should be enhanced. We examined in two experiments whether the survival processing effect would be obtained for faces if they were processed according to a threat-focused scenario, modified from that of Savine et al. (2011), rather than a standard survival scenario. This hypothesis was tested in a between-subjects design with two different threat scenarios (ancestral vs. modern) along with a control scenario (moving). Experiment 1 included male and female faces as stimuli, whereas Experiment 2 only included male faces as stimuli. In both experiments a survival processing effect for faces was obtained.

[91] Investigating the relationships between mild head injury, executive function, and dispositional mindfulness in university students. *Alcock, B.*

Mild head injury (MHI) represents the majority (70 to 90%) of all treated brain injuries and is associated with a wide range of long-lasting cognitive impairments, such as deficits in executive function (Cassidy et al., 2004; Konrad et al., 2011). Given that those with higher levels of dispositional mindfulness report fewer problems with executive dysfunction (Short et al., 2016), mindfulness may be associated with better cognitive outcomes following MHI. The current study sought to explore the relationships between MHI, dispositional mindfulness, and self-reported executive dysfunction in 279 Brock University undergraduates. Results indicated that injury severity was a significant predictor of executive dysfunction, such that more severe injuries were associated with increased working memory problems. Moreover, dispositional mindfulness was found to be a significant predictor of executive dysfunction, such that higher mindfulness was associated with less executive dysfunction. It was also found that for both the MHI and no-MHI group, those with higher levels of mindfulness experienced less executive dysfunction across all executive function domains. These findings suggest that mindfulness may serve as a protective factor following MHI and highlight the potential use of mindfulness strategies in a treatment or rehabilitation setting.
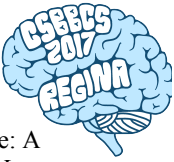
[92] Audiovisual integration abilities in 4 and 5-year-old children. *Beatch, J., & Curtin, S.*

Information in the environment is made more salient when it involves multiple sensory modalities (e.g., audio and visual). When auditory and visual information match, individuals are faster and more accurate at identifying a target. The ability to integrate audiovisual (AV) information is observed early in development and is fundamental for skills, such as cognition and language. We examined 4 and 5-year-olds' AV integration abilities to determine if children respond faster and more accurately when provided with matching AV stimuli compared to mismatched AV, and audio or visual only stimuli. Children pressed a button in response to target animal pictures and sounds. Five-year-olds responded faster to matching AV compared to other stimuli, but only more accurately compared to target AV sounds. Whereas, 4-year-olds responded faster to matching AV only compared to audio targets but more accurately compared to all stimuli. Results demonstrate the benefits of matching AV information differs based on age, and acts as a stepping stone for understanding how these differences may affect development. Understanding AV integration abilities in early childhood is important as these abilities can have cascading effects on development (e.g., cognition and language) and are increasingly important for children to navigate more complex environments (e.g., school).

[93] What interference reveals about object representations in haptic and visual identification. *Desmarais, G., Li, Q., & Anderson, W.*

We investigated the kind of object representation created by haptic and visual input by asking healthy undergraduate participants to learn to recognize objects haptically or visually and presenting distracters during learning trials. Participants were presented with one of four kinds of distracters: no distracter, haptic distracters, verbal distracters, or visual distracters. Once participants could correctly identify all objects, they completed an experimental bimodal object identification task where participants identified either the haptically-presented object or the visually-presented object. Half of the experimental trials were incongruent: the haptically-presented object and the visually-presented object were different. Our analysis of the experimental task revealed two main observations. Firstly, interference during incongruent trials was observed mainly for participants who initially learned to recognize objects visually when they were asked to haptically identify objects. Secondly, and importantly, interference was strongest for participants who were presented with verbal distracters during learning trials, independently of learning and testing conditions. Our results suggests that learning about objects from a haptic input results in a representation that is more easily shared between modalities, and that the representation of objects from haptic and visual inputs is strongly based on verbal codes.

[94] Cross-education for improving hemiparesis post-stroke: A behavioural and neuroimaging study. *Gould, L., Farthing, J., Forrester, S., Renshaw, D., Andrushko, J., & Kelly, M.*

Based on the current state of knowledge and gaps in the literature we are conducting an intervention study to explore a novel treatment for patients with hemiparesis post-stroke. An intriguing approach to stroke rehabilitation is 'cross-education,' which involves physically training the healthy limb to benefit the injured limb. This study applies cross-education combined with usual care, as part of an easy take home strengthening program to improve hand function post-stroke. A total of 24 stroke patients over the age of 18 are being recruited to participate in the study and half are performing cross-education. Muscle strength, range of motion, and brain activation patterns are tested at baseline, 12 weeks, and 26 weeks. Changes in brain activation patterns during the strength task are measured using functional MRI (fMRI). A second fMRI experiment is being conducted with healthy participants to examine the test-retest reliability of the paradigm. The results suggest that there is high reliability in the brain activation patterns and strength measures across T1 and T2. Together, cross-education has the potential to 'boost' function of an impaired limb and lead to more complete recovery post-stroke. This study will help define more consistent and effective stroke rehabilitation and lead to better patient outcomes.

[95] Comparing the effects of vertical elevation and horizontal position on line bisection biases in peripersonal and extrapersonal space. *Hatin, B., Sykes Tottenham, L., & Oriet, C.*

The line bisection task is a simple measure of visuospatial bias, with the majority of adults bisecting lines to the left of true centre. This leftward bias is referred to as pseudoneglect, and is thought to arise from right hemisphere dominance for spatial processing. In the present study, we examined how line bisection performance was affected by physical elevation (the task was completed at eye level, above the head, and near the knees) and horizontal position (the lines were presented centrally, offset to the left, and offset to the right). We also compared performance on the pen-and-paper task to performance on a laser line bisection task, to see whether these spatial manipulations affect performance in similar ways in peripersonal and extrapersonal space. Results showed a leftward bias for the peripersonal pen-and-paper task, and a rightward bias for the extrapersonal laser line bisection task. Physical elevation and horizontal position influenced the direction and extent of the biases on these two line bisection tasks, and performance on these tasks was correlated when lines were up and to the left, and down and to the right. These findings are discussed in the context of other known influences on visuospatial attention.

[96] When time and space collide: Spatial effects in time estimation with auditory stimuli. *McFeaters, C.D., & Voyer, D.*

Four experiments investigated the potential influence of spatial effects on observed auditory asymmetries in the estimation of short time intervals. Participants performed temporal bisection tasks wherein the word "bower," spoken in an angry or flat/neutral emotional tone, was presented monaurally for durations ranging from 260 to 480 ms (in 20-ms increments). In Experiments 1 and 2, the spatial (left/right) placement and response options (words or lines) of the Short/Long response alternatives were manipulated. For both experiments, results showed a larger bisection point for the left ear than for the right when the Short alternative was on the left; the ear asymmetry was reversed when Short was on the right. Experiments 3 and 4 examined potential asymmetries while reducing spatial effects by means of vertical (Experiment 3) or central (Experiment 4) presentation of the response alternatives. Response alternative placement had no effect in Experiment 3, and no auditory asymmetry emerged. In Experiment 4, the bisection point was longer for the left ear when Short was the central response alternative. In all experiments, the bisection point was longer for the angry emotional tone. Overall, results demonstrate that spatial placement of response variables impacts perceptual asymmetries in auditory duration estimation tasks.

[97] Cross-dimensional auditory cueing and the SNARC effect: Can cues about sound pitch and localization influence numerical decisions? *Alards-Tomalin, D., Mondor, T.A., & Leboe-McGowan, J.P.*

Previous studies have shown that acoustic stimuli are associated with spatial reference frames in a manner similar to numbers, where small/large numbers are processed faster using left/right-side responses respectively (Lidji, Kolinsky, Lochy, & Morais, 2007; Rusconi, Kwan, Giordano, Umiltà, & Butterworth, 2006). For example, when judging sound pitch/timbre, reaction times are facilitated when low-pitch auditory stimuli are categorized using a left-side, or lower positioned, response key; and high-pitch auditory stimuli using a right-side, or higher positioned response key. Furthermore, In a recent study, Campbell and Scheepers (2015) found that participants incorporated auditory pitch into numerical decisions, such that people more effectively recognized an increase in magnitude across two read-aloud numbers when the pitch of the voice also increased. Currently, we tested the impact of a discrete auditory cue on numerical judgments (parity/magnitude). Participants heard a pure tone (high/low pitch) in the left or right ear. The cue immediately preceded the presentation of a voice which read a number ranging from 1-9, which the participants rapidly categorized. We anticipated facilitated response times to small/large numbers following low pitch/left-side and high pitch/right-side cues, respectively. Instead, we found that responses were facilitated when the cue featured congruent overlapping pitch/location characteristics versus incongruent.

[98] Influence of auditory pitch on visual motor perception. *Prachi & Prime, S. L.*

Prior research has shown that high pitch sounds are associated with upper space and low pitch with lower space. Ambiguous motion stimuli are perceived as moving upward when paired with ascending pitch and downward with descending pitch. This study investigated how changes in pitch tones affect visual motion perception while varying visual motion saliency and the pitch-spatial location relationship relative to the direction of a visual motion stimulus. Subjects were presented with high or low pitch tones with a random dot kinematogram (RDK) stimulus displaying upward or downward motion. The saliency of visual motion was manipulated by varying the level of coherent motion between 0% and 10% coherence. In Experiment 1, tones were presented from both speakers placed horizontally. In Experiment 2, tones were presented from either a speaker above or below the RDK stimulus. Participants were more likely to judge the direction of visual motion as upward with high pitch tones and downward with low pitch tones. Additionally, low pitch tones from the bottom speaker yielded greater judgment bias than low pitch tones from the top speaker. These data suggest that the extent sound pitch affects visual motion perception depends on the saliency of the visual motion signal.

[99] The role of attentional resources in facial expression processing among individuals with anxiety: An event-related potential study. *Gallant, J., Dickinson, J., Roy-Charland, A., Chamberland, J., Perron, M., & Poulin, J.*

Previous research highlights a relationship between anxiety and emotional facial expression processing, particularly for fear. But, the nature of this relationship remains unclear. The current study aimed to understand a possible underlying factor of this relationship""specifically, the role of attentional resources was explored using event-related potentials (ERPs). Participants with high and low trait anxiety (N=46) were asked to identify target happy, fearful or neutral faces in a Rapid Serial Visual Presentation while ERPs and accuracy were recorded. Results suggest that facial expression processing is largely affected by the degree of attentional resources available and by anxiety level. Further, results are in line with Mogg and colleagues' vigilance-avoidance hypothesis, where individuals with high anxiety showed an early perceptual bias to fearful faces followed by later cognitive avoidance, especially when attentional resources were limited. In general, results serve to clarify previous inconsistency in the literature in terms of the automaticity of processing emotional faces, and suggest that attentional resources are required to process these stimuli.

[100] Transient shifts of attention and recognition memory. *LaPointe, M., Rosner, T.M., Ortiz-Tudela, J., & Milliken, B.*

A prevalent explanation for the attentional boost effect - an enhancement in recognition memory for a primary stimulus when performing a secondary detection task - is an up-regulation of attention at the time of encoding. A similar attentional mechanism has been suggested for the perceptual degradation effect - better recognition memory for blurry than clear words - and the word frequency effect - better recognition memory for low than high frequency words. To test the hypothesis that these memory effects share a common attentional mechanism, we combined these attentional manipulations and measured recognition memory. In the first experiment, we combined perceptual degradation and attentional boost manipulations; in the second experiment, we combined word frequency and attentional boost manipulations; and in the third experiment, we combined word frequency and perceptual degradation manipulations. We reasoned that an interaction in recognition memory performance would be an indication of a redundant attention mechanism operating at the time of encoding. For all three experiments, we replicate the main effects, however, we fail to find a significant interaction; recognition memory was consistently better on trials in which the manipulations were combined than when they were not.

[101] Deep, effortless engagement: relating flow to absorption, personality, and everyday inattention. *Marty-Dugas, J., & Smilek, D.*

Psychological flow is an elusive experience characterized by the feeling of deep, effortless engagement with the task at hand. Traditionally, studies of flow have focused on external tasks, such as sports. But can we experience flow when attention is turned inward to internal states? In the present study we conceptualize flow as deep, effortless engagement with a task, and develop instruments for measuring this experience in both internal and external contexts. Using an individual differences approach, we examine how the tendency to experience deep effortless engagement relates to absorption, personality, and everyday inattention. Both internal and external flow show a moderate positive correlation with psychological absorption, as is expected for measures of flow, as well as openness and conscientiousness. In general, both internal and external flow had negative relations with inattention measures.

[102] On the time-course of cued temporal attention. *McCormick, C., Redden, R., Lawrence, M., & Klein, R.*

A fruitful tool for studying endogenous control of temporal attention is the Kingstone temporal orienting paradigm (1992). Kingstone's cues had two functions: providing information about the foreperiod and signalling to begin timing of that foreperiod. Interested in how exogenous alerting might interact with endogenous alerting we implemented two novel manipulations. First, we separated these two functions by providing informative temporal cues visually well before auditory warning signals indicating the beginning of the foreperiod. Second, borrowing from Lawrence & Klein (2013) we manipulated warning signal intensity: one signal entailed an increase in intensity (I^), which generates alerting exogenously; the other signal entailed a qualitative change with no change in intensity (NO), which would not be expected to generate alerting exogenously. When intensity was manipulated randomly from trial-to-trial within a block, endogenous shifts of attention in time were unexpectedly not observed. We hypothesized that participants invested substantial cognitive resources to detect the NO intensity signals and that interfered with their endogenous utilization of the pre-cues. To test this idea, in the second experiment we blocked the manipulation of signal intensity. Consistent with our hypothesis, the Kingstone pattern was replicated in the I^ condition but not in the NO condition.

[103] Look on the bright side: Associations between the element of value and vertical orientation. *Sedgewick, J.R.*

Visual perception is guided by assumptions from our environment, one of which is the assumption that light comes from above. This association affects both perception and attention to pictorial stimuli: 3D spheres are perceived as convex when lit from above but concave when lit from below, and are identified faster when lit from above within target-identification tasks. We questioned if this light-from-above bias would persist using non-pictorial stimuli, specifically, using value-related words within a semantic association task. In our study, individually presented light and dark words (e.g., shine, shade) were positioned at either the top or bottom of a computer screen, to which participants would state the lighting category of the word. When examining reaction times, participants were faster to categorize light-related words when presented from above center, whereas the reverse was demonstrated for dark-related words. Our findings suggest that in the absence of physical lighting cues, the element of value continues to be cognitively grounded in vertical space.
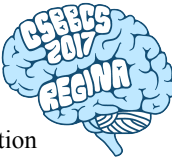
[104] Crossmodal effects of attentional blink across space. *Sinclair, A.J., Tilbury, J., & Prime, S.L.*

Several studies have shown crossmodal attentional blink (AB) with auditory and visual targets (Arnell & Jolicoeur, 1999), yet it remains unknown how crossmodal AB is affected by manipulating the audiovisual targets' spatial congruency. We compared unimodal and crossmodal AB effects under spatially congruent (targets at same location) and spatially incongruent (targets at different locations) conditions. In Exp 1, subjects were tested in two unimodal (visual T1-T2 and auditory T1-T2) and two crossmodal (visual T1-auditory T2 and auditory T1-visual T2) conditions with spatially congruent stimuli: visual stimuli were presented as a single stream at fixation and auditory stimuli were presented to both ears over headphones. In Exp 2, we used the same unimodal and crossmodal conditions, but spatial congruency was manipulated by presenting separate simultaneous streams: two visual streams (left and right of fixation) and two auditory streams (left and right ears). T1 and T2 were presented either in the same (congruent) or opposite stream (incongruent). Our results show all unimodal and crossmodal conditions yielded an AB regardless of spatial congruency, but they differed in the AB magnitude. Spatial manipulations only had an effect on unimodal visual trials. Our findings provide new insight into attentional interference across space and sensory domains.

[105] Does a behavioural inhibition task produce lasting effects on chronic dieters' response towards palatable foods? *Stevanovski, B., & Boucher, M.*

Behavioural inhibition tasks have been shown to have an impact on affective evaluation of the previously inhibited items (Frischen et al., 2012, JEP:HPP). Recent research has attempted to harness such effects to impact various behaviours. We used a stop-signal task in which participants responded ("go") or withheld a response ("no-go") in response to letter cues. Consistently pairing stop-signals (i.e., a no-go cue) with a palatable food can immediately reduce impulsive responses towards that food, especially for chronic dieters. The focus of the current study was to determine whether such an effect persists over at least a 24-hour period. At time one, participants completed a computerized task in which they viewed images of everyday objects (e.g., lamp) and potato chips accompanied by cues. The experimental group completed a go/no-go task, whereas the control group responded with a simple keypress. Approximately 24 hours later, we assessed the consumption of potato chips by participants in the experimental and control groups. Of interest is whether experimental participants will consume less (as a consequence of the behavioural inhibition task) as compared to the control group. Results are discussed in terms of the impact and potential of this intervention in the case of chronic dieters.

[106] The Psychology of blink comparison: Asteroid detection and change blindness. *Tovey, M., & Wiegert, P.*

Blink comparison is the repeated presentation of two or more slightly different images to a human observer in rapid succession. Each sequence is usually displayed in less than a second. When presented with such a sequence of images, a trained observer can become more sensitive to differences between the images. Images of the same portion of the sky taken at different times will contain many stars whose location will not change from image to image. Any moving bodies (like planets or asteroids) will appear in a series of locations due to their orbits around the Sun. Though blink comparison is a powerful tool it can be confounded by other simultaneous changes (O'Regan, Rensink & Clark, 1999). In an asteroid search, simultaneous changes might result, for instance, from image defects or changes in the sky background brightness due to changing weather. Change blindness (Simons & Rensink, 2005) is a phenomenon where (naively) visible changes in an image can be masked from human attention by the presence of other changes. We describe a study in preparation to examine the effect of naturally occurring but distracting changes in sky images and their effect on human asteroid detection.

[107] Can perceptual averaging really occur in the absence of change localization? *Giesinger, C., & Oriet, C.*

Previous research suggests people are able to retain information about the mean emotion of a set of faces even when they are unsure which items changed between the two sets (Haberman & Whitney, 2011). Subjects in that study, however, could use a strategy of localizing the most emotionally extreme face in the set to reliably determine the correct response in the averaging task. In the present study, we eliminated the utility of this strategy. On each trial, subjects viewed two consecutive displays of faces contained within circles. Four items increased (or decreased) in size or emotional intensity. In Experiment 1, subjects first determined whether average size or emotion increased or decreased from the first display to the second, then localized one of the four changed items. In Experiment 2, the order of responding was reversed. The results suggest that when performing both an averaging and localization task, subjects use their knowledge of which stimulus in the set changed to guide their response on the averaging task. Focusing attention to a local region of a display prevents the global distribution of attention necessary for perceptual averaging (Chong & Treisman, 2003). Thus, averaging is not possible when change detection fails.
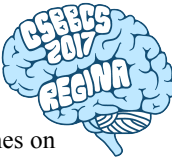
[108] Increasing attentional demands impairs the extraction of summary statistics. *Martin, M., & Johnston, A.*

Multiple stimulus feature dimensions (e.g., colour, orientation, and size) can guide visual attention. Some theories, such as Boolean Map Theory, claim that features of different dimensions can be attended to simultaneously without competition for attention. Here we tested this hypothesis using a summary statistics paradigm across multiple feature dimensions. Participants were presented with a set of rectangles that vary in colour, orientation, and size. On each trial, participants were prompted to report either the majority colour, orientation, or size of the stimuli. Depending on the block condition, participants would be instructed to attend to one, two, or all three of the visual features present in the set, yet were only asked to report one feature per trial. Prior to the main experiment and for each participant, colour intensity, size, and orientation discriminability were controlled using a multi-tiered adaptive psi thresholding procedure. We observed that when the number of encoded feature dimensions is increased, then psychophysical performance decreases and reaction time increases. This is contrary to some claims in the literature, including Boolean Map Theory, which predict no decrease in performance due to attending to multiple feature dimensions. We conclude that attention plays a role in the extraction of summary statistics.

[109] Driving asymmetries in the virtual city and countryside. *Smith, A., Vicencio-Moreira, R., Gutwin, C., & Elias, L.*

Asymmetries in spatial attention and perception are often biased towards the left in neurologically normal individuals, referred to as pseudoneglect (Bowers & Heilman, 1980). Nicholls et al. (2010) report spatial misperceptions consistent with pseudoneglect among humans navigating electric wheelchairs and scooters with more right side collisions observed. Investigations into basic spatial asymmetries, e.g. lane position, while driving motor vehicles and the influence of visual information in the environment on driving have yet to be carried out, and driving simulators provide a practical first step. 53 University of Saskatchewan students navigated a virtual vehicle from a first-person perspective through a city and a country road course. The course was identical in each condition containing 10 left turns, 10 right turns, and 11 straightaways, with only the scenery changing. When driving in the country there was no significant difference in the amount of time spent left or right of centre while significantly more time was spent driving right of centre in the city. The overall mean lane position was rightward across all left turns, right turns, and straightaways in both the city and the country. The underlying mechanism of lateral biases of attention and the implications it has on driving are discussed.

[110] Optimal Prime: The influence of subliminal cue primes on prospective memory task performance. *Crease Lark, M.L., Jamieson, R.K., & Graf, P.*

Event-based prospective memory (ProM) tasks typically occur in a dual-task context. To successfully execute a plan, we must therefore switch from the ongoing activity to the prospective memory task. Little is known about the processes involved in this switch, however previous research suggests that responding to a ProM cue disrupts processing of stimuli immediately following the execution of the ProM task. In the present research, we examine this effect when cue words are primed. Participants were required to make semantic decisions about words as the ongoing activity, and were asked to make a prospective response (press the "Q" key) to a specific category of words (words representing types of birds). Critically, participants were primed immediately before the presentation of the ProM cues with either a repetition prime of the cue word itself (e.g., EAGLE), a category prime (e.g., BIRD), or an unrelated prime (e.g., ACRE). The effects of the different types of primes on both ProM task performance and on the processing of concurrent stimuli are discussed.

[111] Prospective memory and intelligence: Meta-analysis. *Uttl, B., Cnudde, K., & Grant, L.*

Prospective memory (ProM) is our ability to remember to do something in the future, at the right time and place. Although it is well established that intelligence, both crystallized and fluid, explains a substantial proportion of variability in retrospective memory (RetM), much less is known about the relationship between intelligence and ProM. Main objectives of our study were to determine, using meta-analyses, (1) whether intelligence explain a similar proportion of variance in ProM as in RetM, (2) whether crystalized vs. fluid intelligence explains similar or different proportions of variability in ProM, and (3) whether relationship between intelligence and ProM depends on ProM subdomain. Our meta-analyses revealed small to moderate correlations between both crystalized and fluid intelligence and measures of ProM.

[112] Episodic prospective memory vs. vigilance/monitoring. *Uttl, B., McBreen, B.,Tseu, A., Campbell, C., & Markova, V.*

Episodic prospective memory (eProM) allows us to recollect previously formed plans at the right time and place. In contrast, vigilance/monitoring differs from eProM in that the plan remains in consciousness, and thus, does not need to be retrieved in response to the cue. A number of researchers have questioned the distinction between eProM and vigilance/monitoring and some have even suggested that there is no need for a delay or a filler task between ProM instructions and the start of the ongoing task or the first cue appearance to clear the plan from consciousness. Our study examines this claim in a large sample study with undergraduate students. Our results show that the delay between ProM instructions and the start of the ongoing task decreases ProM performance. Moreover, eProM and vigilance/monitoring correlate differently with a number of cognitive processes.

[114] Eye tracking in search of relationships between brand visibility, brand recognition and brand recall while viewing Netflix. *Gallant, J., Pakula, D., Malette, J., Kennedy, H., & Dickinson, J.*

Product placement is characterized by the intentional featuring of a branded item in programming and is often used to influence viewers' attitudes and behaviours, to increase brand salience, and to add verisimilitude to sets through the use of props. Existing literature has shown that product placements vary according to numerous factors such as the size and position of the product and duration on screen. This variability has yielded unreliable and inconsistent definitions of prominence. The current study's aim was to validate a coding system developed by Concave Brand Tracking, which operationally defined five levels of prominence based on on-screen visibility of product placements and interactions with characters in the Netflix series, House of Cards. The study utilized eye-tracking technology to investigate the amount of time spent looking at the product for each level of prominence, while assessing explicit memory in the form of recall and recognition. Findings indicate that memory did improve with level of prominence, with greater memory for brands presented more prominently. However, there were no significant differences in memory between the three mid-level prominence levels.

[113] A computational cognitively-inspired technology for clinical diagnosis: Interfacing cognitive and clinical psychology. *Cook, M., & Jamieson, R.K.*

Cognitive psychology has produced a number of theories for representation of knowledge from text (e.g., Latent Semantic Analysis). However, the field has yet to apply those theories in earnest to problems in particular - an endeavour that is known as cognitive technologies. We use established models for semantic memory and text mining to classify students' essays on their mental health. We use artificial neural networks (ANN) to learn those relationships. The aim is to develop an automated and cognitively inspired system to perform psychiatric diagnosis from free verbal reports. We present how such cognitive technologies should be constructed and how they can be evaluated. The work illustrates how the field can and should leverage the history of hard won contributions from our careful empirical and theoretical work to build applied cognitive technologies that solve real world problems.

Posters II: Sunday, 1:00 – 2:30 PM
Centre for Kinesiology, Health, and Sport Atrium

[115] Joint action outcomes influence the sense of joint agency. *Bolt, N.K., & Loehr, J.*

When people act alone, they typically experience a sense of self-agency or control over actions and their effects. When people act in coordination with others to produce a joint action, they also experience a sense of joint agency or shared control. Multiple cues influence people's experience of joint agency, including the degree of coordination between partners and each partner's role within the joint action. The current study investigated how the outcome of a joint action modulates joint agency. Pairs of participants produced eight-tone sequences that matched a metronome pace. Participants produced tones either in alternation (high coordination) or sequentially (one participant produced the first four tones and the other produced the last four; low coordination). Each participant was the leader, who produced the first tone(s), for half of the sequences. After each sequence, participants received feedback indicating whether or not they correctly matched the pace, and then rated their sense of agency on a scale ranging from shared to independent control. People reported stronger joint agency for correct compared to incorrect outcomes, regardless of coordination requirements, role, and the accuracy and variability of sequence timing. These findings indicate that joint action outcomes are used alongside other cues to inform the sense of joint agency.

[116] Pupil dilation reveals observers' prediction of action outcomes. *Buchko, D., & Loucks, J.*

Dropping an object into a narrow container is riskier than dropping into a wide container, due to the increased chance of missing. The current research investigated whether observers' pupil dilation might reflect assessment of this increased risk (prediction). In Experiment 1, participants' pupil diameter was recorded while they discriminated videos of actors dropping objects into narrow vs. wide containers, in both upright and inverted orientations. Pupils dilated more to high drops over a narrow vs. wide container, but pupils also dilated more to increasing vs. decreasing drop heights for both containers. Inversion showed the opposite findings with respect to pupil size. To further clarify these effects, in Experiment 2 participants viewed the same videos with the container obscured by a black overlay. In this case, there was a more subdued response to high drops, and no overall difference for increasing vs. decreasing height (and opposite findings in the inverted condition). However, pupils did dilate more to increases vs. decreases for participants who believed there was a container behind the overlay, and not if participants held no such belief. Pupils thus directly respond to the inferred predictive relevance of perceptual information during observation.

[117] Improved memory for objects is due to motor system involvement. *Seilman, S., & Loucks, J.*

Recent research indicates that memory for real 3D objects is enhanced relative to pictures of identical objects (Snow, Skiba, Coleman, & Berryhill, 2015). Although there are several possible explanations for this difference, one is that processing of real objects engages the motor system, as individuals unconsciously consider affordances for action on the objects. We hypothesized that if motor system involvement was the cause, then memory should be further enhanced when individuals actually engage in action on those objects, and that no such improvement should occur for action on pictures. One-hundred and twenty participants were randomly assigned to one of four conditions crossing stimuli (object vs. picture) with task (motor vs. non-motor). Participants engaged in a simple decision task with the stimuli which either involved picking up the stimuli to decide (motor) or making the decision on paper (non-motor). Recall and recognition were assessed following this task. As hypothesized, we found improved recall in the object/motor condition relative to the object/non-motor condition, and no such improvement between the picture conditions. These results suggest that motor system involvement is a likely cause of improved memory for real objects.

[118] Youth perceptions on anti-texting and driving campaign messages: An eye tracking approach. *Dénommée, J., Labonté, A., Foglia, V., & Roy-Charland, A.*

Texting and driving is suggested to account for 21% of crashes involving young drivers. Many studies have focused on gaining better understanding on youth attitudes, perception and prevalence of texting and driving to help guide prevention strategies. One of the most reoccurring prevention strategy suggested is public health advertisements. A recent eye-tracking study showed that text-based content on texting and driving advertisements are more effective at attracting attention. We thus conducted an eye-tracking study to determine what type of message would be more effective in attracting young adults', aged 16 to 24 years, attention. A total of 29 participants viewed 60 texting and driving advertisements. Advertisements consisted of two categories; statistical and emotional messages that were divided based on target individual (passenger and driver). The emotional messages were also divided based on valence (positive and negative). Results reveal that both if the target was the drivers or passengers, participants spent significantly more time on statistic messages than on emotional messages. However, more time was spent on passenger emotional messages than on driver emotional messages. Moreover, passenger positive messages were looked at longer than negative ones but driver negative messages were looked at longer than positive ones.

[119] Seeing, hearing and feeling the road: Multisensory integration in driving. *Pandi, M., Townsend, B.,von Mohrenschildt, M., & Shedden, J.M.*

Many of the studies that explore integration of audio, visual, or vestibular cues, are derived from stimulus detection and discrimination tasks that are simple and controlled (Ernst & Bülthoff, 2004). The role of multisensory integration is not clear in more dynamic and realistic tasks. This study attempted to fill this knowledge gap by measuring the contribution of different combinations of sensory cues to driving performance. Healthy undergraduate students were exposed to a series of combinations of vestibular, visual, and auditory cues in a driving simulator. In each condition, participants were asked to maintain a constant speed and drive in the middle of a straight road. Driving performance was evaluated based on mean speed, speed variability, lateral position, and lateral position variability. Results indicated that participants' overall performance benefited from integration of multiple sensory cues.

[120] Using resting-state functional MRI to validate the Embodied Emotion Scale (EES). *Smith, S.D., Sorokopud-Jones, M., Trapnell, P., & Kornelsen, J.*

Emotional experiences are not limited to cognitive representations of affective events. Rather, they typically include visceral responses that involve neural responses in the brain and spinal cord, autonomic nervous system activity, and the release of hormones by the endocrine system. Importantly, these embodied emotional responses differ between individuals. In the current research, we tested the validity of a self-created measure of this construct, the Embodied Emotion Scale (EES). We performed psychometric validation of this 32-item scale to assess the validity of individual items and subscales. We then examined how individual differences on this measure altered patterns of functional connectivity in the brain. Twenty-eight undergraduate students underwent resting-state functional magnetic resonance imaging prior to completing the EES. Covariate analyses using EES scores showed that individuals with a greater tendency to embody emotions had different patterns of functional connectivity in several resting-state networks. Notably, neurons in the pre- and postcentral gyri (motor and sensory regions) showed increased functional connectivity with the default mode network, suggesting that the "resting state" of individuals who scored high on the EES was more embodied than that of other individuals.

[121] The downside of building up: An exploration into the stress impact of exposure to skyscrapers. *Mazumder, R., & Ellard, C.*

How does the built environment impact our experience of urban stress? Considering the health implications, understanding the psychological impacts of urban design is becoming more pressing as more people choose to live in cities. Recent work in urban planning suggests that being amongst high-rise buildings can elicit feelings of stress and oppressiveness, however empirical methods were not used. The aim of this study was to quantify the stress impact of being in the presence of high-rise buildings. Using a between-subjects design, participants were placed in four virtual reality environments containing low-rise and high-rise buildings with and without the presence of trees. It was hypothesized that high-rise buildings would result in higher stress and oppressiveness ratings, when compared to low-rise buildings, and that the presence of trees would mitigate these impacts. While immersed, participants were monitored for skin conductance levels. They were also administered questionnaires that assessed the oppressiveness of the environments. Current results indicate that exposure to high-rise buildings yield higher skin conductance levels and oppressiveness ratings than low rise buildings and that trees do have a mitigating effect. This ongoing research stands to inform how we build our cities to promote well-being.

[122] Psychological ownership of public space. *Negami, H., & Ellard, C.*

Physical public spaces are vital for cities and the communities that occupy them as spaces of recreation, leisure, social activity, and political engagement. However, despite this importance and extensive research in the social sciences, a precise definition of public space remains contested. As a first step in exploring how people think about public space from a psychological perspective, we devised an experiment exploring how psychological ownership relates to perceptions of publicness. In an online study, participants viewed photographs of various spaces across the University of Waterloo campus and rated each photograph on three main variables: familiarity, psychological ownership, and perceptions of publicness. We found that, in general, people feel more ownership over spaces they are more familiar with, and that people perceive spaces to be more public when they feel more ownership over them. Additionally, individual difference variables are examined to explore how much individuals systematically differ in their ratings. By investigating what influences peoples' perceptions and uses of public space, this work helps us gain a better understanding of how public spaces achieve their important functions, as well as establish a more consistent understanding of how we identify public space by evaluating the topic more rigorously.
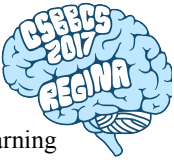
[123] Individual differences in students' interest in quantitative vs. non-quantitative courses. *Uttl, B., & Cnudde, K.*

Undergraduate students are not interested in taking quantitative vs. non-quantitative courses (Uttl, White, & Morin, 2013). The main objective of our study was to examine whether students' lack of interest in quantitative vs. non-quantitative courses can be explained by objectively measured math knowledge and skills, perceived math self-efficacy, and/or math anxiety, in addition to cognitive factors such as working memory, speed of processing, and intelligence. Over 300 undergraduate students were given a 2-hour long battery of tests and questionnaires that examined their interest in quantitative vs. non-quantitative courses, working memory, speed of processing, intelligence, objective math knowledge and skills, perceived self-efficacy, and math anxiety. The results showed that students' objective math knowledge and skills were low; that math self-efficacy and math anxiety predicted students' performance on objective math knowledge and skills tests; and that math anxiety, math self-efficacy and math knowledge and skills were relatively weakly correlated with students' interest in quantitative courses.

[124] Professors teaching quantitative vs. non-quantitative courses receive lower student evaluation of teaching ratings. *Uttl, B., Tseu, A., & McBreen, B.*

Student evaluation of teaching (SET) ratings are used to make high stake personnel decisions (hiring, promotion, firing, and merit pay decisions) based on widely held belief that they measure professors' teaching effectiveness. The key evidence cited for this belief are meta-analyses of so called multisection studies that reported moderate correlations between SET ratings and student achievement. However, we have recently shown that these moderate correlations were artifacts of poor meta-analytic methods including failures to consider small study bias, publication bias, and students' prior ability and achievement (Uttl, White, & Wong Gonzalez, 2016). Others have shown that SET ratings are related to variety of teaching effectiveness irrelevant factors (TEIFs). The main objective of our study was to determine whether professors teaching quantitative vs. non-quantitative courses receive lower SET ratings. Our analyses of a large sample of SET ratings posted on www.ratemyprofessor.com showed that professors teaching quantitative vs. non-quantitative courses receive substantially lower SET ratings.

[125] Seducing learners: Liking does not always lead to learning (online). *Wilson, K.*

The number of university and college courses offered online is growing rapidly. These online courses present lecture material to students in various different ways (e.g., audio, transcripts, slides, video lectures), however, it is unclear which lecture modalities best serve learners. There is evidence that videos of the lecturer may foster social connection, motivating engagement, yet there is little evidence of a benefit to learning outcomes. These seemingly contradictory results may arise from the lecturer's visual features capturing attention, giving the learner a subjective sense of engagement, but processing erroneous visual details may lead to a cost in processing relevant details. In other words, the lecturer may act as a seductive detail, drawing the learners' attention to irrelevant features, impacting comprehension and possibly mind wandering (MW). Through a series of experiments we find evidence that the lecturer in online video lectures has a seductive effect on the learner. The presence of the lecturer in an online video lecture negatively impacts comprehension, but not MW, while learners' prefer and believe their learning is facilitated by the lecturer's presence. This research highlights a tension between liking and learning and the challenge of designing effective online course material that students will show up for.

[126] Fluency and schema congruence impact on attribute ratings and reading times. *Dickinson, J., Laliberte, A., Gallant, J., Hendel, E., Malette, J., & Desrosiers, C.*

Schema congruence, or how much incoming information matches pre-existing schemata, and perceptual fluency, or the ease with which stimuli are processed, have been shown to negatively affect judgments of stimuli. The present study investigated the effect of schema congruence and fluency manipulations on judgments of heterosexual and homosexual male and female stimuli. Participants (N=49) were randomly assigned to 4 groups: fluent/congruent, disfluent/congruent, fluent/incongruent, or disfluent/incongruent. Congruence of stimuli was manipulated by mismatching stereotypes (e.g. A gay man who is a dancer [congruent]; A gay man who drives trucks [incongruent]), and fluency was manipulated by altering font type (i.e. 12 point Times New Roman [Fluent]; 10 point Mistral [Disfluent]). Participants rated stimuli on scales of 1 to 7 for familiarity, stereotypicality, conventionality, ease of imagination, likeability, and ease of reading. Eye movements and dwell times were recorded. Rating results showed significantly higher likeability ratings for straight women and gay men in congruent conditions. Dwell times indicate more time was spent reading phrases describing schema congruent lesbian women and schema incongruent straight women in the disfluent conditions. Overall, results may have implications for how prejudice is formed, and may indicate that feminine individuals are preferred when they match their sexuality stereotype.

[127] Letter reversal in reading acquisition: Excess or lack of perceptual constancy? *Dupont, C., Malo-Véronneau, L., Champagne, M., & Gauthier, B.*

Visual perceptual skills vary from one child to another, which may lead to idiosyncrasies in the way children process letters and words and acquire written language. In this study, we explored categorization abilities of visually similar letters in school-aged children, with the goal of better understanding the nature of letter orientation errors in young and disabled readers. Participants included 18 normal-reading children aged 7 to 13 years and one 8-year-old dyslexic child as a case study. Word reading and letter reversal identification skills were assessed, as well as mirror letter processing abilities using the classical categorical perception paradigm complemented with a new discrimination task for uncovering children's letter mental representations. The results indicate near perfect letter classification at the earliest stage for both normal and disabled readers. However, age was positively correlated with letter discrimination abilities in normal readers and the dyslexic child showed poorer discrimination. Performance on the new discrimination task revealed unstable letter representations in younger and dyslexic readers. These preliminary results challenge the conventional mirror invariance hypothesis and rather suggest that immature perceptual constancy underlie letter orientation errors. These findings need replication and may lead to better teaching and learning methods and more accurate intervention strategies.

[128] How does irrelevant information impact students' information processing of a scientific text? *Turgeon, K., Smith, E., Kastendieck, G., Ottosen, H., & Parrila, R.*

The purpose of this study was to examine how inclusion of seductive sentences (and/or images) to information-rich non-fiction text on the formation of lightning affects learning outcomes. Eye movements of 60 junior high school students were monitored while they read a scientific text (with or without seductive sentences and/or with informative or seductive images). The text (656 or 966 words) and the images were adapted from Lehman et al. (2007) and Harp and Mayer (1997). The students' cognitive and emotional interest was assessed separately for each screen (7 to 11 screens, depending on the condition). After the participants finished reading the text, they answered comprehension questions to measure their learning outcomes. Overall, results showed that including additional seductive information (sentences or images) did not impact learning outcomes. Students spent little time processing the images (average 20 sec). Results also indicated that the additional information significantly increased students' processing time. The added "seductive" sentences and images did not affect the students' cognitive or emotional situational interest. These findings suggest that including irrelevant additional information, no matter its format, may not have the desired effect of improving students' interest, and could be harmful by increasing their information processing time.

[129] Let's talk about it: Language and social cognition in children with epilepsy. *Bailey, K., Im-Bolter, N., & Parks, K.*

Children with epilepsy demonstrate problems with language and social cognition (the ability to understand others' emotions and perspectives during interpersonal conflict). Research shows that children's ability to understand and experience their social world requires communicative interactions with others, which is dependent on language skill. This may explain why children with epilepsy present with deficits in both language and social cognition. Nonetheless, it is unclear whether their poor social cognition is a result of poor language skill or factors related to epilepsy. We examined whether children with epilepsy differ in their social cognitive abilities compared to their age-matched and language-matched peers. We administered measures of semantic language, syntactic language, and social cognition in children with epilepsy (EP group), without epilepsy but age matched (AM group), and without epilepsy and language matched (LM group). The EP group showed worse language compared to the AM group, as well as deficits in different aspects of social cognition compared to both control groups. Thus, language deficits do not fully explain the deficits in social cognition found in children with epilepsy. Other factors (e.g., poor neurological functioning, seizure related variables) may play a role in the social cognitive difficulties associated with epilepsy.

[130] University students' sensitivity to suffixation. *Bourassa, D., & Willits, K.*

Sensitivity to morphological context plays an important role in spelling development. Past research with children has revealed a number of individual differences in sensitivity to morphological patterns in English. The present study examined university students' knowledge of derivational suffixation in a nonword spelling task. Analyses revealed considerable individual differences in both overall sensitivity and sensitivity to particular types of suffixes. Theoretical implications of these findings are discussed.
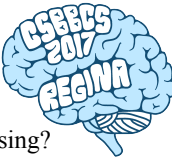
[131] The role of visual perspective in recalling autobiographical events. *Skubnik, D., Hong, J., & Ferretti, T.*

We investigated the ability to retrieve and hold in mind autobiographical memories from different visual perspectives. Participants read sentence cues that described ongoing events (e.g., I was packing the suitcase) and were cued to retrieve a related personal memory from either a first-person (looking from own eyes) or third-person perspective (looking at self). Difficulty in ability to hold memories in mind over a five second period was indexed by examining slow cortical brain potentials. Our results demonstrate that people have more difficulty holding in mind personal memories when they adopted a third versus first-person perspective. These results suggest that actively maintaining a memory for a long duration is easier from a more embodied visual perspective. Behavioral measures also demonstrated a trend for memories retrieved with a first-person perspective to be more vivid, while memories retrieved with a third-person perspective tended to be dated as older. Our results provide novel neurocognitive insight into the ability to retrieve and hold in mind autobiographical events.

[132] The mechanic dropped her wrench: The influence of manipulating fluency on reading speed and attribute ratings during schema violations *Gallant, J., Hendel, E. ,Malette, J., Vaillancourt, D., & Dickinson, J.*

Perceptual fluency, or the subjective ease with which we process information has been shown to affect ratings of familiarity, likeability, and moral judgements. Schema violations can also result in lower ratings of positivity. The current study examined the impact of perceptual fluency and schematic mental models with a reading task, where participants read sentences with schema congruent or incongruent information being presented either fluently or disfluently. Eye-movements were recorded throughout, which provided insight into the influence of perceptual fluency on processing speeds, and, in turn, on attribute ratings. Attributes were measured using 7-point Likert-type scales, including ratings of familiarity, stereotypicality, conventionality, ease of imagination, likeability, and ease of reading. Significant differences were found in dwell times for all conditions with the exception of gay and straight males in the incongruent-fluent condition. This suggests that the violation of both hetero- and homosexual male schemas slows participants' processing speed evenly. Furthermore, it was found that all attributes were significantly impacted by fluency and schema congruence, with the exception of likeability. It is supposed that this finding is the result of social desirability, according to which participants were unwilling to rate any of the subject words (gay/straight men, lesbian/straight women) as unlikeable.

[133] What drives motor effects in lexical-semantic processing? *Heard, A., Madan, C.R., & Pexman, P.M.*

Words rated higher in body-object interaction (BOI) are typically processed faster than words rated low in BOI. This BOI effect has been taken as support for theories of embodied cognition. High BOI words vary widely, however, and include words with referents that range on a number of sensorimotor dimensions. We investigated whether BOI might actually be comprised of several subdimensions. We collected ratings for 7 candidate semantic dimensions and investigated the relationships of those dimensions to BOI and to lexical-semantic processing. Hierarchical regressions were conducted to test which dimension(s) predicted unique variance in BOI ratings and in reaction times for on a lexical decision task (LDT) and a semantic decision task (SDT). LDT responses tended to be faster for words rated as relatively easy to pantomime and useful for human survival. SCT responses tended to be faster for words rated as relatively easy of pantomime, easy to grasp, animate, and large in size. Lastly, words that received high BOI ratings tended to involve a high number of actions and were considered easy to grasp. The results support the inference that multiple semantic dimensions drive BOI effects in lexical-semantic processing, supporting hybrid semantic theories.

[134] Enhancing sound-sequence learning: Does being monolingual vs bilingual matter? *Kneeskern, E., Bernard, A., & Chambers, K.E.,Onishi, K.H.*

Adults are sensitive to sound-sequence regularities (NG ends but cannot begin English syllables). These regularities (phonotactics) differ across languages. Phonotactics are learned more easily when based on phonemic (can change word meaning) rather than allophonic (never changes word meaning) sound variations, but can (sometimes) still be learned when based on allophonic variation (e.g., when living in a multilingual environment; Bernard, Onishi & Seidl, 2007). To understand what enables adults to learn phonotactics even when based on allophonic variation, and test the hypothesis that familiarity with multiple languages may scaffold this learning, we ask whether monolingual-French, and/or bilingual-Spanish-Basque speakers learn phonotactic patterns based on vowel nasality, given that vowel nasality is phonemic and allophonic for the two groups, respectively. After training on non-words with oral vowels before stops (e.g., zad, pok) and nasal vowels before fricatives (e.g., za~v, po~z; ~ indicating nasality), monolingual-French-speaking, but not bilingual-Spanish-Basque-speaking adults distinguished novel items that followed vs violated the regularities whether they contained the same (bak, za~v vs ba~k, zav) or novel vowels (bEk, zE~v vs bE~k, zEv). Results suggest that phonotactic learning depends on the phonemic status of sounds in the participants' native language, and that bilingual language use may not be sufficient.

[135] Creating mind art from an eye movement study on reading. *Riegel, C.E., Robinson, K.M., & Herman, A.*

There is a long and rich history of using eye movement data to investigate how we read and process text. In a recent study, we used data from a study examining the differences in how participants read and process traditional poems to more contemporary poems. However, not only did we examine the differences in eye movements between the two types of poems but we also used the raw data yielded by the eye tracker to create "mind art." Mind art is a fairly recent phenomena where artists use data from sophisticated technological tools such as EEGs and eye trackers to create works of art. In our poster we will present some of the artwork created from the eye movements to demonstrate how these works of mind art can help illustrate basic differences in how we read and process different forms of poetry.

[136] The psychometric properties of retrieval-induced forgetting: Novel cue and recognition testing. *Briere, J.L., & Marsh, B.P.*

Repeatedly practicing some information (Rp+) has been shown to induce forgetting of related, but un-practiced information (Rp-) below a no practice baseline level (NRp), a pattern referred to as retrieval-induced forgetting (RIF; Anderson, Bjork, & Bjork, 1994). The few studies examining the psychometrics of RIF have produced results consistent with either an inhibitory or interference perspective; theoretical distinctions were impossible with the memory tests used. Activation of Rp- items may be inhibited in general (inhibition), or weaker associations between the category-cues and Rp- items may result in reduced memorability (interference). Thus, the current research examined the psychometrics of RIF from an inhibitory perspective by using both novel cue and cue-free recognition testing procedures. Across 2 phases, participants completed 5 RIF tasks (2 repeated and 1 equated) to obtain test-retest and alternate forms reliability estimates of RIF. RIF was eliminated with recognition testing, failed to emerge with novel cue testing at Phase 1, but appeared when participants repeated the task. No test-retest or alternate forms reliability was obtained with cue-free testing of RIF. Results are contrary to inhibitory explanations and suggest that RIF is cue-dependent; removing the cue eliminates RIF while strategic cue use during repeated attempts can instill RIF.

[137] Does a disfluent font improve memory? *Currie, D., Blanchette, T.D., Jalava, S.T., & Bodner, G.E.*

Presenting stimuli in a disfluent manner at study can enhance learning and memory. Such "desirable difficulty" effects could arise because disfluent stimuli are more difficult to process, or because they are more unusual and distinctive in memory. To adjudicate between these accounts, we compared memory for words presented in either an unusual font (Haettenschweiler) or a common font (Arial) across three font-size groups (12 pt, 24 pt, 48 pt) such that the difference in difficulty between the two font types decreased as font size increased, whereas the difference in distinctiveness remained. Memory was tested using either yes/no recognition or free recall. Study latency was used as an independent measure of disfluency. No memory benefits occurred in either task, whether the unusual font let to longer study latencies (12 pt) or not (24 pt, 48 pt). This pattern challenges the disfluency account, but it also provides no support for a distinctiveness account. However, in a follow-up experiment, we obtained a memory advantage when the disfluent font was a blurred Arial font, consistent with both accounts. Thus, it appears that not all forms of disfluency are created equal, and hence not all forms of disfluency are equally desirable.

[138] The effect of background music on episodic memory. *Lemaire, E., & Gosselin, N.*

Fifty-nine percent of students listen to music while studying, some of which report that music benefits cognitive performances including memory. However, previous studies exploring the effect of background music on episodic memory (i.e. long-term memory for specific spatio-temporal events) show heterogeneous results. This heterogeneity may reflect individual differences (e.g. intellectual quotient, IQ) and the absence of control group. According to the optimal arousal theory, various types of auditory stimulation including but not limited to background music may optimize the listener's arousal level which in turn facilitates cognitive performances. Thus, whether background music benefits episodic memory beyond the effect of non-musical auditory stimulation remains unclear. The aim of this study is to explore the effect of background music as compared to noise on episodic memory while taking into consideration IQ scores. Two groups of participants matched on age, education and musical expertise learned three 15-word lists while listening to background music or noise. After a distractive task, they were asked to recall as many words as possible in silence. The number of words recalled are compared between groups while controlling for IQ scores. Preliminary results suggest that background music benefits episodic memory more than a non-musical auditory stimulation.

[139] Recognition memory for associative information: A metacognitive framework. *Doyle, M.E.*

Metacognition is a promising field of research that explores individuals' subjective beliefs about their memory. However, metacognitive techniques have not been fully explored with respect to recognition memory for associations. In this experiment, participants were asked to study a list of word pairs and could allocate their study time for each pair. The stimuli consisted of compound (CANDLE-WAX), high strength (BELOW-ABOVE), and low strength (BROTHER-SIBLING) word pairs. An associative recognition test followed in which participants discriminated between intact pairs (identical to study) and rearranged pairs (words that had been previously seen during study but had not been paired together). We also collected judgments of learning (JOLs) after each study pair and confidence judgments (CJs) after each recognition response. Data analyses indicated that the stimulus manipulation affected both JOLs and CJs, study time, and recognition performance, but not discriminability (d') or recognition response time. Compared to low strength pairs, compound and high strength pairs both had higher hit rates, false alarm rates, JOLs, and CJs, but shorter study time. Metacognition was generally accurate for intact, but not rearranged pairs (CJs only). Future experiments will explore the generality of these findings for different types of pairs and longer retention intervals.

[140] Item-based directed forgetting for pictures: Memory for perceptual details versus gist. *Hockley, W.E. Ahmad, F.N., & Tan, P.*

Previous research has used a 2-alternative forced-choice recognition test to distinguish between memory based on perceptual details versus memory based on conceptual or semantic gist for categorized pictures of scenes. When the test distractor is a new item from the same category as the studied target picture, discrimination must be based on memory for perceptual details to identify the correct alternative. In contrast, when the distractor is from a novel picture category, discrimination can be based on memory for gist information of the target category. In two experiments, we combined this test procedure with an item-based directed forgetting (DF) procedure at study and found that recognition memory was greater for Remembered-cued pictures compared to Forget-cued pictures when discrimination had to be based on perceptual details, but no DF effect was observed when discrimination could be based on gist information. We conclude that more perceptual details are encoded for Remember-cued pictures compared to Forget-cued pictures, but DF instructions do not affect the encoding and retrieval of gist information.

[141] Recognition memory accuracy across study-test cycles. *Jalava, S.T., & Bodner, G.E.*

The vast majority of recognition memory studies consist of a single study phase followed by a single recognition test. Here we explored the effects of accuracy feedback and recognition task type on recognition accuracy (as assessed by d prime) across two study-test cycles using a 2 (feedback: yes vs. no) x 2 (task: yes/no vs. forced-choice) x 2 (cycle: first vs. second) design. Accuracy feedback during both tests (vs. neither test) did not improve recognition accuracy, even on the second study-test cycle. Feedback did not improve accuracy on either type of recognition task, but, surprisingly, accuracy was marginally higher on the forced-choice task. Accuracy was also higher on the second study-test cycle, showing that experience has the potential to improve recognition accuracy. We suggest that using more than one study-test cycle has the potential to enhance our understanding of recognition memory processes and the extent to which they can be shaped by feedback and learning.

[142] Bang....Transfer of learning: A two year longitudinal study. *Kratzig, G. P.*

The following longitudinal study was conducted to investigate transfer of learning (Thorndike, 1901) on both skill acquisition and skill retention over a two year period. Police recruits traditionally practice marksmanship skills in a live-fire setting; however, for this study the live-fire was replaced with a laser-based weapon that could only dry-fire. This study involved three groups of police recruits (N = 248), 1) Control; practiced their skills in a live-fire setting, 2) Experimental; all practice sessions occurred in a simulated synthetic environment, 3) Blend; live-fire was introduced in each practice session immediately before each of the three tests. While there is no literature investigating marksmanship skill acquisition and retention of pistol skills, firearms instructors suggest that live-fire is needed in order to learn how to shoot a pistol. The results of this study found that those recruits who received all of their practice in the synthetic environment, demonstrated a nominal improvement in scores compared to their live-fire trained peers. There were no skill retention differences (i.e., 1 and 2 years post-test) found between the groups. The results of this study provide evidence that using synthetic environments is a viable training option.

[143] Grammatical complexity, topological entropy, and artificial grammar learning. *Vokey, J.R. & Jamieson, R.K.*

We investigate a new and simpler method to compute topological entropy (TE) as an information-theoretic measure of the complexity of artificial grammars. We demonstrate that not only is the method simpler than alternative methods in the literature, it is also less prone to errors of computation common to other methods. We present the results of two experiments on artificial grammar learning relating the TE of artificial grammars to transfer performance.

[144] pitch resolution in musicians and non-musicians in music and speech prosody contexts. *Vomberg, L.H., & Vokey, J.R.*

We investigated how well musicians and non-musicians are able to judge pitch direction of tones lacking the fundamental, especially in the context of speech. Previous research has shown that musicians are better than novices at judging pitch direction in a music context. There are two reasons musicians may perform better in these conditions: musicians may have certain neuro-developmental capabilities that allow them both to be musicians and to better discriminate pitch direction, or that it is a learned ability obtained through playing, listening, and singing. We investigated whether a change to a context of speech prosody would eliminate the differences between musicians and nonmusicians. By manipulating the contexts, we hoped that novices would perform as well as musicians did in the music task by taking advantage of their knowledge of pitch in relation to prosody. However, in contrast to the music context, neither group was able to perform reliably in the speech context.

[145] Problem gambling: The role of cognitive biases and gambling fallacies. *Leonard, C.A., & Arthur, J.N.*

The cognitive model of problem gambling asserts that erroneous cognitions, also known as gambling fallacies, play a key role in the development and maintenance of problem gambling. Research results used to support this model have reported moderate cross-sectional relationships between "erroneous" cognitions and problem gambling. It has now been demonstrated however, that most of the measures constructed to evaluate gambling fallacies have also included the valuation of non-fallacious biases among other confounding valuations. The published results of two recent longitudinal studies provide evidence that fallacious thoughts should not be confounded with non-fallacious biases. In these studies, one of adults and one of adolescents, it was shown that gambling-specific fallacies are not a strong predictor of current or subsequent gambling problems and that they are common even among non-gamblers. To date there are no studies that have attempted to parse out the differential effects of biases and fallacies on problem gambling. Using a sample of (n = 266) Lethbridge community members and University students, the current research evaluated the distinct effects of both biases and fallacies on problem gambling. The implications of the current results for treatment of problem gambling are discussed.

[146] Base-rate consideration: Visual attention, conflict detection, and strategy selection. *Newman, I.R.*

Base-rate neglect is studied with reasoning problems that contain personality descriptions and base-rate ratios that suggest either consistent or competing responses. Hallmark indicators of detection of conflict between competing responses are longer response times and lower confidence. We tested the claim that successful detection of conflict is an implicit process through implicit measures (response time, confidence, and eye-gaze) and explicit measures (self-reported strategy choice and relative awareness) of conflict. Visual attention measures indicated more attention is given to the base-rate ratios for conflict problems than non-conflict problems. Our self-reported strategies demonstrated that attention to base-rate ratios for conflict problems does not differ across self-reported strategy, but typical indices of conflict detection (response time, confidence) did differ across strategy. These data suggest that the supposed implicit detection of conflict is influenced by the explicit strategy one adopts to approach the problem at hand and that base-rate neglect is not related to the duration one spends visually attending to base-rate ratios.

[147] Deductive reasoning is related to need for cognitive closure. *Smith, K.W., & Goel, V.*

Deductive reasoning is biased (Begg & Denny, 1969; Chater & Oaksford, 1999; Goel & Dolan, 2003, Trippas, et al., 2015), even when reasoners suspect their mistake (Frey, DeNeys, & Bago, 2016). We investigate whether reasoning is related to need for cognitive closure: "the desire for a definite answer on some topic, any answer as opposed to confusion and ambiguity" (NFC; Kruglanski, 1989, p. 14). NFC has been shown to influence information processing in social contexts (Kruglanski, et al., 1993). We randomly assigned 41 undergraduates to two groups, to receive invalid syllogisms that were either inconsistent or indeterminate. Both groups saw the same valid syllogisms. After the reasoning task, everyone completed the 42-item NFC Scale (Kruglanski, et al., 1993). Various NFC items were found to be significantly related (+ or - correlations) to reasoning about valid arguments with content (1 +, 1 -) inconsistently-invalid arguments with content (3 +, 6 -) without content (1 +, 4 -) indeterminately-invalid arguments with content (2 +, 8 -) without content (2 +, 1 -). Thus, reasoning can improve significantly as need for closure increases but mostly, reasoning becomes significantly worse as need for closure increases.

[148] The role of attention in visual statistical learning. *Spaniol, J., & Bianchi, L.*

Visual statistical learning (VSL), the extraction of regularities in the visual environment, is typically assessed through implicit tests. Evidence for a role of selective attention in VSL has been mixed (Musz et al., 2015). The current study examined the role of selective attention on VSL when VSL was measured explicitly, via numerical probability judgments. It was hypothesized that attention would benefit VSL, and that learning of complex regularities (conditional probabilities) would show a greater attentional boost than learning of simple regularities (single feature probabilities). During the encoding phase of the study, participants (N=49) were exposed to a series of multi-feature visual objects. The objects were faces that varied along four binary feature dimensions (gender, background colour, position, sunglasses). The encoding task directed attention to two dimensions, leaving the other two dimensions unattended. At test, participants were asked to make numerical judgments of single and conditional feature probabilities. Single probability judgments benefitted from attention during encoding. Contrary to what was hypothesized, conditional probability judgments showed no attentional boost. These findings suggest that attention supports VSL, but that this effect may be limited to simple statistical regularities, at least when VSL is assessed with explicit measures.

[149] On the interpretation of computer generated abstract art. *Turpin, M.H., Castro, A., Fugelsang, J., & Stolz, J.*

How do we make sense of a messy and complex world? What determines where we find meaning, and why? Can we go overboard in our search for meaning? We investigated the relation between several individual differences factors and the tendency to rate semi-randomly computer-generated art as profound. Participants rated a series of abstract images on profoundness, half of which included a randomly generated title, and half of which did not. Participants also completed individual differences measures assessing their proclivity toward rating meaningless pseudo-profound statements as profound, intuitive and analytic thinking style, and verbal intelligence. Of particular interest, the ratings of semantically meaningless but superficially impressive statements was strongly associated with finding computer-generated images profound. Participants also rated the images paired with a randomly generated title as being more profound than those containing no title. Further analyses will assess the degree to which these effects are mediated by individual differences in intuitive and analytic thinking and verbal intelligence. These findings will be discussed in terms of the human goal to ascribe meaning to the world, perhaps in aid of organization of memory.

[150] Investigating predictors of the Feeling of Rightness (FOR) accompanying intuitive answers. *Wang, S.*

Motoric fluency induced by hand dominance affected Judgements of Learning (JOLs), but not actual recall performance (Susser & Mulligan, 2015). The current study reapplied the hand dominance paradigm in a reasoning task, and investigated the effect of hand dominance as a way to experimentally manipulate FOR. We hypothesized that high FORs are associated with answers written with the dominant hand, and writing with the nondominant hand results in low FORs. Additionally, FOR is not predictive of normative accuracy of the answers. In the study, participants (N = 60) completed twenty Cognitive Reflection Test (CRT)-related reasoning problems. For each problem, one intuitive and one deliberate response were both given by the participants, with each response followed by a FOR score from 0 to 100. Participants wrote down answers with their dominant hand on half of the trials, and their nondominant hand for the other half the trials. Writing down answers using the nondominant hand associated with lower FORs, but generated more normatively correct responses than their counterparts. These data suggest that FOR is not a predictor of normative accuracy in reasoning problems. We were successful in manipulating FOR, and further demonstrated a dissociation between FOR and normative accuracy.

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