

24th Annual Joseph R. Royce Research Conference

March 19, 2010

Keynote Address by

Adele Diamond, University of British Columbia

Invited Presentations by

Norman R. Brown, University of Alberta

and

Connie Varnhagen, University of Alberta

Program in Brief

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F. Colbourne

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The executive functions dependent on prefrontal cortex: Genetic and environmental influences and educational and clinical implications
Adele Diamond

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Session 1 (BioSci P226)

8:30 **Mechanisms of recovery after hemorrhagic stroke**

F. Colbourne (Department of Psychology & Centre for Neuroscience, University of Alberta)

Considerable progress has been made in understanding ischemic (impaired blood flow) and traumatic brain injury. However, much less is known about hemorrhagic stroke, which results from a bleed into or surrounding the brain. These events account for 10 - 20% of all strokes, but they generally have higher mortality rates and cause significant disability in survivors. Thus, my lab has been studying the pathophysiology of intracerebral hemorrhage (ICH) in rodents, and we have been evaluating treatments aimed at reducing injury and / or promoting functional recovery. In this talk I will highlight: 1) animal models of ICH, 2) treatments that promote behavioral recovery after ICH, 3) several potential mechanisms of recovery, and 4) unique qualities of ICH that may allow us to further improve outcome.

8:45 **Lack of CA1 neurogenesis following hypothermic neuroprotection in a model of global ischemia**

G. Silasi & F. Colbourne (Centre for Neuroscience, University of Alberta)

Background: Certain cell populations within the brain are selectively vulnerable to global ischemia, which is most commonly caused by cardiac arrest. One such cell population is the CA1 region of the hippocampus, a structure involved in learning and memory. Prolonged cooling (lowering of brain temperature) is a potent neuroprotectant as it lessens CA1 injury following global ischemia. This treatment however, may also inhibit mechanisms of self-repair, such as the birth of new neurons, or neurogenesis. In the current experiment we aimed to determine whether neurogenesis occurs in the CA1 following global ischemia, and if various levels of hypothermic neuroprotection influence this process.

Methods: Adult rats received either 8 minutes of forebrain ischemia or a sham surgery. Systemic hypothermia (32°C) was induced intraoperatively, or 1, 4, 12 or 24 hrs after surgery. Following 2 weeks of recovery rats received 7 daily injections of the mitotic marker BrdU to label all dividing cells within the brain. After a 6-week survival, hippocampal brain sections were processed for H&E staining to determine the number of surviving cells, and immunolabeling for BrdU was performed to quantify cell genesis. Additional immunolabels (NeuN, GFAP, DCX and Ki67) were used to further phenotype any newly generated cells.

Results: Hypothermia treatment was highly neuroprotective when initiated intraoperatively, or at 1 and 4 hrs (>90% protection). Treatment efficacy diminished in the 12 and 24 hr groups (70%, 53% respectively), but was still significant at 12 hrs. Our BrdU labeling shows elevated cellular proliferation in the CA1 region following ischemia, however none of the hypothermia treatment protocols induced differentiation into a neuronal phenotype.

Conclusions: CA1 neurogenesis appears to be minimal in this global ischemia model, and is not enhanced with immediate or delayed hypothermia. Thus, it does not appear that neurogenesis is contributing to the robust neuroprotective effect of hypothermia.

9:00 An evaluation of the safety of three weeks of focal cortical hypothermia in rat

A. Auriat, G. Silasi, M. Penner, D. Clark, & F. Colbourne (Department of Psychology, University of Alberta)

Background: Therapeutic-hypothermia (e.g., 33°C) is neuroprotective after ischemic and hemorrhagic stroke. Efficacy depends upon treatment duration with the possibility of needing more than 1 week of cooling in some cases. Thus, we evaluated whether such protracted cooling injures the brain of normal rats.

Methods: The right motor cortex of rats was selectively cooled for 3 weeks (vs. normothermia) via a novel cooling system. In part 1, several physiological parameters were measured. In part 2, cortical injury was quantified histologically. In part 3, Golgi-Cox staining was used to assess dendritic complexity. In part 4, cellular ultrastructure was assessed. In several of these experiments we also looked for behavioral abnormalities.

Results: Prolonged cortical hypothermia was feasible and without effect on systemic physiological measures (e.g., body weight, blood pressure). There were no signs of cooling-induced cell injury (e.g., necrosis, autophagy). Dendritic complexity was reduced in the cooled motor cortex at 3 but not at 14 days post cooling. There were no notable behavioral abnormalities (e.g., motor asymmetry) after cooling ceased.

Conclusions: Results suggest that prolonged local brain hypothermia is safe. Further development and testing of brain-selective cooling techniques are needed in stroke models and for clinical treatment of stroke.

9:15 Whole phrase frequency predicts behavior in a cloze task

C. Shaoul & C. Westbury (Department of Psychology, University of Alberta)

In a cloze task, certain words or letters are removed from a portion of text, and the participant is asked to replace what is missing. Human languages are highly predictable, and the cloze value (word predictability) is usually measured by collecting subjective norms or looking at transitional probabilities in corpora. What information in the linguistic context is used to complete a phrase with a missing letter or word? We created sentences that had specific frequency properties and asked subjects to fill in a missing letter (with a _ag) or word (have no time to _____). How would the distribution of the frequencies of the possible completions of a phrase in a large corpus of English relate to the responses that our participants made? We compared the ngram family size for all possible completions of our cloze tasks. The corpus n-gram family size was strongly correlated with the number of completion types for the letter cloze task ($p < 0.05$, $r = 0.53$) and for the word cloze task ($p < 0.05$, $r = 0.45$). There were also consistent, reliable rank correlations between the corpus frequencies of the phrases and the popularity of the cloze completions in both the letter and word cloze tasks. These results suggest that there is an effect of the whole phrase frequency on the language system during phrase production and word selection.

9:30 Do bilinguals use gestures to compensate for lower proficiency in at least one of their languages?

A. Laurent, E. Nicoladis, & P. Marentette (Department of Psychology, University of Alberta)

The objective of the present study was both to examine the relationship between speech and gestures in a French-English bilingual sample and to assess the effect of linguistic dominance on gesture use. The children who took part in this study were aged between 6 and 10 years old. They were split into two groups regarding their storytelling experience and were asked to recount two short segments of a Pink Panther cartoon. The results tended to be in favor of the assumption that speech and gestures are two components of a single system from an early age. Moreover, there is no influence of the linguistic

dominance on the frequency of gesture use. These results are discussed in the light of ongoing research on the speech-gesture link and relative to other studies showing mixed results with regard to linguistic dominance.

Invited Presentation (BioSci P226)

10:00 **Taking it personally: When (and why) public events define lifetime periods**

Norman R. Brown (Department of Psychology, University of Alberta)

Memories created by war, terrorism, and natural disaster can play a critical role in the construction of group identity and the persistence of group conflict. Over the past several years, my colleagues and I have been examining the mnemonic impact of such events at the individual level rather than the group level in order to understand when (and why) autobiographical memory and history become intertwined. This research provides evidence for a direct link between the historical and the personal by demonstrating that *historically-defined autobiographical periods* do exist. It also indicates that it is personal significance, not historical importance per se, which determines whether public events play a role in organizing autobiographical memory. In other words it appears that personal memory and knowledge of the collective past become entwined only when public events bring about wide-spread, profound and enduring changes to the fabric of daily life. Evidence for these claims comes from 19 samples collected in 10 countries. In this talk, I summarize this evidence and discuss its implications.

Session 2 (BioSci P226)

10:20 **Involvement of meaning construction in the processing of opaque and transparent compounds**

K. A. Marchak (Department of Psychology, University of Alberta)

Previous research has shown that lexical and conceptual representations of the constituents of transparent compounds become available and are used to access the meaning of the compound (Libben, 1998). This research also suggests that the lexical representations of the constituents of opaque compounds become available. However, due to the lack of semantic priming from the constituents to opaque compounds, it appears that the conceptual representations are not activated (Zwitserlood, 1994). The lack of semantic priming is puzzling because lexical representations typically activate associated conceptual representations. Our project is designed to shed light on this paradox. We propose that the conceptual representations were activated, but then suppressed due to a conflict between the constructed meaning and the directly retrieved meaning (Gagné, Spalding & Gorric, 2005; Libben, 2005; Ji, 2008). To assess the feasibility of this possibility, we first examined whether the lexical and semantic representations of the constituents of compounds are available by using a priming paradigm in a lexical decision task.

Experiment 1 used sixty monomorphemic target words (e.g., moon) which were preceded by one of three primes: opaque compound (e.g., moonshine), transparent compound (e.g., moonlight), and a control (e.g., heirloom). Nonsense filler items were also included. Responses to the target were faster when it was preceded by either the opaque or transparent prime compared to the control prime. Reaction time to the target was equivalent in the opaque and transparent conditions. These findings confirm that the lexical representations of the constituents for opaque and transparent compounds become activated. Experiment 2 examined the availability of the constituent's conceptual

representations and was identical to Experiment 1, except that the target (e.g., sky) was a semantic associate of the first constituent of the opaque and transparent primes.

10:35 Autobiographical content versus object terms as cues for retrieval of autobiographical memories

T. Uzer, P. J. Lee, & N. R. Brown (Department of Psychology, University of Alberta)

This study was conducted to investigate the prevalence of direct retrieval of autobiographical memories cued by autobiographical contents versus object terms and how life transitions create changes in the components of autobiographical memories (e.g., people, places, activities). We studied students who relocated to attend university and students that did not, by comparing temporal extension of event components, temporal distribution of AMs, proportions of directly retrieved AMs, and reaction times. First, participants recalled four people that they have seen a lot, four locations that they have visited a lot and four activities that they have been doing a lot since starting the university. Next, participants recalled memories involving these components plus 12 object terms, and then dated them. Finally, participants reported durations associated with components (first/last time of occurrence). Proportion of directly retrieved memories was greater for memories cued by components than those cued by object terms. Event components provided faster retrieval times than object terms for both groups. Temporal extension of components shows that relocators reported components that have only been present since starting university four times greater than non-relocators. We showed that events are directly accessed mostly through their components whereas concepts provide access to events mostly through their links to event components. We also describe transitions as dynamic, and discriminated in time and content, and demonstrate that transitions are graded changes that may impact the organization and retrieval of AM.

10:50 On the role of recognition in inferential decision making

O. Schweickart & N. R. Brown (Department of Psychology, University of Alberta)

This study examines the processes underlying binary decisions when only one object in a pair is recognized. Participants were asked to perform four tasks: (1) to provide timed recognition judgments for a set of 16 countries, (2) to rate their knowledge of each country, (3) to estimate each country's per capita GDP, and (4) to choose the country with the higher per capita GDP in each of all possible country pairs. The order of the four tasks was manipulated which allowed to monitor the effect of repeated exposure on recognition judgments. Reaction times (RTs) for binary decisions displayed a classic symbolic distance effect (Banks, 1977; Moyer & Dumais, 1978): RTs were inversely related to the difference between the subjective per capita GDPs of the compared countries. The effect remained even after controlling for recognition time differences between pair members. These findings disconfirm predictions made by simple non-compensatory decision models and indicate that a magnitude-comparison process plays a central role in inferential decision making.

11:05 Emotion and contextual-memory

C. R. Madan, C. S. M. Lau, J. B. Caplan (Department of Psychology, University of Alberta), & E. Fujiwara (Department of Psychiatry, University of Alberta)

Emotional items are remembered better than neutral items. It is unclear how this extends to memory for context involving emotional items. One would expect that memory would be enhanced for context associated with an emotional event as it may act as a reliable precursor to the emotional event (e.g., as in fear conditioning). In the present study, we manipulated the pairings of emotional and neutral words and direction of cued-recall probes. Pairs were pure (EMOTIONAL-EMOTIONAL, NEUTRAL-NEUTRAL) or mixed (EMOTIONAL-NEUTRAL, NEUTRAL-EMOTIONAL). We asked whether emotion would enhance association-memory, independently of its effects on item-memory (e.g., target retrievability). We fit the data with a probabilistic model to obtain

estimates of how emotion influenced cued recall depending on emotionality of the target or probe (item-memory effects), or relationship between constituents (association-memory effect). In a follow-up we replaced emotional words with taboo words to exaggerate the manipulation. Findings suggest that mildly emotional words reduced memory for the associations whereas taboo words neither impaired nor enhanced memory for the associations. Consistent with other recent findings, our results suggest that emotional enhancement of memory effects do not extend to relational memory. Thus, in contrast to fear conditioning studies, emotion did not enhance memory for contextual (associated) information here.

11:20 Holographic memory models are neurally plausible

J. B. Caplan (Department of Psychology, University of Alberta)

Two mathematical frameworks have been used successfully to explain a human behaviour on a broad range of tasks: the Matrix Model, which relies on matrix multiplication to store associations, and so-called "holographic" models (they use the same math as holography) which rely on a different matrix operation, convolution, to store associations. The Matrix Model has been thought of as neurally plausible because it approximates learning in a connectionist network and has been seen as being plausibly carried out by the circuitry within the hippocampus; this has implicitly pushed convolution-based models on the back burner. However, a recent surprising finding - "grid cells" in the entorhinal cortex, a major input to the hippocampus - has been suggested to form a 2-D spatial Fourier basis set, and thus the entorhinal-hippocampal pathway may carry out a Fourier transform. A Fourier transform is well known to be a mathematical shortcut to compute a convolution; thus, I suggest that the grid-cell finding may be telling us that the hippocampus carries out spatial, as well as non-spatial associative learning via convolution (in addition to - or possibly instead of - matrix multiplication), supporting the neural plausibility of holographic memory models and potentially explaining how the hippocampus implements "associative symmetry," a property of convolution-based models wherein there is no directionality stored within associations.

Posters (BioSci Lobby)

1 Conspecific or heterospecific? ZENK activation in the nidopallium of black-capped chickadees.

M. T. Avey, M. A. Hoeschele, M. K. Moscicki (Department of Psychology, University of Alberta), L. L. Bloomfield (Department of Psychology, Algoma University), & C. B. Sturdy (Department of Psychology, University of Alberta)

Immediate early gene (ZENK) activity has been used as a marker for activity in the songbird nidopallium for almost two decades. ZENK activity increases with the presentation of more ethologically relevant stimuli classes, such that conspecific vocalizations induce more ZENK activity compared to heterospecific vocalizations or artificial stimuli, such as tones. We tested the relationship between increases in ZENK activity and phylogenetic relatedness of vocal stimuli, in other words, the degree of "heterospecificity". We used vocalizations from the genus *Poecile*, all of which produce a "chick-a-dee" call that is used in a variety of contexts for a variety of putative purposes. The "chick-a-dee" calls used as stimuli were from black-capped chickadee (*Poecile atricapillus*), mountain chickadee (*Poecile gambeli*), and boreal chickadee (*Poecile hudsonica*). Black-capped and mountain chickadees are sister species whereas the boreal chickadee is closely related, but located on a separate branch of the *Poecile* clade. We played back one of the three types of chickadees to black-capped chickadees, which have previously been shown to have increased ZENK following conspecific calls and, in

operant conditioning experiments, to be able to discriminate between black-capped and mountain chickadee calls. ZENK activity was quantified by the amount of labeled protein product in the caudal medial nidopallium (NCM) and caudomedial mesopallium (CMM). We found no differences in the amount of ZENK expressed between the three groups of Poecile vocalizations; however, all groups differed significantly from the silence control condition which had little ZENK induction. These results suggest that ZENK induction in the nidopallium is not a conspecific/heterospecific dichotomy but that a more complex relationship exists that may depend on vocal similarities or selective advantages to attending to vocalizations.

2 **Note-type based species classification**

L. M. Guillette, M. Hoeschele, T. M. Farrell, L. L. Bloomfield & C. B. Sturdy (Department of Psychology, University of Alberta)

Bloomfield et al. (2008) showed that black-capped and mountain chickadees sorted their chick-a-dee calls into species-level categories. In this task, the terminal "dee" portion was a more efficacious stimulus for species classification than the initial "chick-a" portion. In a separate study, linear discriminant analyses were able to classify notes by species with 100% accuracy using any call note type from either species, calls (Dawson et al. 2006). In the current, ongoing set of experiments, we aim to determine whether classification into species-level categories are mediated equivalently all call-note types, as suggested by the results of the linear discriminant analysis, or whether some note types are more well suited to aid in species classification to others using a go/nogo operant discrimination. Our results suggest that a simple (sounding) question does not necessarily lead to a simple answer and birds appear to be adopting several strategies to solve the task.

3 **Despotic territory acquisition in the red-winged blackbird**

I. Helgesen & P. Hurd (Department of Psychology, University of Alberta)

The red-winged blackbird (*Agelaius phoeniceus*) is a polygynous passerine common throughout most of North America. Males often hold harems of as many as six or seven females, leading to high variability in male reproductive success. Research on female mate selection has shown that females select mates primarily on the basis of the territory rather than inherent qualities of the male. This ought to lead to fierce competition between males for territories, creating a high correlation between territory quality and the male's fighting ability, or RHP. However, markers of RHP show only weak correlations with ability to acquire a territory, and with the quality territory among territory owners. Here, we attempt to resolve this conflict by using computer simulations to examine the conditions under which RHP does and does not correlate with territory quality. Factors such as aggressiveness, aging, and spatial limitations are investigated. Results show that high RHP-territory quality correlations are more difficult to achieve than had been expected, particularly in populations with high mortality.

4 **Event-related brain potential reflections of self referential processing**

M. Alpaugh, M. Kostiuk (Centre for Neuroscience, University of Alberta), E. Fujiwara (Department of Psychiatry, University of Alberta), & A. Singhal (Department of Psychology, University of Alberta)

The self positivity bias is a pervasive psychological phenomenon, where people typically judge the self as more positive (or less negative) than they judge others on a range of dimensions. In the present study we examine whether this bias can be observed at the level of brain activity through event-related potentials (ERPs). All subjects were self-selected from the psych pool and were asked to judge self-relevance for a series of positive and negative personality traits. EEG recordings were made while participants were performing these judgements. Data from twenty-nine participants was collected using a HydroCel Geodesic Sensor Net with 256 electrodes. Similar to a previous study by Watson et al. (2007), we hypothesized that the N400, a late occurring negative waveform, would be a good marker of self-congruent and incongruent judgements because it is

known to reflect semantic mismatches. Consistent with the self positivity bias individuals judged more positive traits as self-descriptive and negative traits as not self-descriptive; they rarely judged positive characteristics as not self-descriptive and negative traits as self-descriptive. Reaction times were faster for positive stimuli that were endorsed than positive stimuli that were rejected. Reaction times for negative stimuli showed a small difference between endorsement and rejection. The N400 amplitude followed our reaction time data for positive words: When a participant rejected a positive word as not self relevant the N400 amplitude was larger than when a positive word was endorsed as self relevant. This result suggests a greater detection of semantic incongruity. This difference also appeared for negative words in that when a negative word was ranked as self relevant the amplitude was larger than when the negative word was ranked as being not self relevant; suggesting a less semantic incongruent condition. Further, the P100 (a measure of visual perception) was larger for words ranked as self relevant compared to words ranked as not self relevant. This result suggests early attention is given to stimuli related to self.

5 Proprioceptive modulation of early auditory processing in peripersonal and extrapersonal space

I. Surdhar & A. Singhal (Department of Psychology, University of Alberta)

Previous monkey neurophysiology and human patient work suggest that there are bimodal neurons coded for early visual and tactile processing in peripersonal (within reach) space. Here we present two event-related brain potential (ERP) studies designed to investigate whether this extends to the auditory system. In Experiment 1, twelve participants responded with a footswitch to rare pink noise targets presented from 2 speakers placed in either peripersonal or extrapersonal space. Limb position was varied such that there were 4 conditions; hands up (toward speakers) and hands down (on lap) in both peripersonal and extrapersonal space. Event-related brain potentials were recorded from 256 electrodes and results showed an increase in N100 amplitude when hands were up in peripersonal space compared to all other conditions. This suggests that proprioception enhances early attentional processing (likely at the level of the thalamus) of sounds close to the body. In Experiment 2 we examined the dynamic properties of this system by adding a tool condition. Here, participants reached towards loudspeakers in extrapersonal space either with or without xylophone mallets in their hands such that there were 4 conditions: mallets up and hands up towards the speakers without previous training, and mallets up and hands up following training. Training consisted of learning to play a piece of music on the xylophone for 5 minutes. The results showed that ERP markers of auditory attention were enhanced with mallets up after training. These results suggest that manual tool use alters the processing of stimuli in extrapersonal space in the same fashion that proprioceptive input can in peripersonal space.

6 Neural Mechanisms of Sensorimotor Behavior

L. Cruikshank, J. Caplan, & A. Singhal (Centre for Neuroscience & Department of Psychology, University of Alberta)

Many behaviors rely on sensory and motor systems coordinating their activity. The neurophysiological mechanism that facilitates this coordination however, remains unclear. Evidence from animal research has suggested that theta oscillations (3-12 Hz rhythmic brain activity) are a neural mechanism underlying sensorimotor integration in rats. However, it is not known whether this mechanism might extend to humans. Cortical theta has been reported over frontal-midline areas in the human EEG, yet research addressing its function has yielded varied results. Furthermore, the mu rhythm (8-12 Hz) is the chief rhythm implicated in human sensorimotor tasks.

We tested the Theta Model of Sensorimotor Integration in humans using a basic reaching paradigm. We hypothesized that neocortical theta is present during sensorimotor integration but has been overlooked due to the fact that mu and theta rhythms coincide

spatially and are adjacent frequencies. We directly compared visually guided and delayed hand actions, which require integration of different cortical circuits. Specifically, visual perceptual brain mechanisms in the lateral occipital cortex are critically recruited during delayed hand actions. We hypothesized that the N170, an ERP associated with object recognition, would reflect differences in the amount perception-based information required during planning of these actions.

Participants were auditorily cued to reach towards target dots on a touchscreen while EEG activity was recorded. The highly reported mu rhythm was present prior to movement and desynchronized, giving way to more anterior theta oscillations during the movement. Additionally, event-related potential (ERP) analysis revealed that the N170 response was larger during the planning phase of the delayed action compared to the visually guided action, despite equivalent sensory P1 responses over occipital electrodes.

These findings are consistent with theta as a mechanism for sensorimotor integration. They also suggest that the N170 reflects the incorporation of ventral stream processing, or LOC recruitment, during delayed action planning.

7 **Is mild cognitive impairment associated with markers of biological vitality and lifestyle activity?**

S. Dolcos, A. Braslavsky, B. P. Geall, S. W. S. MacDonald, & R. A. Dixon (Department of Psychology, University of Alberta)

Although cognitive status in older adults varies along a continuum, studies have investigated cognitive and noncognitive differences between groups provisionally classified as (a) not impaired cognitively (NIC) and (b) mild cognitive impairment (MCI). One rationale is to develop clinically relevant markers for identifying older adults who are most at risk for accelerated decline or dementia. Using data from the Victoria Longitudinal Study (VLS), we examined cross-sectional group differences on indicators from three clusters of MCI risk-protection factors: biological vitality, activity lifestyle, and psychosocial affect. Combining data across VLS Samples 1 and 2 we assembled two linked cross-sectional data sets (Wave 1: n=416, age=64-95; Wave 2: n=301, age=68-100). At both waves, we classified the status groups by relative performance on five cognitive reference tests (Wave 1 NIC n=220, MCI n=196; Wave 2 NIC n=174, MCI n=127). Three-year stabilities were high and similar: for NIC, 81% maintained status from Wave 1 to Wave 2; for MCI, 75% were similarly classified at Waves 1 and 2. Wave 1 results showed significant MCI deficits for diastolic blood pressure, body mass index, positive and negative affect, as well as several daily activity clusters (self-maintenance, travel, novel cognitive activities). Follow-up logistic regression analyses indicated that self-maintenance activity (e.g., shopping) and novel cognition (e.g., reading books) were significantly associated with a decreased risk of MCI ($p < 0.05$). Replication Wave 2 analyses showed significant MCI deficits for peak expiratory flow and the same three activities (from Wave 1), with similar logistic regression results. Finally, initial logistic regression analyses linking the waves confirmed (a) the potential role of select lifestyle-activity markers in distinguishing NIC and MCI adults, and (b) that biological markers were correspondingly less promising.

8 **Antipsychotic medications and weight gain: The impact of treatment duration**

K. Henrick (Department of Psychology, University of Alberta) & S. Purdon (Neuropsychology, Alberta Hospital Edmonton)

Objective: Obesity is an escalating epidemic associated with dire health consequences, such as cardiovascular illness and type II diabetes. These associated conditions attribute to the heightened rate of mortality in obese persons. Individuals with serious mental health disorders have an elevated risk of becoming obese that appears to be aggravated by

antipsychotic medication. This review will evaluate prior investigations to assess the effect of medication type and treatment duration on weight gain in schizophrenia.

Method: A meta-analysis was performed on the magnitude of the weight gain observed in short-term and long-term prospective investigations of clozapine, olanzapine, risperidone, quetiapine, ziprasidone and haloperidol.

Results: Weighted effect sizes (Hedge's *G*) averaged across the published studies suggested, in descending order, weight gain from relatively short duration exposure to clozapine ($ES=0.47$), olanzapine ($ES=0.44$), quetiapine ($ES=0.28$), and risperidone ($ES=0.33$), but not ziprasidone ($ES=-0.03$) or haloperidol ($ES=0.07$). Weight gain from relatively long duration exposure was also apparent, in descending order, clozapine ($ES=0.44$), olanzapine ($ES=0.49$), quetiapine ($ES=0.42$), and risperidone ($ES=0.36$), but not ziprasidone ($ES=-0.22$). Insufficient data was available for the long-term treatment of haloperidol.

Conclusions: With the exception of ziprasidone, the published evidence to date suggests significant weight gain with atypical antipsychotic medications that is not observed with a typical antipsychotic medication. This suggests a cumulative weight increase over time that could have detrimental effects on health status, compliance and overall treatment efficacy.

9 Hostile attribution biases as mediators of the long-term effects of peer victimization on adjustment problems

N. Hosan, W. Hoglund, & A. Chakawa (Department of Psychology, University of Alberta)

Research indicates that chronic peer victimization contributes to long-term risks for adjustment problems (e.g., depression, aggression) in adolescence. According to social-information processing theory, adolescents who experience negative peer interactions on an on-going basis interpret peers, ambiguous behaviours as intentionally mean and react emotionally/physically (Crick & Dodge, 1994). Cross-sectional research indicates that hostile attribution biases influence the concurrent associations between victimization and adjustment problems in early adolescence (Hoglund & Leadbeater, 2007), but it is unclear whether hostile attribution biases mediate the effects of growth in peer victimization on prospective levels of adjustment problems. The current study investigates whether hostile attribution biases in relational and instrumental contexts in grade 5 mediate the effects of growth in relational and physical victimization from grades 1 to 3 on levels of depression/anxiety and aggression in grade 6, and gender differences in these long-term associations. Participants were 432 racially/ethnically diverse children (51% boys; mean age = 6.3 years; 73% Caucasian, 13% Asian, 7% Aboriginal, 7% other). Baseline data were gathered in the fall of grade 1, follow-up data were gathered in the spring of grades 1 ($n = 423$), 2 ($n = 397$), 3 ($n = 385$), 5 ($n = 259$), and 6 ($n = 237$). Measures included both self-reports (victimization, hostile attribution biases) and teacher-reports (depression/anxiety and aggression). Results indicate that higher initial levels and growth in victimization predict higher hostile attribution biases in grade 5. For physical victimization only, higher initial victimization predicts higher levels of adjustment problems in grade 6 and this is mediated by hostile attribution biases. Further analyses will account for shared variance between relational and physical victimization and test whether path estimates differ by gender. Findings from this study will improve understanding of the contributions of social cognitive distortions on the relation between peer victimization and adjustment problems.

10 **Intraindividual variability in neurocognitive speed performance in type 2 diabetes**

B.P. Geall, R.A. Dixon (Department of Psychology, University of Alberta), S.W.S. MacDonald (Department of Psychology, University of Victoria), A.L. Fischer (Department of Psychology, Simon Fraser University), D.F. Hullsch (Department of Psychology, University of Victoria)

Older adults with diseases characterized by central neuropathology typically demonstrate significant deficits on neurocognitive speed performance in both rate (slower) and intraindividual variability (IIV, elevated). For some conditions (e.g., mild cognitive impairment) IIV may be significantly more effective at distinguishing cognitive status groups than mean rate. In contrast, older adults with somatic diseases (e.g., arthritis) do not typically show such neurocognitive speed deficits. We explored whether Type 2 diabetes (T2D), an intermediate disease with indirect neurobiological and neuropsychological implications, was associated with elevated neurocognitive inconsistency. Based on previous T2D studies in the Victoria Longitudinal Study (VLS), we assembled cross-sectional data for four speeded tasks (e.g., lexical decision, choice reaction time) from VLS Sample 3 (Wave 1; $n = 577$; age range = 53 ^ 85 years). Documented multi-step diagnoses and all recommended exclusionary criteria were applied to classify T2D patients. Study sample consisted of T2D ($n = 41$, M age = 68.59) and control ($n = 458$, M age = 67.50) participants. We examined three T2D-related research goals. First, MANOVAs revealed robust speed (rate) deficits for the T2D group. Second, using intraindividual standard deviations to represent IIV, we observed greater variability for the T2D group in lexical decision. Third, logistic regression analysis was used to determine whether IIV was differentially predictive of T2D status. Results indicated that IIV and T2D status have demonstrable effects both individually and conjointly in predicting T2D status. Mechanisms for IIV-T2D associations are discussed, with attention to T2D-related effects on neuronal system tone and neuronal synchrony.

11 **Exploring structural mediation models of type 2 diabetes-cognition relationships**

G. P. McFall (Department of Psychology, University of Alberta), S. Dolcos (Department of Psychiatry, University of Alberta), S. W. S. MacDonald (Department of Psychology, University of Victoria), & R. A. Dixon (Department of Psychology, University of Alberta)

Type 2 diabetes (T2D) is increasing in prevalence in North American older adults and is linked through indirect biological factors to a heightened risk of cognitive deficits and dementia. In previous Victoria Longitudinal Study (VLS) studies, we observed T2D-related deficits especially in cognitive speed and speed-intensive executive functioning, both cross-sectionally and longitudinally. Subsequently, using univariate moderator-mediator analyses we found that three biomarkers (i.e., functional health, systolic blood pressure, gait-balance composite) mediated T2D effects on cognition (i.e., episodic memory, executive functioning, neurocognitive speed). In the present study, we explored selected structural mediator models of T2D-cognition relationships using structural equation modeling (LISREL 8.8). We assembled cross-sectional data from VLS Sample 3 (Wave 1), including T2D ($n=41$, ages 55-81 years) and control ($n=458$, ages 53-90 years) groups. The T2D-episodic memory model showed a good fit ($X^2(5,N=493)=6.31$, $p=.278$, RMSEA=.023, CFI=.998) with functional health and gait-balance acting as mediators, but when age was added to the model only the T2D-related mediating effect of gait-balance remained. The T2D-neurocognitive speed model fit the data ($X^2(5,N=491)=7.82$, $p=.167$, RMSEA=.034, CFI=.996) with systolic blood pressure and gait-balance showing mediation effects, but again when age was added to the model only the mediating effects of gait-balance remained. The T2D-executive functioning model fit the data ($X^2(4,N=491)=8.90$, $p=.064$, RMSEA=.050, CFI=.989) with gait-balance acting as a mediator, but when age was included no biomarker mediation effects remained. Future research will include selected alternative models and larger cross-sectional and longitudinal VLS samples.

12 **Exploring the effects of obesity on cognition in older adults**

A. N. Demsky, B. P. Geall, G. P. McFall, & R. A. Dixon (Department of Psychology, University of Alberta)

Background: Obesity is a growing epidemic that has been linked to numerous adverse health outcomes. Accumulating evidence suggests that elevated body weight (in interaction with co-morbidities, such as hypertension and diabetes) in aging adults may be related to lower cognitive performance (concurrently), accelerated cognitive decline (longitudinally), and exacerbated risk of neurodegenerative disease.

Objective: To explore the effects of elevated body weight on neurocognitive performance in older adults. Based on a previous study (Nilsson & Nilsson, 2009) we hypothesized that the effects would be observed primarily in measures tapping semantic processing (memory, speed, fluency).

Methods: A cross-sectional sample from the Victoria Longitudinal Study (VLS; Sample 3, Wave 1) was prepared (with exclusionary criteria) to include $n=496$ participants aged 53-85 years ($M=67.6$). Cognitive performance was assessed across 6 domains: verbal speed, perceptual speed, semantic & episodic memory, fluency, and executive functioning. Participants were stratified by body-mass index into normal weight (BMI 18.5-24.9), overweight (BMI 25.0-29.9), or obese (BMI >30.0) categories and by chronological age as young-old (YO; 53.0-64.9), middle-old (MO; 65.0-74.9), and old-old (OO >75.0).

Results: Analyses of variance revealed several main effects and two-way interactions. We summarized a set of significant ($p < 0.01$) three-way interactions (BMI x Gender x Age) involving our measures of semantic processing. The trends were notably consistent across semantic fluency, semantic memory, and semantic speed. In particular, OO obese males showed a marked decrement in performance when compared to age-matched normal and overweight men. Conversely, OO obese females demonstrated a considerable advantage in semantic processing performance when compared with age-matched normal and overweight females. These trends persisted when obesity-related diseases (e.g. Type 2 diabetes, hypertension) were controlled.

Conclusion: Current research suggests that semantic performance may be selectively compromised in older obese individuals. Further research establishing neurological and health covariates of this emerging pattern is recommended.

13 **Olfactory identification and cognitive functions in aging**

R. Wang, G. P. McFall, & R. A. Dixon (Department of Psychology, University of Alberta)

Olfactory dysfunction has been linked to cognitive decline with normal aging, and may be an early marker of mild cognitive impairment and Alzheimer's disease. Studies of the relationship between olfaction and cognition are scarce compared to vision and audition. To date, few cognitive domains have been examined in context of olfaction and aging, with largely inconclusive results. Our study aims to explore (a) whether odour identification performance is associated with multiple cognitive functions and (b) whether differences in olfactory performance are associated with differential cognitive change in aging.

We assembled longitudinal data from the Victoria Longitudinal Study. We drew participants from Sample 3 (source $n=580$) who completed the Brief Smell Identification Test (BSIT, $n=106$) and the extensive VLS cognitive battery. We assessed each individual at two waves, at a 3-year interval. After applying exclusionary criteria, our final Wave 1 sample consisted of 94 participants (M age = 69.31 years; 54-90 years), with 69 retained in Wave 2. We conducted an initial set of exploratory analyses: (a) odour identification performance characteristics, (b) correlations in BSIT score and cognitive performance (by

age and gender), (c) ANOVAs featuring high vs. low smell groups, and (d) 2-wave ANOVAs.

First, the BSIT produced robust concurrent data, and good stabilities in level of performance. Second, for S3W1, we found significant correlations of BSIT with executive functioning and neurocognitive speed, but not memory or global cognition. For S3W2, we found significant correlations between BSIT and all cognitive domains except for global cognition. Higher BSIT score was associated with better cognition. Third, preliminary ANOVAs showed ageXsmell interaction effects for semantic memory, executive functioning, neurocognitive speed, and working memory. Fourth, preliminary longitudinal results suggested baseline olfactory performance predicted differential change in cognition. Our findings may lend to the plausibility of using odour tests for assessing cognitive status in normal aging, and perhaps early detection of MCI and AD.

14 The influence of peer victimization on children's hostile attribution biases

A. Chakawa & W. Hoglund (Department of Psychology, University of Alberta)

Peer victimization is a common occurrence among school aged children that often affects social development (Kochenderfer-Ladd & Wardrop, 2001). Studies report that about 21% of children aged 5 to 11 are victimized by their peers at school (Kochenderfer & Ladd, 1996; Shojaci, Wazana, Pitrou, Gilbert & Kovess, 2009). Few researchers have examined the relationship between relational (e.g., rejection) and physical victimization (e.g., hitting) and children's hostile attribution biases (i.e., the tendency to perceive hostile intent in others in ambiguous situations). Research shows that there may be a link between experiences of peer victimization and hostile attribution biases (Hoglund & Leadbeater, 2007). These studies suggest that children who experience peer victimization are more likely to see themselves as disliked by members of their peer group and perceive their peers as hostile, uncaring, and untrustworthy. Furthermore, some researchers suggest gender differences associated with relational and physical victimization. Research shows that experiences of peer victimization among boys often involve acts of physical victimization whereas girls often experience peer victimization through acts of relational victimization (Kochenderfer-Ladd & Skinner, 2002). However, these results are inconsistent. The current study asks: 1) Do experiences of peer victimization contribute to hostile attribution biases among a sample of children in kindergarten to grade 3? and 2) Do experiences of physical victimization and relational victimization among children differ by gender? Data was collected using a sample of 44 children (in kindergarten to grade 3). Children's hostile attribution biases and experiences of peer victimization were measured using self-reports. Findings from this research will contribute to understanding of how experiences of peer victimization contribute to children's hostile attribution biases and gender differences in these experiences.

15 Improving Canadian children's performance on equivalence problems

R. Watchorn (Department of Psychology, University of Alberta), M. Lai (Chiayi University), & J. Bisanz (Department of Psychology, University of Alberta)

In Canada and the United States, the majority of children from Grades 2-5 fail to solve equivalence problems (e.g., $2 + 4 + 5 = 3 + \underline{\quad}$) despite having the requisite addition and subtraction skills. Performance on these problems is related to performance in algebra, considered to be the "gatekeeper" to higher math. Several intervention methods have led to only limited success. In a previous study, we found that Taiwanese children are much more successful (Watchorn, Lai, & Bisanz, 2009). One hypothesis is that performance on equivalence problems is greatly facilitated by exposure to "non-canonical" arithmetic problems, that is, problems with numbers and operations on both sides of the equal sign (e.g., $2 + 4 = 1 + 5 = 6$). Taiwanese students are routinely exposed to non-canonical problems, whereas children in Canada and the United States rarely encounter such problems.

In five monthly sessions, Canadian students in Grades 1 and 2 (N=58) were exposed to non-canonical problems similar to those that Taiwanese students encounter. Following the final session, children were tested on 20 equivalence problems and performance was compared to a control group (N=86). Children who were exposed to the non-canonical problems (M=0.264, SD = 0.001) were much more successful on equivalence problems than children who were not (M=0.037, SD = 0.0008). The intervention was effective in both grades, as determined with 95% confidence intervals, but children in Grade 2 (M = 0.375, SD = 0.002) benefited more than those in Grade 1 (M = 0.153, SD = 0.002).

Although the success of the intervention is promising, the majority of students (55%) still did not obtain the correct answer to any equivalence problems even after repeated exposure to problems challenging their interpretation of the equal sign. If we can determine other factors contributing to Taiwanese children's success, we may be able to help students struggling to make the important connection between arithmetic and algebra.

16 Who are you calling sweetheart? Caregivers' use of patronizing speech while interacting with people with Alzheimer disease

T. Rust, S. Kwong See, & A. Schwalfenberg (Department of Psychology, University of Alberta)

Patronizing speech is also known as baby talk, accommodative speech, and elderspeak. Some aspects of patronizing speech include the use of tag questions, shorter sentences, and diminutives. Research has demonstrated that persons with obvious disabilities and those who live in institutions are more likely to be the recipients of patronizing speech than are persons who do not have obvious disabilities or those who are community dwelling. By using patronizing speech, staff may be reinforcing dependency and increasing social isolation among the people they provide care to, thereby precipitating physical, cognitive, and functional declines (Ryan, Giles, Bartolucci, & Henwood, 1986). The relationship between caregivers, use of patronizing speech while interacting with persons with Alzheimer disease and their beliefs about Alzheimer disease is being examined in this study. Preliminary results will be discussed.

18 Working memory capacity and iconic gesture production: Do our hands help us remember?

L. Smithson (Department of Psychology, University of Alberta)

Iconic gesture production may facilitate speech production by making use of visuospatial working memory and by indirectly affecting verbal working memory capacity (Krauss, 2004; Wesp, 2001). By maintaining spatial representations of concepts that are described verbally, gestures can make use of the visuospatial working memory to increase verbal fluency (Krauss, 2004). Individuals with low levels of working memory may use iconic gestures to a greater extent to compensate for poor working memory capacities (Wesp, 2001).

In a study by Wagner (2006), it was shown that individuals who scored poorly on the OSPAN working memory test (which requires participants to remember a string of letters while solving math problems) benefited significantly from gesture use, whereas individuals who scored well did not show any change in performance when gesture was permitted. Therefore, when working memory is overloaded with information, the addition of another modality of representation may enhance performance. Accordingly, when compared to individuals with higher levels of working memory on a task with a similar level of difficulty, we would expect individuals with lower working memory to have a higher iconic gesture production rate.

The purpose of this research is to clarify the function of iconic gesture production in relation to working memory capacity. English monolingual adults were included in this study. Participants were asked to watch cartoons and to retell the stories. Their stories

were videotaped and transcribed. Gestures were coded and gesture rates were calculated for each participant. Working memory capacity was assessed through a memory battery called the Automated Working Memory Assessment (AWMA). This is a standardized test that enabled working memory capacity comparisons between participants.

Our preliminary findings suggest that individuals who have lower working memory capacities have higher iconic gesture production rates than those with higher capacities of working memory.

19 **Selection of spatial reference directions**

K. Hemrick, M. Teyema, Z. Tundak, & W. Mou (Department of Psychology, University of Alberta)

Objective: It has previously been suggested that humans establish an allocentric reference direction when viewing an array of objects from a single viewpoint and form allocentric representations in memory. It is unclear, however, whether these findings can be translated to more real-life situations that involve navigating through space, wherein the entire spatial layout is not visible from a single viewpoint. One hypothesis is that humans integrate object locations perceived at each viewpoint with respect to a common allocentric reference direction and allocentric spatial memories of object locations are formed. The alternative hypothesis is that humans update object locations perceived at different viewpoints with respect to their current egocentric reference direction and no allocentric spatial memory of object locations is formed. To test these two hypotheses a more naturalistic paradigm was used, having subjects self-navigate through a spatial array.

Method: Students from the University of Alberta (F=8; M=8) donned a head-mounted display and were asked to navigate through a virtual array of six objects along a predetermined path. Three of the six path legs were orthogonal with the virtual room and three were non-orthogonal. Objects were displayed sequentially and then removed from view when the path leg was completed. After participants completed ten trials and learned locations of all six objects, they conducted judgments of relative directions (JRD, e.g. “imagine you are standing at X, facing Y, please point to Z”). All of the imagined headings at JRD were parallel with the experienced paths.

Results: Collectively, subjects demonstrated significantly higher pointing accuracy in the aligned (orthogonal) paths than in the misaligned (non-orthogonal) path legs ($t(15)=-3.02$, $p<0.01$). This suggests that subjects may have preferentially relied on the external cues of the room, which supports the hypothesis of selecting a common allocentric frame of reference.

Conclusions: These results suggest that people may also favour the use of external cues when learning object locations from multiple orientations during locomotion. Although this experiment was based on a virtual room, these findings may apply to more naturalistic situations of everyday spatial updating. However, further research is required to explore this possibility.

20 **Cognitive impairment in three subtypes of multiple sclerosis: A meta-analysis**

D. J. LaFreniere & S. E. Purdon (Alberta Hospital Edmonton Neuropsychology, Alberta Health Services)

Multiple sclerosis (MS) is a degenerative autoimmune disorder with associated demyelination of cerebral cortex that typically results in slow motor and psychomotor speed. Several subtypes of MS have been introduced to differentiate between the progression of the degeneration; a relapsing-remitting, a primary progressive (linear descent), and a secondary progressive variant (a relapse-remitting pattern that evolves into a linear descent). The current study offers a quantitative review of several tests of cognitive status that have been used in MS investigations, with the goal of delineating subtype-specific profiles of cognitive decline. All three variants of MS were associated

with cognitive impairment on phonological verbal fluency (VF), the paced auditory serial addition test (PASAT), the symbol digit modalities test (SDMT), the verbal selective reminding test (VSRT), and the Stroop test. The secondary progressive group exhibited more substantial impairments on VF, SDMT, and VSRT than the primary progressive group, which in turn was more impaired than the relapsing-remitting group. The PASAT and Stroop showed less differentiation between groups. Cognitive profiles of the three most common variants of MS may be better differentiated with tests of verbal production speed, visuomotor tracking speed, and verbal learning, than with tests of working memory or response inhibition.

21 Cognitive impairment in abstinent methamphetamine users: A meta-analysis

R. D. Field & S. E. Purdon (Alberta Hospital Edmonton Neuropsychology, Alberta Health Services)

Methamphetamine (MA) is a stimulant that has powerful effects on the central nervous system, and has become one of the most commonly abused illicit drugs. MA abuse has been associated with neurotoxic effects as well as a general, moderate deficit in cognitive functioning. The purpose of this study is to analyze the persistent effects of chronic MA use on cognitive function in abstinent users, specifically in the domains of executive function and memory. A meta-analysis of test performance confirms the presence of broad impairments of medium to substantial effect size in cognitive function. Impairments are noted in measures of memory (eg: RAVLT, HVLTR, etc.) and executive function (Stroop, Trails B, etc.) in abstinent MA users compared to healthy controls. Impulsivity, or the inability to suppress incorrect responses, is noted to be increased in MA users. Possible modulating variables are also included, such as demographic factors (eg: Gender, Age, etc.) and MA use patterns (eg: Duration of abstinence). Finally, a possible association between executive impairment and memory impairment is explored.

22 Relative order judgements mechanisms in subspan and supraspan lists

Y. Liu, M. Chan, & J. Caplan (Department of Psychology, University of Alberta)

Judging the relative order of events is a core function of human memory. In short, sub-span, consonant lists with immediate judgments of relative recency (JOR), instruction wording ("which item was presented earlier?" versus "which item was presented later?") was able to reverse memory search direction (Chan et al., 2009). We wondered whether instruction wording would have an analogous influence on the JOR judgment in supra-span lists. For supra-span lists - in addition to an overall recency effect, a distance effect is typically observed (e.g., Yntema & Trask, 1963), where performance improves as a function of serial position difference between the two probes. Our participants performed JORs on sub-span and supra-span consonant lists (Experiment 1; LL = 4, 8) or a range of supra-span noun lists (Experiment 2; LL = 4, 6, 8, 10). Linear mixed-effects model analysis revealed a similar instruction effect on supraspan lists as for subspan lists - increase in performance with increasing target position for the "Later" instruction and a decrease in performance with target position for the "Earlier" instruction. This suggests that JORs in both regimes may function similarly, including an attentional bias across serial position due to where the target is expected most.

23 Motivation and identity differences in heritage and foreign language learners

R. Narovlyansky, K. Noels, & A. Mellott (Department of Psychology, University of Alberta)

This study examined motivation and identity of two subgroups of heritage language learners (HLL) and a group of foreign language learners (FLL). It was hypothesized that, relative to the foreign language learners, heritage language learners would report that they were learning the language because it was important to them and they would identify more strongly with the language community. In addition, those heritage language

learners who had parents who spoke the language would have a greater sense of obligation to learn the language than those heritage language learners who did not. Two hundred and ninety-three students from the University of Alberta, who were registered in a language class, completed an online questionnaire. Mean analyses supported the hypothesis that HLL learners, particularly those with parents who spoke the heritage language, wanted to learn the language for more reasons related to their perceptions of self and a desire to interact with the language community. Furthermore, the data suggests that speaking the language is an important aspect in being a part of the language community. These results are discussed with regards to their implications for motivational theory and for language teaching practices.

24 Language priming and Chinese self and identity

K. Saunders & K. A. Noels (Department of Psychology, University of Alberta)

The purpose of this study is to examine how the thoughts on identity of individuals of Chinese ethnicity change depending on the context they are in. Seventy-three participants, who were enrolled in an introductory psychology class at the University of Alberta, were asked to fill out a paper questionnaire in either English or Chinese. All participants were chosen because they were proficient in English and Chinese, and were born in Canada or a permanent resident or naturalized citizen of Canada. It was hypothesized that, relative to those who completed the questionnaire in English, individuals who completed the questionnaire in Chinese would report a more dialectical sense of self, express lower self-esteem, and describe themselves as more interdependent. It was also hypothesized that participants who completed the Chinese questionnaire would report a stronger Chinese than Canadian identity (relative to those who complete the English questionnaire). Despite this general tendency, however, it was expected that, regardless of the language of the questionnaire, participants would express greater Chinese (and lower Canadian identity) in family and friendship scenarios, and stronger Canadian (and lower Chinese identity) in the university and community scenarios. The results are discussed in terms of their theoretical implications for the understanding of the ethnic identity of bicultural and bilingual individuals, and for their practical implications for the integration of immigrants into Canadian society.

25 The influence of others on second language learning motivation

A. Howerly, K. Marchak, K. A. Noels, K. D. Saumure, & S. Adrian-Taylor (Department of Psychology, University of Alberta)

This study investigated the relationship between a second language learner's motivation to learn a language and the support they receive from others. The data in the current study were collected through an open-ended questionnaire completed by 104 students in language courses, including heritage language learners (HLL), foreign language learners (FLL), and English-as-a-second-language (ESL) learners. Participants indicated their reasons for learning the language, which were coded in terms of Deci and Ryan's (2001) categories of intrinsic and extrinsic motivation. The results showed that ESL students were more likely than the other groups to state that they were learning the language because of external and internal rewards and pressures. FLL were more likely than the other two groups to state that they were learning the language because it was intrinsically enjoyable. Open-ended questions asked participants to describe how others had either helped or hindered their language learning, including family, peers, teachers and members of the language community. The results suggest ways in which others can facilitate or hinder learners acquisition of other languages.

26 Motivational orientation, effort and engagement in French language learners

S. Mehrabi, K. A. Noels (Department of Psychology, University of Alberta), & R. C. Gardner (Department of Psychology, University of Western Ontario)

Gardner (2005) has long argued that learners are more likely to engage effortfully in the language learning process if they indicate that they wish to integrate with the target language community. Noels (2001) has argued that other reasons for learning the language, including an enjoyment of the learning process and the feeling that the language is integral to the learner's sense of self, are important predictors of the intensity of effort. This study examined these predictions from two different theoretical frameworks in university students of French as a second language, who completed a questionnaire assessing their reasons for learning the language and a variety of indices related to their engagement in the learning process and in the French community. The results of regression analyses showed that the integrative orientation was related to, but not synonymous with, intrinsic enjoyment and self-determined orientations. Moreover, the integrative orientation predicted a variety of intergroup variables, including positive attitudes towards French-Canadians, frequent and good quality contact with members of the French community, as well as more frequent use of French. In contrast, the intrinsic enjoyment and self-determined orientations predicted less classroom anxiety, greater self-perceptions of French competence, a stronger intention to learn the language and greater interest in the French language. Both sets of orientations independently predicted motivational intensity (i.e., effort). These results suggest that, in order to achieve a more complete understanding of language learning motivation, researchers must consider aspects of both theoretical frameworks.

27 Ethnolinguistic vitality and the identity of Franco-Albertans

D. Tessier, K. Marchak, K. A. Noels, & S. Gaudet (Department of Psychology, University of Alberta)

This study looked at Franco-Albertans' ethnic identity across situations, including the importance of the French language and bilingualism, and how it impacts their perception of their community's vitality. Two hundred adult Franco-Albertans participated in a telephone survey addressing their feelings of English and French identity across different situational domains and how they perceived their identities to relate to each other (e.g., conflictual, alternating, blended); their thoughts about the French and English languages; and their sense of belonging to the regional Francophone community and its current and future vitality. The results of means analyses indicated that, although both groups felt equally connected to the Franco-Albertan community and equally strongly about the importance of being Franco-Albertan, across different situational domains older adults tended to report equally strong Anglophone and Francophone identities, whereas younger adults reported stronger Anglophone than Francophone identity. Moreover, older adults reported greater conflict between Francophone and Anglophone identities than did younger adults. Younger respondents tended to feel less strongly that the French language was essential for Franco-Albertan identity. These age-related differences are consistent with sociohistorical changes in French-English relations in Canada; older generations were faced with considerably more political challenges to their language and community vitality from the majority Anglophone community than were younger generations. The implications of such generational differences for the future vitality of the community are discussed.

Invited Presentation (BioSci P226)

1:10 Making sense of the web

Connie Varnhagen (Department of Psychology, University of Alberta)

The web is a vast virtual world. Children and youth spend over 2 hours a day on the Web through computers and other electronic devices, searching for information, playing games, and communicating with people from all over the world. How do children and youth make sense of this world? In our lab, we have been studying development of critical appraisal for web based information, entertainment, and communication. I will present our developmental findings from a large study from Grade 3 to University and librarians. Our findings have practical benefit in terms of providing input to an adaptive tool to help children learn critical appraisal skills and theoretical benefit in terms of understanding cognitive development in this new domain.

Session 3 (BioSci P226)

1:30 Examining the use of technology in university education

N. Hogan & G. Corabian (Department of Psychology, University of Alberta)

University students, relationship with e-learning is complex. From our vantage point, we can appreciate the potential impacts of new technologies on the quality of our education. While there are some exciting possibilities, there are also reasons to move forward cautiously.

In our experience, modern university classes vary in the extent to which they incorporate technology. Material may be presented as notes on a chalkboard or as an electronic slideshow containing videos and interactive software. However, we do not assume that more technology is better. At its best, instructional technology provides students with a richer and more engaging learning environment. At its worst, instructional technology can be misused to the extent that it becomes an unnecessary and unwanted burden on students, and can even hinder students' ability to learn new concepts when compared to traditional instructional techniques.

It is at least as important to adhere to principles of effective and responsible use of instructional technology as it is to try to advance the technology itself. We will discuss the principles that we think are important and are often ignored. For example, new technology should only be used if it improves on existing methods and if instructors are trained to use it properly. In informal discussions with our peers, we agreed that instructors are often too quick to incorporate the latest technologies into the classroom.

1:45 Cyberbullying versus traditional bullying: Past research and future directions

K. Welker & C. Varnhagen (Department of Psychology, University of Alberta)

Cyberbullying is a recent phenomenon that has yet to be thoroughly explored, but its effects are immediately apparent and can range from distraction at school to suicide (Associated Press, 2008; Ybarra, Mitchell, Wolak, & Finklehor, 2006). To better understand adolescents, perceptions of cyberbullying, students in Grades 6, 8, and 10 completed a questionnaire indicating their agreement with whether different behaviours constituted bullying. Adolescents indicated greater agreement that traditional bullying behaviours as opposed to cyberbullying behaviours constitute bullying. Adolescents, particularly girls, also indicated greater agreement that indirect cyberbullying behaviours

(e.g., spreading rumours using text messaging) as opposed to direct cyberbullying behaviours (e.g., sending a rude or mean email or instant message) constitute bullying. To expand upon this study, we have designed a questionnaire to determine how children, parents, and teachers define bullying for themselves. The questionnaire will ask students (grades 4-11), their parents, and their school teachers to write their own definitions for bullying and cyberbullying. Participants will then be given the academic definition of bullying: intentional, repeated acts, in the context of a power imbalance (Olweus, 1994). They will be asked if they agree with the three academic criteria and will use a three point scale to indicate their level of agreement. Preliminary analyses of group, sex, and age differences will be presented. By studying the definitions used by students, parents, and teachers, we can create a more accurate definition that reflects the lived experiences of those who are most affected by cyberbullying.

2:00 Tracing the development of inhibitory control in the preschool years: A longitudinal study

S. Wiebe (Department of Psychology, University of Alberta), T. Sheffield, & K. A. Espy (Office of Research, University of Nebraska-Lincoln)

The preschool years are an important time for the development of executive control, related to the continued maturation of networks involving prefrontal cortex. This study examined the development of inhibitory control, and relations between growth and child demographic and temperament characteristics. The sample included 394 preschool children (194 girls, 200 boys), enrolled at 3, 3.75, 4.5, or 5.25 years in a cohort-sequential design, and followed longitudinally every 9 months through age 5.25. Children completed a preschool go/no-go task, and were instructed to press a button whenever a fish appeared on the computer screen (75% of trials), but withhold the button-press when a shark appeared (25% of trials). We used growth curve modeling to analyze accuracy on go and no-go trials as well as reaction times for go trials, and then examined the relations between growth parameters and covariates including maternal ratings of child temperament and behavior problems, maternal education (as an index of SES), and child sex. Children with better effortful control were more accurate on no-go trials, but less accurate on go trials. Children with fewer attention problems also were more accurate on no-go trials. Higher maternal education was associated with more accurate go performance and faster improvement in response times on go trials. Girls were more accurate on no-go trials, whereas boys responded more quickly and accurately on go trials. Results extend previous findings of sex and SES differences in preschool executive control, and suggest that lab performance is meaningfully related to everyday behavioral regulation.

Session 4 (BioSci P226)

2:30 Bioacoustics of the chick-a-dee call of the Mexican chickadee (*Poecile sclateri*)

M. K. Moscicki, M. Hoeschele, & C. B. Sturdy (Department of Psychology, University of Alberta)

To understand the communicative functions of any vocalization it is important to first classify, describe, and quantitatively measure the elements of that vocalization. Mexican chickadees (*Poecile sclateri*) produce a namesake chick-a-dee call. Here, the note types (A, C, D, and Dh) present in a sample of Mexican chickadee chick-a-dee calls are classified and described. In addition, frequency and temporal measures of each note type are analyzed and the differences in these measures are compared across note types to determine which features may be useful for note-type discrimination. Frequency measures, especially peak frequency, may potentially be the most useful features for discrimination among note types. Lastly, call syntax is analyzed and shows that Mexican

chickadees, like other chickadee species studied to date, produce the notes within their chick-a-dee calls in a fixed order: $A \rightarrow C \rightarrow Dh \rightarrow D$; there is the potential for any note type to be repeated or omitted within this sequence. These studies describe the chick-a-dee call of Mexican chickadees and provide a foundation for future work aimed at understanding the communicative significance of this call within this species as well as for comparative work on the chick-a-dee call among chickadee species.

2:45 Discriminating dames discern dominant dudes: Acoustic mechanisms signaling dominance in black-capped chickadees

C. B. Sturdy, M. Hoeschele, M. K. Moscicki (Department of Psychology, University of Alberta), K. A. Otter, H. van Oort, K. T. Fort (Department of Biology, University of Northern British Columbia), T. M. Farrell, H. Lee, & S. W. J. Robson (Department of Psychology, University of Alberta)

Male songbirds use acoustic signals (i.e., songs) to attract and retain females (i.e., mates). Females, in turn, select males based on the acoustic characteristics of male song, such as song complexity, or dominance status. Bioacoustic analyses of male black-capped chickadee fee bee songs revealed a potential acoustic mechanism signaling male dominance status; the relative amplitude of the two song notes. The fee and bee is more consistent in dominant males, while subordinate males sing quieter fee notes relative to the bee note. Using playback of unknown male fee bee song to female black-capped chickadees we found that females respond differentially to dominant and subordinate songs. Females vocalize more and are more active during dominant song playback. These studies identify a novel acoustic cue related to the dominance status of the singer and that dominance status, as signaled by this acoustic cue, is perceived by females.

3:00 Musical perception and octave generalization in humans: how can we compare them to songbirds?

M. Hoeschele (Department of Psychology, University of Alberta), R. Weisman (Department of Psychology, Queen's University), & C. Sturdy (Department of Psychology, University of Alberta)

Songbirds are often used as models for the evolution of language learning because of their similar vocal development. In addition, it is thought that modern human music and language may have the same evolutionary origins. Thus, the study of songbirds, with regards to basic music perception, may be fruitful. Octave generalization, or the ability to treat notes with a doubling of frequency as the same note, is a basic part of human musical perception. In past studies, songbirds have failed to generalize to octaves, however, humans also fail to generalize to octaves in some experimental contexts. We replicated an experiment with humans that originally showed a failure of European starlings to generalize to octaves. We found that humans also failed to generalize to octaves in this task, unless they were members of a rare group of absolute pitch possessors. We discuss the implications of these results and address what we believe should be the next step for human-songbird biomusicology comparisons.

3:15 All's quiet on the cerebral front: The silencing effect of protein synthesis inhibition on spontaneous neural activity

A. V. Sharma, C. D. Hughes (Department of Psychology, University of Alberta), & C. T. Dickson (Department of Psychology, Department of Physiology, & Centre for Neuroscience, University of Alberta)

There is much evidence suggesting that memory formation has multiple and dissociable temporal stages (e.g., encoding and consolidation). Of this, the most salient has been the effect of post-training brain manipulations that engage, modify or disrupt intracellular signaling. Memory can be enhanced in the post-training period by locally applied stimulants and can be impaired by local suppression of protein synthesis. This suggests that the temporary neural changes brought about by learning are subsequently strengthened by molecular events occurring after the learning episode. A tacit assumption regarding the intracerebral application of currently available protein synthesis inhibitors (PSIs) is that they have no effect upon spontaneous brain electrical activity, even

though evidence for this is weak at best. Since PSIs have recently been documented to have a variety of unexplained and potentially detrimental biological effects, we decided to carefully re-evaluate this idea. Bilateral hippocampal recordings were made in urethane anaesthetized rats before, during and after unilateral intrahippocampal infusions of varying concentrations of anisomycin (ANI), a commonly used PSI. Ipsilateral to infusion, we used a 16-channel linear recording probe that simultaneously sampled local field potentials and multiunit activity and contralaterally we implanted a monopolar electrode. We found that ANI infusions effectively silenced ongoing ipsilateral spontaneous field and multiunit activity for a long (>4 hour) period. Calculation of current flow using current source density analysis on laminar traces showed a similar suppression. This was in contrast to the contralateral signal which showed little to no decrement in activity across the same time period. The ipsilateral suppression of neural activity was correlated with the degree of intrahippocampal protein synthesis inhibition as measured by the incorporation of radio-labelled amino acids. These results present a critical problem for the de novo protein synthesis hypothesis, as they demonstrate a strong confound for all results obtained using ANI to test memory consolidation.

Keynote Address (MEC 2-1)

3:45 The executive functions dependent on prefrontal cortex: Genetic and environmental influences and educational and clinical implications
Adele Diamond (Department of Psychology, University of British Columbia)