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Scientific Day



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Recueil de résumés  
Abstracts booklet



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**CRLEC**  
Centre de recherche sur le langage,  
l'esprit et le cerveau  
FACULTÉ DES SCIENCES HUMAINES  
Université du Québec à Montréal

Conférence d'honneur  
 Distinguished Lecture

**11:00 – 12:00**  
**Amphithéâtre (SH-2800)**

**Early Language Acquisition: Infant Brain Measures Advance Theory.** Patricia Kuhl, Co-Director, Institute for Learning & Brain Sciences, University of Washington

Neuroimaging the infant brain is advancing our understanding of the human capacity for language and helping to elucidate 'critical periods' for language learning early in development. I will describe studies and data that test specific hypotheses about the nature of the mechanisms underlying human language learning. One hypothesis under test is that early in development, infant learning is 'gated' by the social brain. Our work is leading to the identification of biomarkers that may allow early diagnosis of risk for language impairments such as autism and dyslexia. Language is a model system for understanding humans' most advanced capabilities.

Lunch

**12:00 – 13:00**  
**Salle polyvalente (SH-4800)**

Séance d'affichage  
 Poster session

**13:00 – 16:00**  
**Salle polyvalente (SH-4800)**

**01. Norepinephrine enhances vocal learning by promoting the sensory encoding of communicative signals.** Yining Chen (McGill University), Jon T. Sakata (McGill University)

Learning the acoustic structure of communicative sounds forms the basis of vocal learning. Indeed, it is important to memorize the sound of a signal before learning the motor commands to produce the sound. As such, it is critical to understand the processes underlying auditory learning to reveal mechanisms of vocal learning. Catecholamines such as norepinephrine (NE) have been implicated in auditory learning for vocal learning. We investigated the extent to which NE modulated the auditory learning of communicative signals ('songs') in the zebra finch, a songbird that learns its song in a manner that parallels how

humans acquire speech. We have previously demonstrated that NE-synthesizing neurons are more active under conditions that promote the sensory learning of song. To determine whether NE can enhance auditory learning for vocal learning, we infused NE into an auditory processing area implicated in sensory learning as juvenile songbirds heard song for the first time in their lives. Relative to control birds, birds that were given NE during song tutoring produced songs as adults that were significantly more similar to the songs they were tutored with. Furthermore, birds given NE during tutoring (but not control birds) showed evidence of song learning within days of tutoring. These findings indicate that NE significantly and rapidly promotes the sensory learning of song in the service of vocal learning and suggests the

possibility that NE in auditory processing areas could contribute to speech learning in humans.

**02. Machine learning approaches uncover the acoustic bases of vocal learning biases.** Logan James (McGill University), Ronald Davies (McGill University), Jon Sakata (McGill University)

Vocal learning (e.g., language acquisition) is sculpted by biological predispositions. However, revealing the nature of these predispositions requires controlled experiments and computational approaches. Songbirds like the zebra finch offer a powerful opportunity to reveal the nature of vocal learning biases. By tutoring naïve zebra finches with random sequences of species-typical vocal elements, we have previously documented biases in how zebra finches sequence their acoustic elements (i.e., positional biases). For instance, the last element in the song tended to be longer than other elements in the song (similar to phrase-final lengthening in human speech), and elements in the middle of song tended to be higher in pitch (similar to harmonic arch structure for musical phrases). To further reveal the nature of learning biases, we employed machine learning algorithms to classify acoustic elements based on their position within the song (i.e., beginning, middle, end) and to determine which acoustic features (duration, pitch, amplitude, and various measures of entropy) provided the most predictive information about positional variation. Using random forest algorithms, we found that duration provided the most predictive information about position in song. Pitch and amplitude, followed by various measures of entropy, were secondary to duration and provided additional predictive information about position. A clustering algorithm also revealed two distinct groups with different weights across features. These data reveal the potential for machine learning algorithms to uncover the structure of learned vocal signals, and we are extending these machine learning analyses to investigate “rules” underlying vocal sequencing across vocal learning species.

**03. “Hi baby”, “Allô Bébé”: Does infants’ ability to associate a speaker with a language require visual cues?** Maria Tamayo (Concordia University), Esther Schott (Concordia University), Krista Byers-Heinlein (Concordia University)

Infants can distinguish between male and female voices (Johnson et al., 2011) and between different languages (Byers-Heinlein et al., 2010), but can they combine these two skills to

associate a person with the language they speak? One of our previous studies suggests that infants are not able to associate a speaker with a language when only hearing the speaker’s voice (Schott & Byers-Heinlein, 2017). The current follow-up study investigates whether visual cues are required for infants to make an association between the speaker and the language they speak. We use a looking time eye-tracking study to test monolingual and bilingual infants aged 12 and 18 months. This study uses the same familiarization-test paradigm as our previous study, but includes visual stimuli (speakers’ faces) in addition to auditory stimuli (speakers’ voices). During familiarization, participants watch video clips of speakers telling a story in either English or French. At test, the speakers either continue using the same language (same trials) or switch to the other language (switch trials). We predict that visual cues will facilitate infants’ ability to associate a speaker with a language. Thus, participants should notice the language change and look longer to switch trials than to same trials when hearing and seeing the speaker. Data collection for this study is ongoing. These results will be relevant for bilingual caregivers adopting a one-person-one-language approach, as speaking to infants exclusively in one language would only be particularly beneficial if infants are able to associate each caregiver with a specific language.

**04. Daddy speaks English, Maman parle français: Do bilingual and monolingual infants form associations between a person and the language they speak?** Esther Schott (Concordia University), Krista Byers-Heinlein (Concordia University)

Do infants form associations between a person and the language they speak? Advocates of the one-person-one-language approach argue that this skill could help bilingual infants acquire their languages (Doepke, Australian Review of Applied Linguistics, 1998). We used a looking-time paradigm to test whether 5-month-old ( $N = 38$ ) and 12-month-old ( $N = 50$ ) infants notice when a speaker switches the language they speak. Monolingual (English or French) and bilingual (English-French) infants were familiarized to a woman speaking English and a man speaking French (or vice-versa) while seeing a constant visual stimulus (flowers). At test, the voices either continued speaking the same language (same trials) or switched to the other language (switch trials). If infants notice the switch, they are expected to look longer during the switch trials than same trials. We found no evidence that 5-month-olds ( $p = .86$ ) or 12-month-olds ( $p = .54$ ) noticed the switch. Moreover, there was no

interaction with infants' language background (monolingual vs. bilingual;  $p > .05$ ). Thus, we found no evidence that infants are keeping track of which person speaks which language. Ongoing research is investigating whether additional cues such as the presence of a speaker's face can help infants to form associations between a person and the language they speak.

**05. Do Mothers Listen to Form or Function in Their Infant's Speech?** Chu Han Wang (McGill University), Pegah Athari (McGill University), Susan Rvachew (McGill University)

A social shaping mechanism has been hypothesized to explain early vocal development. Specifically, contingent maternal responses to infant utterances increase the ratio of speech-like to nonspeech-like vocalizations produced by infants in controlled laboratory experiments (Bloom 1987, 1988; Goldstein, King & West, 2003; Goldstein & Schwade, 2008). However, it is not clear that social shaping explains infant vocal behaviour in natural mother-infant interactions. In a longitudinal study we investigated the relationship between the form and function of infant vocalizations and contingent maternal responses to vocalizations produced by four infants (Infant 1, 6 – 10 mos; Infant 2, 6 – 8 mos; Infant 3, 11 – 14 mos; Infant 4, 11 – 14 mos). It was hypothesized that mothers would be more likely to provide a contingent (as opposed to noncontingent) vocal response to her infant's vocalization if it was more speech-like, confirming the role of social shaping as a mechanism to increase speech-like infant vocalizations with age. Contrary to these expectations, mothers did not reliably respond contingently to speech-like vocal forms. Instead, they focused on forms that they perceived as meaningful (i.e., canonical babbles or other vocals): Infant 1  $\chi^2(1) = 51.102, p < 0.05$ ; Infant 2  $\chi^2(1) = 15.789, p < 0.05$ ; Infant 3  $\chi^2(1) = 110.418, p < 0.05$ ; Infant 4  $\chi^2(1) = 223.401, p < 0.05$ . We conclude that the interactions appear less like social shaping and more like "mutual creativity and a cocreation of novelty" as described by Hsu and Fogel (2001).

**06. Linking Intrinsic Anatomical Connectivity and Second-Language Learning Success Using Improved Tractography Reconstruction of Language Pathways.** Kaija Sander (McGill University), Elise B. Barbeau (McGill University), Shari Baum (McGill University), Michael Petrides (McGill University), Denise Klein (McGill University)

Learning a first language occurs easily and naturally at a young age. However, learning a second language (L2) at a later age is

more difficult, and there is a large variability in L2 acquisition, with individuals learning with more or less difficulty depending on the age and way of acquisition. Variability in L2 acquisition is also influenced by between-individual differences in language learning abilities, though little is known about the factors that lead to those differences. The main goal of this project is to identify individual neural biomarkers or predictors associated with language learning success. Specifically, we are interested in the white matter tracts connecting the language regions of the brain to determine how brain plasticity relates to variability in language learning. Monolingual English speakers took an intensive 12-week French course. Before and after the course, we obtained anatomical T1 and diffusion MRI data, and behavioural data measuring language proficiency for each subject. We reconstructed language tracts of the brain using improved tractography protocols, to help us identify differences between individuals in anatomical brain connectivity. This project has several outcomes that could be relevant to our understanding of L1 or L2 acquisition, and even certain disorders involving language. Linking intrinsic anatomical patterns and the ability to acquire an L2 could inform us on neural biomarkers predicting L2 learning success or difficulties. This could eventually be translated into teaching methods for children with learning disabilities or developmental disorders affecting language, and stroke patients who have some language impairments.

**07. Bilingualism and Irony Processing: Is There A Relationship?** Fiona Deodato (McGill University), Mehrgol Tiv (McGill University), Debra Titone (McGill University)

Irony is a common linguistic device that indirectly communicates one's attitude through humor, muted affect, or insincerity. Despite its ubiquity, little is known about how bilinguals, who may uniquely exercise similar cognitive capacities as those that support processing of indirectly language, comprehend and process irony. Prior work has suggested that bilingual experience relates to core capacities of irony processing, such as potential advantages in executive functions and increased social and linguistic awareness due to the constant cross language activation and inhibition. Thus we were interested in investigating the extent to which bilingual second language (L2) experience, specifically global L2 proficiency and age of acquisition (AoA), and working memory (WM) modulate irony comprehension when reading in the first language (L1). A sample of 48 English-L1 bilinguals read

positive and negative scenarios and were required to make sensibility judgments to subsequent literal, ironic or anomalous statements as we recorded their reaction time. Results suggest that 1) bilinguals responded more slowly to ironic vs. literal statement; but faster to ironic vs. anomalous statements 2) bilinguals found an ironic statement following a negative scenario easier to process than following a positive scenario; 3) bilinguals were faster and more easily recognized irony as their global L2 proficiency increased. These results are consistent with the idea that irony comprehension is facilitated by cognitive capacities that are promoted by bilingual experience.

**08. Greater Bilingual Language Experience Predicts Greater Sarcasm Use in Daily Life.** Mehrgol Tiv (McGill University), Vincent Rouillard (Massachusetts Institute of Technology), Naomi Vingron (McGill University), Sabrina Wiebe (McGill University), Debra Titone (McGill University)

We investigated whether bilingual language experience impacts indirect language use in daily life, particularly with respect to sarcasm. Prior work suggests that language experience promotes metalinguistic awareness and executive control, which likely support our ability to engage in indirect communication. Thus, in this study, we predicted more frequent use of sarcasm among bilinguals vs. monolinguals, especially among more fluent bilinguals. To test these predictions, 116 adults (25 self-reported monolinguals and 91 self-reported bilinguals) completed the Sarcasm Self-Report (Ivanko, Pexman, & Olineck, 2004) and Conversational Indirectness Scales (Holtgraves, 1997), along with a language experience questionnaire. There were three key results: First, using principle component analysis, we found components relating to General Sarcasm, Embarrassment Diffusion, and Frustration Diffusion, partially replicating Ivanko et al. who studied individuals presumed to be monolingual. Second, using these component scores as dependent variables in multiple regression analyses for bilingual adults, we found that components related to increased L2 proficiency (but not L2 age of acquisition) predicted greater general sarcasm use (i.e., more proficient L2 users used sarcastic language more frequently). Finally, we observed overall greater use of sarcasm (based on the same component scores) in bilinguals as a group compared to monolinguals as a group, where monolinguals reported comparable sarcasm tendencies as low-medium proficiency bilinguals. Taken together, these results indicate that greater bilingual language experience is related to greater use of sarcasm in daily life. We are now investigating whether and how the

relationship between bilingual language experience and sarcasm use manifests during on-line language processing.

**09. The Impact of Sentence Context and Visual Speech Cues on Speech Perception under Noisy Conditions in Bilinguals.** Alexandre Chauvin (Concordia University), Jean-Louis René (Concordia University), Natalie Phillips (Concordia University)

Listening environments are rarely pristine; background noise is omnipresent. Nevertheless, most people perceive speech well, suggesting the existence of mechanisms to support speech processing in noise. For example, visual cues (e.g., lip movements) improve speech perception under poor listening conditions. Likewise, semantic and lexical information (i.e., contextual cues) help disambiguate speech. These effects are well documented in native listeners, but little is known about them in non-native listeners. In this ongoing study, we are investigating the extent to which bilinguals benefit from visual speech cues and contextual information in their first (L1) and second language (L2). Participants were presented with sentences in noise (twelve-talker babble) and asked to repeat the terminal word of each sentence. Half of the sentences offered contextual information (e.g., “In the woods, the hiker saw a bear.”) while the rest offered little context (e.g., “She had not considered the bear.”). The sentences were presented in three modalities: visual, auditory, and audio-visual. Preliminary results with younger adults (Mage = 25.2; Medu = 15.4; ML2 fluency = 4.3 / 5) show greater accuracy in L1 and L2 when contextual cues and/or visual speech cues are available, suggesting that these sources of information can be used in L2. We will present current data on young adult and discuss the implications for aging as we prepare to test bilingual older adults. We predict that older adults may benefit from both context and visual speech cues to a greater extent than younger adults as this may help compensate for sensory decline.

**10. Individual differences in language mixing modulate cross-language syntactic activation during natural reading.** Naomi Vingron (McGill University), Jason Gullifer (McGill University), Veronica Whitford (University of Texas at El Paso)

An open question is whether bilinguals activate non-target syntax during natural reading, and whether differences in L2 experience modulate this activation. English exclusively places adjectives before nouns (the red truck), whereas French typically places adjectives after nouns (le camion rouge). Here, we

monitored eye movements of 27 French-English bilinguals (French=L1) as they read intact English sentences or English sentences containing violations consistent/inconsistent with French (He saw the truck red parked on the street. vs. He saw red the truck parked on the street.). GDs 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 than the others. GDs on the post-target region (on the street) were slower for French-consistent violations for bilinguals who rarely mix languages. Interestingly, TRTs were slower for all bilinguals reading French-consistent violations vs. intact sentences, suggesting either downstream integrative effort or heightened salience for cross-language violations. These results suggest that bilinguals indeed access non-target language syntax during natural reading, though the way in which this affects sentence processing differs based on individual differences in language background.

**11. Bilinguals Show Limited Eye Movement Evidence of Cross-Language Syntactic Activation for Direct-Object Constructions.** Naomi Vingron (McGill University), Ying Ying Liu (McGill University), Pauline Palma (McGill University), Veronica Whitford (University of Texas at El Paso), Deanna Friesen (Western University), Debra Jared (Western University), Debra Titone (McGill University)

Important questions for bilingual reading are whether target language syntax is exclusively activated when reading in a particular language, whether syntax from another known language is co-activated, and how prior language experience modulates this. Here, we investigate these questions for direct-object constructions using eye tracking. In English, verbs always precede direct-objects (I love her), while in French this precedence only holds when the direct-object is a full noun (J'aime Lucy vs. Je l'aime). French-English bilinguals (L1 French: N=27; L1 English: N=57) read English sentences containing intact (She drives it), French-consistent (She it drives) or French-inconsistent direct-object constructions (Drives she it). Eye movement measures revealed a bilingual reading cost for sentences containing direct-object constructions violated in a manner either consistent or inconsistent with French in both L1 and L2 readers. However, individual differences in language mixing only modulated the reading times for first language reading (English-native) but not for second language reading (French-native). Taken together, there was only limited evidence

for robust cross-language syntactic activation for direct-object constructions when French-English bilinguals read in their second language (English), unlike our prior findings for the same participants examining adjective-noun constructions that differ across English and French (e.g., the red car, the car red). Thus, cross-language activation during bilingual reading may depend on the particular type of syntactic construction that conflicts across languages. Specifically, constructions that cross syntactic boundaries (e.g., direct-object constructions) may be more amenable to cross-language activation than constructions that do not (e.g., adjective-noun constructions), which has implications for second language instruction.

**12. Entraîner les habiletés métamorphologiques par l'éveil aux langues: conception et évaluation d'un dispositif didactique.** Alexandra H. Michaud (Université du Québec à Montréal)

Plusieurs chercheur·euse·s recommandent aux enseignant·e·s de français langue d'enseignement de prendre des mesures adaptées à l'hétérogénéité linguistique de leur classe (Armand, Beck et Marillet, 2004; De Pietro, 1999; Candelier, 2003), plutôt que de fonder leur enseignement sur l'idée que tou·te·s ont la langue de scolarisation comme langue première (Dabène, 1992; De Pietro, 1999; Perregaux, 1993). À ce sujet, des programmes d'éveil aux langues (EAL) ont été développés pour éveiller les élèves à la diversité linguistique du monde et légitimer les langues des élèves qui n'ont pas la langue d'enseignement comme L1 (Candelier, 2003; Armand, Beck et Marillet, 2004). Un des objectifs de l'EAL est d'ordre métalinguistique. Parmi les habiletés métalinguistiques susceptibles d'être entraînées avec un programme d'EAL, les habiletés métamorphologiques revêtent un intérêt particulier pour le développement des compétences en littératie (Carlisle, 1995 ; Carlisle, 2010, Fejzo, Godard et Laplante, 2014; Fejzo, 2016). Notre étude poursuit comme objectif la conception et l'évaluation d'un dispositif didactique d'éveil aux langues pour l'entraînement des habiletés métamorphologiques des élèves du deuxième cycle du primaire. Cette recherche-développement suit une méthodologie inspirée de Van der Maren (1996) qui comprend 1) la définition du problème de recherche, 2) la formulation des objectifs, 3) la création du prototype, 4) l'évaluation du prototype et 5) sa bonification et la conception de la version finale.

**13. Does lip reading make speech comprehension easier for everyone? Electrophysiological evidence on interindividual differences in younger and older adults with varying working memory capacity.** Nathalie Giroud (Concordia University), Max Herbert (Concordia University), Natalie Phillips (Concordia University)

For older adults, speech comprehension represents a strong load on working memory because of the need to rapidly process auditory cues while maintaining relevant information. The presence of visual cues (i.e., lip movements) during speech processing has been shown to enhance speech comprehension in older adults. However, the relation between audiovisual speech processing and working memory remains unclear. In this EEG study, we investigated the extent to which interindividual differences in audiovisual speech processing may be explained by working memory capacity (WMC) in younger ( $N=32$ ,  $M=23.66y$ ) and older adults ( $N=16$ ,  $M=73y$ ). The N400 was recorded time-locked to the last word of high and low predictable sentences. The semantic context (SC) effect was quantified as the difference in the N400 magnitude evoked by low minus high predictable sentences and assessed separately for an auditory-only (AO) and an audiovisual condition (AV). All individuals, regardless of age or WMC, showed an earlier SC effect (approx. 80ms) in the AV condition compared to the AO condition, highlighting the faster integration of unpredictable words in sentences with visual cues available. Additionally, we found a stronger SE effect in the AV condition compared to the AO condition, but only in individuals with high WMC. Thus, our data suggest that only a high WMC allows to use visual speech cues to create strong predictions about the end of a sentence. We therefore argue that individual differences in WMC may relate to qualitatively different aspects of the audiovisual benefit during speech comprehension in young and older adults.

**14. Auditory discourse processing in bilinguals: An ERP analysis.** Maude Brisson-Mckenna (Concordia University), Angela Grant (Concordia University), Natalie Phillips (Concordia University)

When communicating in a second language (L2), one may feel competent at producing and comprehending single words or phrases, but producing and comprehending extended discourse is often more challenging. Yet, most psycholinguistic studies have focused on investigating the role of bilingualism on word- and sentence-level processing. As such, the goal of our current

experiment is to contrast two different frameworks of discourse processing in L2. The Capacity Theory of language comprehension (Just & Carpenter, 1992) predicts that bilinguals are only able to benefit from discourse-level cues in L2, such as semantic and world knowledge information, if they have the sufficient working memory capacities to do so. In contrast, the Noisy Channel Model (Gibson, Bergen, & Piantadosi, 2013) predicts that bilinguals will rely mainly on discourse-level cues in L2 as they are less familiar with the syntax. In the current study, English-French bilinguals listened to short stories in English and in French while their brain activity was recorded using electroencephalograms. We examined whether bilinguals were more sensitive to discourse-level or word-level cues in their L2 compared to in their first language (L1) by looking at the amplitude and latency of the N400 component. Stimulus-locked analyses revealed greater negativities in L2 compared to in L1 ( $p = .012$ ). We interpret this as reflecting the overall greater processing load in L2. We also found a significant N400 effect for the discourse-level cues ( $p = 0.031$ ) and no significant effects for the word-level cues, thus lending support to the Noisy Channel Model.

**15. The Role of Semantic Context in Bilingual Speech Perception in Noise: An ERP Investigation.** Kristina Coulter (Concordia University), Annie Gilbert (McGill University), Shanna Kousaie (McGill University), Debra Titone (McGill University), Denise Klein (McGill University), Vincent Gracco (McGill University), Natalie Phillips (Concordia University)

Although speech perception often occurs in suboptimal listening conditions, semantic context can help individuals perceive speech under noisy listening conditions in their native language (L1). However, the extent to which bilinguals can use semantic context while perceiving speech in noise in their second language (L2) is unclear. Therefore, we used event-related brain potentials (ERPs) and an adapted version of the Revised Speech Perception in Noise Task to examine this in 15 English-French, 19 French-English sequential bilinguals, and 16 simultaneous bilinguals. Participants listened to English and French sentences varying in sentential constraint, leading to a predictable or unpredictable final word (e.g., high: “The lion gave an angry roar.”, low: “He is thinking about the roar.”). Participants repeated the final word of each sentence. Sentences were presented in quiet and noise (i.e., a 16-talker babble mask). Larger N400 amplitudes were observed in quiet compared to noise and in L2 compared to L1. A larger and later N400 was

observed for low context sentences compared to high context sentences across all groups and in L1 and L2, suggesting more effortful processing of low compared to high constraint sentences. High constraint sentences elicited larger N400 amplitudes in L2 compared to L1 while low constraint sentences elicited similar N400 amplitudes in L1 and L2. These findings indicate that, although bilinguals benefit from semantic context during speech perception in both their languages, bilinguals appear to benefit from semantic context to a lesser extent in their L2 compared to L1.

#### 16. **Self-reported effect of background music in older adults.**

Amélie Cloutier (Université de Montréal), Nathalie Gosselin (Université de Montréal), Élise Cournoyer Lemaire (Université de Sherbrooke)

Background music accompanies our daily activities at all ages, whether of a cognitive nature or not. Car driving, reading, cooking and sports are good examples. Moreover, a qualitative study reports that many older people testify that music has a positive impact on their cognition, but also on their mood. However, studies investigating the effect of background music on cognition present heterogeneous results. The main objective of this study is to compare the self-reported effect of background music on cognition and emotions in the elderly, using a rating scale questionnaire. This study also aims to explore the preferences and musical habits of this population in relation to their daily activities. In order to achieve these objectives, 20 people aged over 60 completed the questionnaire. Preliminary results suggest that background music has a significantly more positive impact on emotions compared to cognition. Also, older adults prefer to listen to relaxing and familiar music when they perform a cognitive activity. However, they prefer to listen to stimulating and familiar music with lyrics during non-cognitive activities. In conclusion, these results seem to converge with the literature on the effect of background music on cognition in adolescents and young adults.

**17. Inhibitory and Lexical Frequency Effects in Younger and Older Adults' Spoken Word Recognition.** Sarah Colby (McGill University), Victoria Poulton (McGill University), Meghan Clayards (McGill University)

Older adults are known to have more difficulty recognizing words with dense phonological neighbourhoods (Sommers & Danielson, 1999), suggesting an increased role of inhibition in

older adults' spoken word recognition. Revill & Spieler (2012) found that older adults are particularly susceptible to frequency effects, and will look more to high frequency items compared to younger adults. We aim to replicate and extend the findings of Revill & Spieler (2012) by investigating the role of inhibition along with frequency for resolving lexical competition in both older and younger adults. Older (n=16) and younger (n=18) adults completed a visual word paradigm eyetracking task that used high and low frequency targets paired with competitors of opposing frequency, and a Simon task as a measure of inhibition. We find that older adults with poorer inhibition are more distracted by competitors than those with better inhibition and younger adults. This effect is larger for high frequency competitors compared to low. These results have implications for the changing role of inhibition in resolving lexical competition across the adult lifespan and support the idea that decreased inhibition in older adults contributes to increased lexical competition and stronger frequency effects in word recognition.

**18. Bilingual Experience and Executive Control over the Adult Lifespan: The Role of Biological Sex.** Sivaniya Subramaniapillai (McGill University), Maria Natasha Rajah (McGill University), Stamatoula Pasvanis (Douglas Institute Research Centre), Debra Titone (McGill University)

We investigated whether bilingual language experience over the lifespan impacts women and men in a manner that differentially buffers against age-related declines in executive control. To this end, we investigated whether executive control performance in a lifespan sample of adult women and men were differentially impacted by individual differences in bilingual language experience, assessed using an unspeeded measure of executive control, the Wisconsin Card Sort Test. The results suggested that women showed both the greatest degree of age-related decline across WCST measures, and a greater likelihood than men to express improved performance as a function of increased bilingual experience. We consider implications of this finding for advancing our understanding of the relation between bilingualism and cognition, and also the effects of biological sex on cognitive aging.

**19. Relationship of pure-tone and speech-in-noise measures of hearing to scores on the Montreal Cognitive Assessment Scale (MoCA): Sex differences and comparisons to other neuropsychological test results.** Faisal Al-Yawer (Concordia University), Halina Bruce (Concordia University), Karen Li (Concordia University), M. Kathleen Pichora-Fuller (University of Toronto), Natalie Phillips (Concordia University)

Research shows a relationship between hearing loss (HL) and cognitive decline in older adults. Scores on the Montreal Cognitive Assessment (MoCA), a brief screening measure, show an association with HL. Furthermore, there are sex-related differences in the prevalence of age-related HL. It is unclear how the association between HL and MoCA scores compares to the association between HL and more comprehensive neuropsychological testing or if these associations between cognitive tests and HL vary by sex. 170 older adults (M=68.94 years;61.2% female) were tested. Hearing was assessed using pure-tone audiometry and the Words in Noise (WIN) test. Cognition was assessed using the MoCA, Stroop, and Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Most participants had good hearing (66.9% normal hearing (NH) defined as a pure-tone average thresholds at 500, 1000, and 2000Hz in both ears <25 decibels) and high MoCA scores (M=26.89;73.8% passing based on score >25/30). There was no difference in the proportions of individuals passing the MoCA based on hearing (76.5% of NH;68.4% of HL). Nevertheless, MoCA scores were correlated with PTA ( $r=-0.176$ ;  $p=0.027$ ). When the sample was sex-split, the correlation was significant only for women ( $r=-0.220$ ;  $p=0.03$ ). This pattern remained even when hearing-dependent subtests of the MoCA were excluded ( $r=-0.223$ ;  $p=0.028$ ). We observed similar sex-specific correlations between women's WIN and Stroop scores ( $r=-0.365$ ;  $p=0.061$ ). PTA in all participants was associated with scores on the RBANS memory subtests ( $r$  range=0.253-0.335). The present findings highlight sex-differences in a sample of healthy older adults. Implications for cognitive screening and sensory-cognitive relationships are discussed.

**20. Utilisation des générateurs de bruit pour le traitement de l'hyperacousie : une série de cas.** Charlotte Bigras (Université de Montréal), Claudia Côté (Institut de réadaptation en déficience physique de Québec), Stéphane Duval (Institut Raymond-Dewar, Centre de recherche interdisciplinaire en réadaptation), Donald Lafrenière (Institut Raymond-Dewar, Centre de recherche interdisciplinaire en réadaptation),

Catherine-Ève Morency (Institut de réadaptation en déficience physique de Québec), Marjolaine Viau (Institut Raymond-Dewar, Centre de recherche interdisciplinaire en réadaptation), Sylvie Hébert (Université de Montréal)

Introduction : L'hyperacousie, un problème de tolérance aux sons externes, est une plainte de plus en plus rapportée dans le milieu clinique de l'audiologie. La désensibilisation sonore est l'une des thérapies proposées pour traiter les acouphènes, mais son efficacité n'a pas été démontrée pour l'hyperacousie lorsque cette dernière constitue la plainte principale du patient. Notre objectif est de documenter les effets audiologiques et psychologiques d'une thérapie par générateurs de bruit chez des patients ayant comme plainte principale l'hyperacousie. Méthodologie : Cinq femmes ayant pour plainte principale l'hyperacousie ont porté des générateurs de bruit bilatéralement pendant quatre semaines. L'effet du traitement a été mesuré à l'aide du Loudness Contour Test de Cox ou de la mesure des seuils d'inconfort, des réflexes stapédiens et des questionnaires GÜF, HADS et WHOQOL-BREF avant l'intervention (Pré-traitement), après deux semaines de traitement (Mi-traitement), après l'intervention (Post-traitement) et un mois après la fin de l'intervention (8 semaines). Résultats : Les seuils d'inconforts ont en moyenne augmenté de 10 décibels pour quatre patients sur cinq (étendue : 6,25 à 18,75 décibels) et le score au GÜF a diminué en moyenne de 10,8 points pour tous les patients (étendue : 3 à 24 points). Ces résultats suggèrent que le port de générateurs de bruit diminue la sensibilité auditive et la détresse qui y est associée. Discussion et conclusion : L'utilisation de générateurs de bruit semble être un traitement envisageable pour les patients ayant pour plainte principale l'hyperacousie.

**21. The effect of the emotional characteristics of different sound environments on selective attention of adults.** Eva Nadon (Université de Montréal), Rebekka Lagace-Cusiac (Université de Montréal), Jadziah Pilon (Université de Montréal), Nathalie Gosselin (Université de Montréal)

Our daily activities (e.g., cooking or driving) are very often performed in the presence of sound, which could influence selective attention abilities. These capabilities make it possible to select relevant information from a large number of distractors when performing specific tasks. The emotional characteristics of different sound environments (e.g., their valence and arousal) are important to consider while trying to understand their impact on cognition. The first aim of this preliminary study is to explore

the effect of emotional characteristics of various sound environments on selective attention. To do this, neurotypical adults performed a Stroop task including congruent trials (e.g., RED written in red) and incongruent trials (e.g., RED written in green) in different sound environments varying in valence and arousal. The response times and error rates of the participants will be compared according to the types of trials and the sound environment. Predictions are that the more pleasant and stimulating the sound environment is, the better the performance will be. The second aim is to examine if participants' listening habits and preferences while performing cognitive tasks have an impact on their performance in different sound environments. To do that, participants will answer a questionnaire investigating their habits and listening preferences when conducting cognitive tasks.

**22. Étude des caractéristiques perceptives de l'accent d'emphase produit par des enfants atteints d'un trouble du spectre de l'autisme.** Camille Vidou (Université du Québec à Montréal), Jade Picard-Lauzon (Université du Québec à Montréal), Vanessa Moisoni (Université du Québec à Montréal), Paméla Trudeau-Fisette (Université du Québec à Montréal), Lucile Rapin (Université du Québec à Montréal), Lucie Ménard (Université du Québec à Montréal)

L'accent d'emphase est produit par une modulation des paramètres acoustiques de F0, de durée et d'intensité dans le but de mettre en relief une unité linguistique. Les études ont montré que les enfants atteints d'un trouble du spectre de l'autisme (TSA) éprouvent des difficultés dans la production et la perception de l'accent d'emphase. Cette étude s'intéresse aux implications communicatives de ces difficultés en répondant aux deux objectifs suivants: 1) établir les niveaux d'intelligibilité de l'accent d'emphase produit par des enfants à développement typique (DT) et par des enfants TSA et 2) décrire les caractéristiques perceptives de l'accent d'emphase produit par des enfants TSA. Un premier test d'identification de l'accent d'emphase a été mené. Quinze adultes francophones neurotypiques ont assigné une condition prosodique (neutre ou emphase) à des mots produits par des enfants TSA et DT. Les résultats montrent que les sujets font davantage d'erreurs dans l'assignation de l'accent chez les enfants TSA. Une deuxième évaluation des caractéristiques perceptives de l'accent d'emphase a été menée auprès d'un nouveau groupe d'adultes. Les poids perceptifs des paramètres de hauteur, d'intensité, de durée et de précision articulatoire ont été évalués via une échelle

visuelle analogique. Les résultats montrent que l'augmentation de la hauteur, de la durée et de la précision articulatoire lors du passage de neutre à emphase est perçue moins importante chez les enfants TSA. Ces résultats suggèrent que les paramètres habituellement recrutés dans l'emphase ne sont pas tous fonctionnels au niveau perceptif chez les enfants TSA, impliquant alors une réduction de l'intelligibilité.

**23. The development of a video-based coding tool to monitor response to intervention in school-age children with autism: The Autism Behavioural Change Observational Measure.** Melanie Custo Blanch (McGill University), Megha Sharda (Université de Montréal), Ruveneko Ferdinand (McGill University), Melissa Tan (Westmount Music Therapy), Krista Hyde (Université de Montréal), Aparna Nadig (McGill University)

Evaluating effectiveness of behavioural interventions is a challenge in Autism Spectrum Disorders (ASD) research. There is a lack of tools sensitive to treatment-related change, have applicability across multiple settings and that target school-aged children with ASD. The Autism Behavioural Change Observational Measure (ABCOM), a 27-item video observation-based behaviour coding questionnaire, was developed with the intention of evaluating response-to-treatment in school-aged children with ASD. ABCOM gauges autism-relevant outcomes (shared social interaction, initiation of communication, restrictive repetitive behaviours, etc.) using a 4-point Likert scale based on frequency of observed behaviours in a given session and may be used in varied naturalistic intervention settings. The ABCOM was tested with video-recordings from a completed randomized control trial (RCT: ISRCTN26821793) of 6-12 year-old children with ASD who received a music or non-music intervention. Two experienced raters were trained using a standardized procedure using 3 example videos, 9 training videos and a written manual to achieve acceptable levels of reliability. Both raters were blind to session ID and not involved in the RCT. After initial training and coding of 9 videos, both raters reached an ICC=0.92,  $p=.001$ . On 10 subsequent test videos coded by both raters, an ICC=0.95 ( $p<.001$ ) was reached. Domain-wise ICC (range: 0.73-0.96) and internal consistency (measured using Cronbach's alpha, range: 0.27-0.77) suggested high inter-rater reliability and moderate-to-high internal consistency for the initiation of communication, shared social interaction and problem behaviour domains. We are in the process of further evaluating the validity of the ABCOM as a

potential observation-based outcome measure for ASD interventions.

**24. Comparing intensity ratings of emotions in music and faces by adolescents with Autism Spectrum Disorder.** Hadas Dahary (McGill University), Shalini Sivathanan (McGill University), Eve-Marie Quintin (McGill University)

People with autism spectrum disorder (ASD) can demonstrate difficulty in processing emotions in faces. Little research has examined emotion processing using music, a domain where they show great skill. We assessed perception of musical and facial expressions of emotions for adolescents with ASD with high and low cognitive ability. Twenty-three participants aged 12 to 16 with ASD and verbal IQ of 50-111 completed Music and Facial emotion recognition tasks. Across tasks, they identified and rated the intensity of emotions (happy, sad, or fearful) in music excerpts (Music ER task) and in faces (Facial ER tasks). Response time was recorded. Cognitive ability had a significant effect on emotional intensity ratings, but not on response time ( $p > .05$ ), such that participants with lower cognitive ability (VCI:  $\leq 80$ ;  $n=12$ ) rated emotions (happy and fearful) more intensely than those with higher cognitive ability (VCI:  $> 80$ ;  $n=11$ ) across Music and Facial ER tasks ( $p < .01$ ). It appears that adolescents with ASD with low or high cognitive ability identify emotions in music and faces similarly. However, adolescents with lower cognitive ability appear to be more sensitive to emotions of happy and fearful presented in faces and music. Higher intensity ratings for arousing emotional stimuli may support previous accounts of atypical development or connectivity of limbic brain areas including the amygdala. Findings provide implications for using targeted music interventions that capitalize on disorder-specific strengths (musical ability) to teach emotion processing skills to individuals with ASD.

**25. Rhythm Perception in Music by Adolescents with Autism Spectrum Disorder.** Charlotte Rimmer (McGill University), Hadas Dahary (McGill University), Tania Fernandes (McGill University), Shalini Sivathanan (McGill University), Eve-Marie Quintin (McGill University)

Individuals with Autism Spectrum Disorder (ASD) have demonstrated strength in perceiving musical stimuli, with most studies focusing on pitch and melody perception and memory (Heaton, 2009). Few studies have assessed musical rhythm perception of individuals with ASD and found typical

performance when processing and producing simple and complex rhythms, which seems associated with visual perceptual skills (DePape et al., 2012). Previous studies have focused on individuals with high cognitive functioning. Thus, the relationship between rhythm perception, ASD symptomology, and cognitive skills remains to be investigated across levels of functioning. The current study aimed to assess the relationship between ASD symptomology and rhythm perception across levels of cognitive functioning. Twenty-seven adolescents (Mage = 14.57) with ASD and varying levels of cognitive functioning completed a rhythms perception task. The participants' performance was significantly better than chance,  $p < .01$ . A regression analysis revealed that visual spatial abilities but not verbal comprehension abilities predicted task performance. Regression coefficients indicated that individuals with a lower VSI score performed the task less accurately than those with a higher VSI score,  $p < .01$ . A regression also showed that scores on the SRS-2 Social Motivation Scale predicted performance on the rhythms task, such that higher difficulties in social motivation resulted in less accurate performance,  $p < .05$ . Our results are consistent with previous findings showing preserved rhythm perception for individuals with ASD, and that this ability is related to visual spatial skills. Given previous reports of musical strengths, we suggest music intervention including a rhythmic component as a strength-based approach for this population.

**26. Examining the Relationship between Verbal and Visual-Spatial Skills and the Cognitive and Emotional Processing of Music by Adolescents with Autism Spectrum Disorder.** Shalini Sivathanan (McGill University), Hadas Dahary (McGill University), Gwenaëlle Philibert-Lignières (McGill University), Eve-Marie Quintin (McGill University)

Background: There is growing evidence that music perception is a strength for individuals with Autism Spectrum Disorder (ASD). Music represents a unique domain in which to assess both cognitive and emotional processing, and people with ASD recognize music-evoked emotions, show enhanced pitch discrimination, musical memory, and melodic perception. Previous research has also demonstrated that level of intellectual functioning is related to music perception, however direct comparisons between cognitive and emotional processing of music, including individuals with varying levels of intellectual functioning, have yet to be established. Thus, the aim of this research is to assess the impact intellectual functioning within

the autism spectrum on perception of cognitive and emotional aspects of music perception. **Methods:** Twenty-three adolescents with ASD with low and high verbal comprehension (WISC-V: VCI) and visual-spatial (WISC-V: VSI) skills completed musical rhythm, working memory, and emotion recognition tasks adapted for this study. **Results:** Across emotion recognition tasks, results showed that performance accuracy was not influenced by participants' level of intellectual functioning (VCI and VSI). However, participants in the low VCI group rated music-evoked excerpts as more intense than those in the high VCI group. Additionally, accuracy on the musical working memory and rhythms tasks were influenced by participants' VSI scores, but not VCI. **Conclusions:** Results suggest that adolescents with ASD are able to recognize music-evoked emotions, musical working memory, and rhythm, irrespective of level of verbal cognitive skills. Findings lend support toward the use of targeted, strengths-based music interventions adapted to varying cognitive skills within the spectrum.

**27. Recognition of music-evoked emotions among adolescents with autism spectrum disorder: Examining the effect of musical excerpt duration and relationship with cognitive skills.** Tania Palma Fernandes (McGill University), Hadas Dahary (McGill University), Shalini Sivathanan (McGill University), Eve-Marie Quintin (McGill University)

Individuals with autism spectrum disorders (ASD) show impairments recognizing emotions conveyed in facial expressions and speech, but can recognize music-evoked emotions comparably to individuals with typical development, suggesting a strength within the musical domain. Music is a dynamic stimuli, which can convey different emotions over the course of minutes and even seconds. We examined the effects of musical excerpt exposure duration, cognitive skills (verbal and visual spatial), and ASD symptomology on the performance (accuracy and reaction time) of adolescents with ASD on music-evoked emotion recognition tasks. Twenty-one adolescents with ASD identified emotions (happy, sad, or fearful) in two music-evoked emotion tasks: the long music task (LMT; mean duration of 37 seconds/excerpt) and the short music task (SMT; mean duration of 4 seconds/excerpt). Participants completed the Verbal Comprehension Index (VCI) and Visual Spatial Index (VSI) of the WISC-V and their teachers completed the Social Responsiveness Scale (SRS-2). Results indicated that adolescents with ASD can accurately recognize music-evoked emotions irrespective of musical excerpt exposure duration.

However, they were faster in identifying emotions in the SMT compared to the LMT and in identifying happy vs. fearful music-evoked emotions. Further, cognitive skills impacted response times on the LMT, but not on the SMT. ASD symptomology did not impact performance on both tasks. These findings suggest that emotion processing and decision making among individuals with ASD and difficulty with verbal and visual-spatial skills may be facilitated by shorter exposure to emotions and potentially to other types of stimuli, which warrants further research.

**28. Intellectual abilities and autistic traits in musical prodigies.** Chanel Marion-St-Onge (Université de Montréal), Megha Sharda (Université de Montréal), Margot Charignon (Université de Montréal), Isabelle Peretz (Université de Montréal)

Musical prodigies are musicians who acquire exceptional musical performance levels before they reach adolescence. A previous study on a group of musical prodigies (n=8) showed that they have superior IQ and an exceptionally good working memory (WM; Ruthsatz et al., 2014). Ruthsatz et al., also showed that 4 out of 8 musical prodigies were autistic or had close relatives who were, which suggest a link between these two phenomena. In the current study, we tested 7 musical prodigies (3 females, aged 17-32) on a standardized IQ test (WAIS-IV; Wechsler, 2008), which includes working memory tasks, and on a visual WM task (from MEM-III; Wechsler, 2001). We also measured autistic traits of our participants with the Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001). Prodigies had full-scale IQ scores in the normal range (Mean±1SD = 100±15; M = 108.5 ± 14.0). Verbal and visual WM scores were also in the normal range (Mean±1SD = 10±3; Scaled scores: M = 11.85±3.84; M = 12.14±2.79). The autistic traits of participants were variable ((Mean±1SD = 10±3; Scaled scores : M=18.4±7.8), but below what is considered to be typical in individuals with Autism Spectrum Disorder (35+). Our preliminary results indicate that an exceptional IQ or WM may not be essential for being a musical prodigy. These results also challenge the idea that musical talent may be linked to autism. Data from 5 more prodigies will be added in the poster presentation.

### 29. La cognition des musiciens : et si l'entraînement musical influençait la manière dont on se repérait dans l'espace?

Caroll-Ann Blanchette (Université de Montréal), Greg L. West (Université de Montréal), Nathalie Gosselin (Université de Montréal)

Diverses études indiquent que les musiciens possèdent une meilleure mémoire que les non musiciens. En appui avec ce constat, une augmentation de matière grise (MG) ou d'activité fonctionnelle au niveau hippocampique est associée à un entraînement musical. L'hippocampe est connue pour jouer un rôle clé dans divers types de mémoire, incluant la mémoire spatiale. Lorsque les individus se déplacent dans l'espace, ils adoptent différentes stratégies qui dépendent de parties distinctes du cerveau. La stratégie d'apprentissage spatiale implique la mémorisation de relations entre les points de repères d'un environnement afin de créer une « carte cognitive » qui est soutenue par l'hippocampe. La stratégie réponse, quant à elle, implique la formation d'une association stimulus-réponse, soit, la mémorisation d'une série d'actions à partir d'un point de départ donné et elle est prise en charge par le noyau caudé. Nous avons voulu déterminer si les musiciens utilisent préférentiellement une stratégie de navigation dépendante de l'hippocampe, c'est-à-dire une stratégie de type spatiale. Pour cela, des musiciens et non musiciens ont été testés à l'aide du labyrinthe virtuel 4 sur 8, une mesure comportementale informatisée permettant d'identifier la stratégie de navigation spontanément adoptée par un individu. Des capacités en mémoire supérieures, développées via un entraînement musical, témoigneraient d'une meilleure santé hippocampique et se manifesteraient par une plus grande proportion d'apprenants spatiaux. L'entraînement musical, au même titre que l'entraînement cognitif, se devrait alors d'être envisagé comme un outil prometteur dans le maintien des fonctions cognitives.

### 30. The influence of emotional and semantic content on voice identity memory. Hanjian Xu (McGill University), Jorge Armony (McGill University)

Listeners can recognize familiar voices across various utterances, suggesting the existence of voice identity processing and long-term representation systems. Emotion, as a natural feature of social stimuli, is known to facilitate long-lasting recognition of visual stimuli. However, much less is known regarding its influence on voice identity memory. To examine this question, we recruited 44 subjects (23 female) to participate

in a memory experiment. During encoding, 24 participants (13 female) listened to 6 sentences with fearful prosody produced by different speakers (3 male) twice (Fear group). The other participants listened to the same stimuli, but expressed in a neutral tone (Neutral group). During recognition, immediately after encoding, subjects heard 4 sentences produced by each of the old speakers: same-emotion/same-sentence, same-emotion/different-sentence, different-emotion/same-sentence, and different-emotion/different-sentence. Twenty-four sentences (half fearful) produced by 6 novel speakers were also presented. An ANOVA revealed significant effects of emotion ( $F(1,42)=58.13$ ,  $p<0.001$ ), content ( $F(1,42)=14.31$ ,  $p<0.001$ ), and an interaction between both ( $F(1,42)=16.74$ ,  $p<0.001$ ), reflecting better memory for stimuli expressed in the same emotion and with the same content as during encoding. Interestingly, post-hoc t-tests showed a significant better accuracy for same-emotion/different-sentence than different-emotion/same-sentence ( $t(43)=3.62$ ,  $p=0.001$ ), suggesting that emotion is a stronger enhancer of memory than semantic content. Finally, a marginally significant group-by-emotion interaction was also observed ( $F(1,42)=4.15$ ,  $p=0.048$ ), due to a larger effect of emotion on accuracy for the Fear group. Together, these results confirm the influence of emotion on memory accuracy, although they raise the possibility that these effects could be driven by acoustic features.

### 31. Combined fMRI-adaptation (fMRI-a) and multivariate pattern analysis (MVPA) reveal difference between musicians and non-musicians in response to auditory emotional information. Jocelyne Whitehead (McGill University), Jorge Armony (McGill University)

Emotions portrayed in the auditory domain convey critical information that enables the listener to interpret the intent and affective state of the emitter. Recent work has shown musical expertise to shape how acoustic information is processed in the brain; however, little is known about its influence on emotional processing. To address this question, we employed an fMRI-adaptation (fMRI-a) paradigm with a fast multiband sequence ( $TR=0.529s$ , voxel: 2mm isotropic), where musicians ( $N=15$ ) and non-musicians ( $N=15$ ) passively listened to pseudospeech and musical excerpts, expressing a neutral or fearful emotion. FMRI-a, in combination with multivariate pattern analysis (MVPA) allowed for a more detailed and comprehensive view of the differences in neural responses to voice and music, as well as how these may be modulated by emotion. We observed a

difference in processing music between musicians and non-musicians that was not present for voice. Moreover, only musicians showed music-specific adaptation effects, with the bilateral amygdala, thalamus, hippocampus and superior temporal gyrus (STG) contributing the most to this effect. In addition, only musicians showed a distinction in processing fear from neutral music, with the greatest contributions coming from the bilateral STG, thalamus, Heschl's gyrus, and left amygdala. These findings provide strong support for a role of expertise in the processing of musical emotions. Moreover, they demonstrate the advantage of using high-resolution fMRI and combining adaptation paradigms with multivariate analytical approaches.

**32. Tapping Into Rate Flexibility: Musical Training Facilitates Synchronization Around Spontaneous Production Rates.** Rebecca Scheurich (McGill University), Anna Zamm (McGill University), Caroline Palmer (McGill University)

The ability to flexibly adapt one's behavior is critical for social tasks such as speech and music performance, in which individuals must coordinate the timing of their actions with others. Natural movement frequencies, also called spontaneous rates, constrain synchronization accuracy between partners during duet music performance, whereas musical training enhances synchronization accuracy. We investigated the combined influences of these factors on the flexibility with which individuals can synchronize their actions with sequences at different rates. First, we developed a novel musical task capable of measuring spontaneous rates in both musicians and non-musicians in which participants tapped the rhythm of a familiar melody while hearing the corresponding melody tones. The novel task was validated by similar measures of spontaneous rates generated by piano performance and by the tapping task from the same pianists. We then implemented the novel task with musicians and non-musicians as they synchronized tapping of a familiar melody with a metronome at their spontaneous rates, and at rates proportionally slower and faster than their spontaneous rates. Musicians synchronized more flexibly across rates than non-musicians, indicated by greater synchronization accuracy. Additionally, musicians showed greater engagement of error correction mechanisms than non-musicians. Finally, differences in flexibility were characterized by more recurrent (repetitive) and patterned synchronization in non-musicians, indicative of greater temporal rigidity. [Scheurich, R., Zamm, A., & Palmer, C. (2018). Tapping into rate flexibility: Musical

training facilitates synchronization around spontaneous production rates. *Frontiers in Psychology*, 9, 458. doi:10.3389/fpsyg.2018.00458].

**33. Comparing and contrasting the neural mechanisms of autobiographical memory and problem solving.** Sarah Peters (McGill University), Signy Sheldon (McGill University)

This study examined whether neural overlap between autobiographical memory and goal-directed problem solving is determined by how information is retrieved. In an MRI scanner, young adults performed two retrieval tasks. To autobiographical memory and problem solving cues, they first produced multiple memory/solution exemplars (generation) then thought about one instance in detail (elaboration). Multivariate analysis showed that neural overlap was strongest between retrieval forms. Generation was associated with anterior brain activity, evident within the hippocampus, and elaboration with posterior brain activity. These results provide insights into how retrieval processes are organized in the brain and influence higher cognitive functions.

**34. From the brain to the hand: electrophysiological correlates of language-induced motor activity.** Fernanda Perez-Gay Juárez (McGill University, Université du Québec à Montréal), David Labrecque (Université du Québec à Montréal), Victor Frak (Université du Québec à Montréal)

The link between language and motor systems has been the focus of increasing interest to Cognitive Neuroscience. Some classical papers studying Event Related Potentials (ERPs) induced by linguistic stimuli studied electrophysiological activity of Frontal and Central electrodes around 200 ms when comparing action and non-action words, finding a bigger p200 for action words. However, the degree to which these correlates are related to motor activity has not yet been directly measured. On the other hand, a series of studies have validated the use of a grip force sensor (GFS) to measure language-induced motor activity during both isolated words and sentence listening, finding that action words induce an augmentation in the grip force around 300 ms after the onset of the stimulus. The purpose of the present study is to combine both techniques to assess if the p200 is related to the augmentation of the grip force measured by a GFS. We ran a first experiment in a group of 17 healthy subjects to verify if listening to action and non-action words while maintaining an active grasping task could induce the p200 differences observed

in previous studies. Having found the said effect, we proceeded to measure both EEG and grip force during the same task in another group of 10 subjects. Our results show that the amplitude of the p200 in central electrodes is correlated to the augmentation in the GFS around 300 ms induced by linguistic stimuli, opening new venues of interpretation for the sensorimotor interaction in language processing.

**35. Cerebellar and parietal cortex activation predicts walking pattern characteristics during continuous gait adjustments to the split-belt treadmill: an [18F]-FDG PET study.** Dorelle Hinton (McGill University), Alexander Thiel (McGill University), Laurent Bouyer (Université Laval), Caroline Paquette (McGill University)

**Introduction:** The ability to walk on a split-belt treadmill, where each leg is driven at a different speed, highlights the nervous system's capability to quickly adapt our walking pattern to our environment. However, specific contributions from cerebral and cerebellar regions to this motor adaptation remain unknown. This project aimed to establish the brain regions that increase in activation during continuous gait adaptation to the split-belt treadmill compared to typical treadmill walking in healthy adults and how the gait pattern influences these changes in activation. **Methods:** Directly following bolus injection of 18F-fluorodeoxyglucose tracer, 10 healthy adults walked on a treadmill for 30 minutes. In the tied-belt condition, both treadmill belts were maintained at a comfortable walking speed. On a separate occasion, the continuous adaptation condition changed the speed ratio between treadmill belts every 15 seconds. Positron emission tomography images of cerebral glucose metabolism of each condition were compared to assess for clusters with significant increases in metabolism when continuous, unexpected gait pattern changes are required. **Results:** The change in cadence, a temporal measure of gait, was the only predictor of peak activation within the posterior Parietal cortex ( $p < 0.01$ ), whereas step length variability, a spatial measure of gait, was the only predictor of peak cerebellar activation. **Discussion:** Our results suggest that step timing influences parietal cortex activation and that spatial aspects of each step influence cerebellar activation. Separation of control within the brain for different aspects of the gait cycle points to the inherent flexibility of the neural control of walking.

**36. The stoppiest stop and its favourite seat: Manner and constituency.** Filiz Mutlu (McGill University)

Lenition is formally expressed as element loss (Harris 1994). A plosive T has at least the elements  $|\tau|$ ,  $|h|$ , and a fricative F has at least  $|h|$ , so losing  $|\tau|$  from T yields F. A truly voiced plosive D has also  $|L|$  (Nasukawa 1995, Ploch 1999). Logically, it should be possible to lose  $|h|$  and end up with  $|\tau|$ ,  $|L|$ , i. e. a nasal stop N. However, D does not lenite to N (Harris 1994, Honeybone 2005). Further, in languages with the constraint  $*D\#$ ,  $D \rightarrow N$  is a possible resolution, yet it is never utilised (Harris, p.c.). In one version of Government Phonology (GP), GP 2.0 (Pöchtrager 2006), manner is represented as structure. T has two layers of structure, F has one. Losing one layer yields F. However, N also has two layers, hence losing one layer should be able to yield F, yet this never happens. Onset Prominence (OP) (Schwartz 2015) has different nodes which correspond to edge (by itself N), and noise, their combination yielding T/D. While this captures the complexity of T, again it is not clear why noise cannot be lost to yield N. Ideally, the representation of N should predict its behaviour. I will address this issue in a new model, Spatial Phonology, building on research in structural representation (also see Backley and Nasukawa 2016, van der Hulst 2015, Steriade 1993).

**37. Priming semantic priming reveals post-lexical integration effects on the N400 ERP component.** Alexandre Herbay (McGill University), Phaedra Royle (Université de Montréal), John Drury (Stony Brook University), Lauren Fromont (Université de Montréal), Karsten Steinhauer (McGill University)

Neurocognitive processes underlying the N400 Event-Related Potential component, typically associated with lexical-semantic processing, are still not properly understood. Several mechanisms have been proposed to account for N400 amplitude reductions associated with semantic priming: (1) automatic spreading activation (ASA), (2) prediction-based priming and (3) post-lexical integration processes in working memory. Here we present two priming experiments that used different lists that each contained 80% of related word pairs reflecting a list-promoted semantic relationship, 10% of related word pairs reflecting other list-minority semantic relationships, and 10% of unrelated pairs. This allows distinguishing relational priming (difference between promoted-relationship pairs and other minority-relationships pairs) from relatedness priming (difference between minority-relationships related pairs and unrelated pairs). Native French participants rendered semantic relatedness judgments for each pair of words while their EEG

was recorded. We used Stimulus Onset Asynchronies (SOA) of 250ms in Experiment 1 and 450ms in Experiment 2. We hypothesized that different SOAs should affect the onset of potential early prediction effects but not the onset of post-lexical integration effects. We found priming effects in the N400 time window: relatedness priming was observed starting after 300ms while relational priming was not observed until 400ms in Experiment 1 and 390ms in Experiment 2. We argue that relational priming is not compatible with ASA, as semantic networks arguably do not reflect the abstract type of semantic relationship, nor with predictive processes, as relational priming effects onsets are not significantly modulated by different SOAs. Thereby, relational priming effects are best explained by post-lexical integration processes.

**38. Scalar Implicatures through the Lens of Compositional Distributional Models.** Maxime Codère Corbeil (Université du Québec à Montréal)

Distributional models were first developed to deal with words in isolation but they rapidly expanded so they could also represent whole sentences (Clark, 2014). In distributional approaches, the meaning of a given sentence is represented by a vector derived from the combination of the vectors associated with the words composing the given sentence. As of now, sentence-vectors only

represent the explicit meaning of a sentence but for sentence similarity measures to be truly compelling, it would need to be able to compare both explicit and implicated meanings of a sentence. Our research is a first step in a new direction, bridging compositional distributional models and approaches to Scalar implicatures (SI) by looking at how implicated meaning could be treated within these models. SI is a special kind of quantity implicature involving a series of alternatives that can be generated by substituting lexical items that are linked via a conceptual scale (Geurts, 2010). We propose that instead of using the sentence-vector of the original sentence to measure sentence similarity, we use a sentence-vector that contains both the information from the base sentence as well as the implicated information derived from the SI. We then examine how these new sentence-vectors would be represented using two compositional models: Mitchell and Lapata (2010) and Coecke et al. (2010). The model of Mitchell and Lapata uses simple multiplication between vectors in its composition whereas Coecke et al. derives sentence meaning while taking into account the structure of the composed sentence using pregroup grammar.