Booth: 1

Presenter: Samir Gouin

Title: Decoding the acoustics of auditory emotion perception in cochlear implants users with machine learning

Authors: S. Gouin, S. Paquette, A. Lehmann

Keywords: rehabilitation; machine learning; emotion processing; EEG data

Abstract: Cochlear implants have had tremendous success restoring a sense of hearing in the deaf. However, even after months of intensive rehabilitation, many cochlear implant users often struggle with appreciating emotive tones in speech and music despite overall good speech comprehension. Failure to perceive emotional expression can result in maladjusted social behavior and, in turn, impair their capacity to express emotions adequately, leading to detrimental socio-economic consequences. Recent advances in data analysis and automated pattern identification offer a means of comparing neuroimaging data associated with emotional processing beyond conventional analysis and could bring empirical support to developing training programs for emotion rehabilitation in cochlear implant users. Hence, we used a machine learning approach to identify emotion-processing bio-markers in high-density electroencephalograms collected from cochlear implant users (n = 22) and matched normal-hearing controls (n = 22). Participants’ brain responses elicited by short musical and vocal emotional (happy, sad, and neutral) stimuli were used to train a Random Forest classification algorithm to help identify, in each group, the pattern of brain responses that can best predict the presented emotion. Using this machine learning approach, we were able to confirm the presence of emotion-specific patterns of brain activity in cochlear implant users despite the cochlear implant user’s reported emotion perception deficit. Given that an algorithm can differentiate presented emotions based on neural activity, this bio-marker could be used to inform new CI processing strategies and/or rehabilitation programs leveraging these differences to improve emotions perception in CI users.

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Booth: 2

Presenter: Olivier Valentin

Title: predicting brain health using multimodal imaging and machine learning algorithms

Authors: O. Valentin, A. Perrin, A. Lehmann

Keywords: computational modelling; neuroinformatics; brain health; machine learning; multimodal imaging

Abstract: Alzheimer's disease is a prevalent neurodegenerative disorder affecting up to 6.5 million of people in the United States. The disease is associated with faster rates of brain atrophy compared to healthy individuals, suggesting that Alzheimer's may be a form of accelerated brain aging. While current treatments for Alzheimer's only manage symptoms or slow disease progression, early diagnosis is critical for both patients and families to better understand the disease, plan for the future, and initiate therapies that may slow progression and improve management. Unfortunately, the current diagnostic methods for Alzheimer's rely on the documentation of significant cognitive decline, by which time severe brain damage has already occurred. Therefore, there is a critical need to develop a diagnostic tool that can detect early manifestations and accurately diagnose Alzheimer's in its earliest stages.

Here, we present a machine learning approach able to predict participant’s age based on electroencephalography (EEG) data, with potential applications for developing a predictive tool to detect early premature aging of the brain. The best accuracy result was obtained using a Gradient Boosting classifier (76.6%, p<0.01) with a 0.5 learning rate. The correlation between the predicted and estimated age confirms the ability of our models to predict age. These results confirm that (1) aging affects human brain EEG signals, and (2) age can be predicted using resting state EEG data. Although this project used a neuroimaging database of healthy individuals, the outcome of this research project might enable early detection in individuals who have not yet been diagnosed.

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Booth: 3

Presenter: Razieh Alemi

Title: Motor processing with cochlear implants

Authors: R. Alemi, J. Wolfe, S. Neumann, J. Manning, L. Hanna, W. Towler, C. Wilson, A. Bien, Sh. Miller, E. Schafer, J. Gemignani, N. Koirala, V. L. Gracco, M. Deroche

Keywords: cochlear implant; fNIRS; motor processing

Abstract: Auditory-motor and visual-motor networks are often coupled in daily activities such as listening to music and dancing, but they are known to be highly malleable as a function of sensory input. Thus, congenital deafness may modify neural activities in the motor cortex or its connections to auditory and visual networks. Here, we investigated whether the cortical response of children with a cochlear implant (CI) to a simple and repetitive motor task would differ from that of children with typical hearing (TH) and whether this related to their language development.

Participants were 75 school-aged children, 50 with CI (with varying language abilities), and 25 controls with TH. We used functional near-infrared spectroscopy (fNIRS) to record cortical responses over the whole head, as children squeezed the back triggers of a joystick that vibrated or not with the squeeze.

Clear motor cortex activity was reflected by an increase in oxygenated hemoglobin concentration (HbO) and a decrease in deoxygenated hemoglobin concentration (HbR) in all children, irrespective of their hearing status. In addition, the visual (but not auditory) cortex was strongly deactivated in this task, and this deactivation was exacerbated among those children with CI who had good language skills compared to those with CI and language delays. Presence or absence of vibrotactile feedback made no difference.

These findings suggest that the expected activation of the motor cortex and deactivation of supposedly irrelevant regions during a low-level motor task provides a sensitive index of healthy cognitive functions that relate to language skills.

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Booth: 4

Presenter: Marie-Anick Savard

Title: Physiological responses to trigger and control sounds in misophonia: the role of attentional modulation

Authors: M.-A. Savard, E.B.J. Coffey, M.L.D. Deroche

Keywords: misophonia; attention; music; physiology; sounds

Abstract: In the presence of specific trigger sounds, people with misophonia demonstrate exaggerated emotional responses and heightened autonomic arousal. Although recent findings have highlighted the importance of higher-level cognitive processes in misophonia, we have little insight into how these processes could be used to modulate misophonic responses. Because individuals with misophonia often report attending to music to divert their attention from triggers, we explored how physiological responses in misophonia could be modulated by attending to dichotically-presented musical excerpts, or trigger sounds.

Participants with misophonia and healthy controls completed a task in which they were presented with music (unfamiliar piano pieces) in one ear while neutral sounds, generally unpleasant sounds, or typical trigger sounds played in the other ear. During each trial, a visual prompt indicated which ear (left or right) participants should attend to. Measure of physiological arousal (i.e., pupil dilation, heart rate variability, skin conductance responses) were continuously recorded throughout the experiment. We report differences in physiological responses in people with and without misophonia, as they selectively attend to trigger and control sounds presented simultaneously and separately.

Our study represents a first investigation of the effectiveness of voluntary attentional modulation on misophonic reactions. We aim to increase our insight into how high-level processes are involved in misophonia, and how they can be used to modulate problematic reactions.

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Booth: 5

Presenter: Emilia Lew

Title: Language background changes viability of pitch but not timing cues in short-term recall

Authors: E. Lew, A. Sares, M. Deroche

Keywords: language; short-term memory; pitch

Abstract: With greater recognition of the impact of hearing loss on overall cognitive decline, greater focus is being directed toward testing auditory memory in clinical settings. Auditory memory is often evaluated by reading a list of unrelated words out loud. However, this method introduces pitch and rhythmic variations that may impact.

In a series of online studies evaluating auditory short-term memory in normal-hearing adults, we examine how pitch patterns (Experiment 1), word pacing (Experiment 2), and interactions between pitch and time grouping (Experiment 3) affect free recall of target words and cued recall of forgotten target words. Studies were available in French and English. We found no significant effect of pitch manipulation in Experiment 1 but found a consistent benefit of slower pacing for free and cued recall in Experiment 2. Experiment 3 returned an effect of rhythm, with temporal groupings improving participant performance in free recall. However, this effect was not seen in the cued recall portion of the task, suggesting that grouping effects decay rapidly compared to pacing effects. Experiment 3 also showed an interaction between group and pitch, with French participants benefitting more from the arpeggio pitch condition than English participants. One possibility is that French listeners are better able to use pitch information to encode words due to the nature of the French language. Our results highlight the possible impact of language experience on task performance.

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Booth: 6

Presenter: Loonan Chauvette

Title: Un gant haptique vibrotactile pour étudier l’intégration multisensorielle auditive et tactile de la musique

Authors: L. Chauvette, É. Leprohon, A. Sharp

Keywords: multisensoriel; musique; technonologie

Abstract: Les sens de l'ouïe et du toucher sont intimement liés. Les vibrations d'un objet peuvent être perçues à la fois comme un son par le système auditif et comme une sensation haptique par les mécanorécepteurs de la peau. L’intégration de ces deux modalités sensorielles dans le cerveau est notamment importante chez les musiciens professionnels et chez les personnes avec une surdité. Afin d'étudier l'intégration auditive et tactile dans le cerveau, nous développons un gant haptique vibrotactile qui permet d’appliquer des vibrations mécaniques précises à la peau des mains. Les seuils de détection vibrotactile ont été mesurés pour des ondes sinusoïdales entre 100 et 1000 Hz, appliquées à l'aspect dorsal des phalanges proximales et à la paume des deux mains à l'aide du gant vibrotactile. Des mesures préliminaires de seuils de discrimination sont en cours pour des ondes complexes avec divers paramètres spectraux. Les résultats préliminaires montrent que les seuils de détection en fonction de la fréquence de stimulation sont cohérents avec la littérature existante. Cependant, une légère variabilité interindividuelle et spatiale a été observée. Cette variabilité peut être partiellement attribuée à des facteurs physiologiques, mais pointe également vers des limitations du prototype de gant actuel. Ces limitations permettent de guider le développement de prochains prototypes pour une meilleure précision et cohérence entre les actuateurs. L'acquisition de valeurs normatives est un premier pas vers la conception d'expériences plus complexes pour étudier l'intégration auditive et tactile dans le cerveau, notamment suite à une plasticité induite par l'entrainement musicale ou par privation sensorielle.

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Booth: 7

Presenter: Alexis Whittom

Title: Investigation de l’impact d'activités musicales sur la qualité de vie des personnes âgées avec et sans perte auditive

Authors: A. Whittom, A. Sharp.

Keywords: musique; audition; qualité de vie; aînés

Abstract: Contexte. Au Canada, 77% des personnes âgées de 60 à 69 ans présenteraient une perte auditive liée à l’âge. Cette déficience sensorielle peut entraîner une diminution de la qualité de vie. Peu d’information existe sur l’impact de la participation à des activités musicales sur ces dimensions ainsi que sur la qualité de vie globale des personnes âgées, particulièrement celles présentant une perte auditive. Objectifs. 1. Mesurer l’impact de la participation à des activités musicales sur la perception musicale, la cognition, la régulation émotionnelle et sur la qualité de vie des personnes âgées avec et sans perte auditive. 2. Mesurer l’impact de la surdité sur ces dimensions en lien avec la participation musicale. Hypothèse. 1. Les aînés ayant participé à des activités musicales auront des scores plus élevés aux mesures de cognition, de perception musicale et de qualité de vie que ceux n’en ayant jamais participé à de telles activités. 2. L’impact positif des activités musicales se reflétera plus fortement chez les personnes malentendantes que chez celles sans surdité. Méthode. 200 personnes âgées (60 ans et plus, 50% F) divisées en 4 groupes (G1. Perte auditive et participant à des activités musicales. G2. Idem à G1 sans activités musicales, G3. Audition normale et activités musicales, G4. Idem à G3 sans activités musicales). Analyses. Des ANOVAs permettront de comparer les mesures dépendantes entre les groupes (4). Celles-ci seront les scores obtenus aux questionnaires et aux tâches évaluant la perception musicale, la cognition, la régulation émotionnelle ainsi que la qualité de vie.

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Booth: 8

Presenter: Angela MacDonald-Prégent

Title: Using natural language samples with autistic children with limited spoken language abilities

Authors: A. MacDonald-Prégent, F. Saiyed, K. Hyde, M. Sharda, A. Nadig

Keywords: limited spoken language; autism; natural language sample; response to intervention

Abstract: Background: Many evidence-based interventions are available for autistic children; however, given the heterogeneity of autism, it is important to understand which specific subgroups benefit most from which interventions. Here we use data from an RCT comparing the effects of music-mediated intervention (MI) to a control play-based intervention (non-MI) in school-age children with autism to further explore response to treatment in children with limited spoken language abilities (LSLA).

Objectives: 1) Characterize the expressive language abilities of children with LSLA using a multi-factorial definition including both a sentence repetition standardized test and measures derived from natural language samples and 2) Examine change in expressive language observed in language samples from the first to the last intervention session, as a detailed language and communication outcome measure.

Methods: The full sample included 47 autistic participants, 6-12 years old. Children were categorized as LSLA if a) CELF-4 sentence repetition subtest’s scaled score was four or below b)  mean length of utterance in words (MLUw) was three words or below, and c) number of different root words (DRW) was two SD below the mean. Videos from the last intervention session were transcribed and coded to analyze change from timepoint 1 to 2 in MLUw and DRW, nonverbal intentional communication, and number of intentional communication acts.

Results and Conclusion: 1) 14 participants (MI=6, nonMI=8) were classified as LSLA. 2) Measures derived from language samples were sensitive enough to track change in intervention.

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Booth: 9

Presenter: Laura Bensimon

Title: Impact of alternative and augmentative communication (AAC) intervention on family functioning and parental self-competence in families with minimally-speaking children on the autism spectrum

Authors: L. Bensimon, A. MacDonald, A. Nadig

Keywords: autism; intervention; minimally-speaking; competence; family functioning

Abstract: Close to one-third of children on the autism spectrum are minimally speaking. Their communication challenges place significant demands on parents and the family system. Parents of minimally-speaking children experience lower levels of perceived self-competence and well-being than both parents of speaking children with autism and parents of children without disabilities. Therefore, it is especially important to find ways to support these parents. The current study aims to examine the parental impact of an Alternative and Augmentative Communication (AAC) intervention for minimally-speaking children on the autism spectrum. Eighteen parent-child dyads were recruited, they received AAC intervention virtually through parent coaching over 12 weeks. Parents completed measures of perceived self-competence (PSOC) and family functioning (FIQ-R) both before and after the intervention. Results showed no significant difference in PSOC and FIQ-R scores at time 1 and time 2. Potential explanations for this lack of effect include the limited intensity of this intervention, small sample size, demographic factors and acceptability of parent coaching for the family.

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Booth: 10

Presenter: Bavo Van Kerrebroeck

Title: Rhythmic coordination in human-machine trios

Authors: B. Van Kerrebroeck, C. Palmer

Keywords: coordination dynamics; human-machine interaction; group synchrony; musical rhythm

Abstract: This study aims to contribute fundamental insights into the sensorimotor and rhythmic coordination principles of humans in groups, by having humans synchronize with an adaptive metronome in a triadic tapping task. Specifically, by having the adaptive metronome behave according to a set of behavioural models that are capable of rhythmic synchrony, this study will compare the trios’ performance in terms of accuracy and stability as well as self-reports about experienced group cohesion and social attribution. Outcomes of this study should lead to a better understanding of the strengths and weaknesses of current coordination models, extend them towards group contexts, and offer insights for their use in adaptive and responsive well-being, rehabilitation, and learning applications.

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Booth: 11

Presenter: Jasmine Lee

Title: L’influence de l’expérience langagière sur la cognition et le cerveau des bilingues

Authors: J. G. Lee, S. Kousaie

Keywords: bilinguisme; cognition; l'imagerie par résonance magnétique fonctionnelle (IRMf) au repos

Abstract: Des recherches antérieures ont relié le bilinguisme et les fonctions exécutives, suggérant que le bilinguisme confère un avantage cognitif. Cependant, les résultats publiés sont mitigés, dû en partie à l’utilisation de méthodologies qui comparaient généralement des groupes de bilingues à des groupes de monolingues, et ce, malgré les différences individuelles entre les participants bilingues (par exemple, en termes de la maîtrise de la langue [ML], de la fréquence d'utilisation [FdU], ou de l'âge d'acquisition de la langue seconde [AA]). La présente étude vise à identifier les aspects spécifiques de l'expérience langagière qui pourraient conférer un avantage neurocognitif et comportemental relié aux fonctions exécutives. On reliera les aspects spécifiques de l'expérience linguistique des bilingues à leurs fonctions cognitives (évalué par des mesures comportementales des fonctions exécutives), et leur connectivité fonctionnelle observée dans les circuits neuronaux associés à la cognition, tel que mesuré grâce à l'imagerie par résonance magnétique fonctionnelle (IRMf) au repos.

La collecte de données est présentement en cours et a pour objectif de recruter 100 adultes bilingues qui parlent l'anglais et le français. L'expérience linguistique et les fonctions exécutives seront traitées de façon continue et corrélées avec la connectivité fonctionnelle pour évaluer la relation entre l'expérience bilingue, le comportement, et le cerveau. Nous faisons l’hypothèse qu’une augmentation de l'expérience linguistique chez les bilingues (particulièrement la ML, FdU et l'AA) sera associée à une meilleure performance comportementale ainsi qu'une plus grande connectivité fonctionnelle dans les circuits du cerveau reliés à la cognition et aux fonctions exécutives.

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Booth: 12

Presenter: Cassiea Sim

Title: Accommodating the neurodivergent needs of children in an educational concert setting

Authors: C. Sim, M. Moura, E.-M. Quintin

Keywords: neurodivergence; autism; music; concert experience; education

Abstract: Background: Neurodivergent students who are integrated into mainstream classrooms participate in field trips with their classes regardless of the accommodations provided in locations outside of their school. Given the evidence that autistic children have an interest in music, field trips to attend musical concerts could be of particular interest for neurodivergent students, although the overall experience may not be adapted to their needs.

Objectives: We aimed to assess whether neurodivergent students attend music concerts as part of school field trips and investigate what their struggles and overall appreciation of the concert experience might be.

Methods: The Montreal Symphony Orchestra and McGill University’s BAND Research Group collaborated to assess school groups’ appreciation of concerts, emphasizing neurodivergent students’ experiences, through a post-concert questionnaire.

Results: Preliminary results from the 2021-2022 season showed that 63% of school groups attending educational concerts included neurodivergent students, and 70% of the neurodivergent students that attended struggled with some aspect of the concert experience. Nevertheless, 70% of educators of neurodivergent students deemed the content of the concerts to be suitable for their students. This suggests that students are not struggling with the content of the concerts but the experiences surrounding.

Conclusions: Neurodivergent students are integrated in a large portion of school groups who attend concerts. These students struggle with some aspects of the experience but enjoy it as a whole. Our results support existing evidence suggesting that neurodivergent students have an affinity for music and that efforts should be made to increase accessibility to musical activities.

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Booth: 13

Presenter: Lutzi Castano

Title: Interpersonal physiological synchrony of deep and shallow conversation

Authors: L. Castano\*, C. St. Georges\*, F. van Vugt \* shared first author (equal contribution)

Keywords: interpersonal relationship; physiology; synchrony; conversation

Abstract: Social connections are crucial for health. In particular, deep, intimate conversations on personal topics contribute to wellbeing and the formation of interpersonal relationships. Surprisingly, recent studies suggest that humans shy away from these beneficial conversations because we have miscalibrated expectations of how they will be experienced: we believe they will be more awkward and less beneficial than they really are. In the present study we investigate the physiological underpinnings of these effects. Specifically, we assess synchrony in autonomous nervous system activation between dyads of participants engaging in conversation. We recruited participants who meet in unacquainted dyads and have a 10 minute conversation about either deep or shallow topics, while we measured physiological parameters in both participants simultaneously. Cardiac activity was measured through ECG and PPG signals, respiration through a breathing belt and electrodermal activity using electrodes placed on the fingers. These same parameters were measured during 2 minute baseline and follow-up blocks during which participants were at rest and did not interact. We also measured participants' expectations and experiences of the conversations themselves using questionnaires, as well as measures of interpersonal closeness and listening behaviours. Our analyses focus on the synchrony between autonomous nervous system activation between the participants in each dyad and comparing this between deep and shallow conditions. Thus, the study elucidates the physiological mechanisms that enable or obstruct the forging of bonds between human beings.

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Booth: 14

Presenter: Véronique Martel

Title: Anomalous brain responses to beat deviance in Beat Deafness

Authors: V. Martel, Y.T. Lu, E. Cristea, A-M. Bissonnette, D. Rahmani, M. W. Weiss, I. Peretz

Keywords: congenital amusia; beat deafness; event-related potentials; electroencephalography

Abstract: Feeling the beat is fundamental to our experience of music. Yet, some individuals fail to synchronize with a beat, as seen in beat deafness. Studying the brain signature of this form of congenital amusia provides us with novel insights into the processing of rhythm. Here, we examined internally generated beats with the clock illusion, where equal sound events in an isochronous sequence (“tick-tick”) are perceived as unequal (“tick-tock”), with every other tone perceived as strong. Occasional intensity deviant and time deviant tones were introduced in subjective weak and strong positions of the isochronous sequences. Ten beat-deaf adults and 14 matched controls were instructed to detect the time deviants while cortical electric activity was recorded. Across participants there was an early N200 Electrical Response Potentials (ERP) to time deviants, in line with preserved predictive coding of upcoming beats. We also observed an unreliable P300 to time deviants in participants with beat-deafness relative to controls, in line with abnormal anisochrony detection. The presence of an anomalous brain response to time deviants in beat deafness is analogous to the brain responses observed in pitch deafness by small pitch deviance detection. This finding suggests that neurofeedback may be used to improve auditory learning in general.

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Booth: 15

Presenter: Haruka Saito

Title: A cross-linguistic study of audio-aerotactile perceptual integration using voicing continua

Authors: A. Saito, B. Ménard, C. Tiede, D. Whalen

Keywords: multisensory integration; speech perception; audio-aerotactile integration

Abstract: Previous studies on multimodal integration in speech perception have found that not only auditory and visual cues, but also tactical sensation – such as an air-puff on skin that simulates aspiration – can be integrated in the perception of speech sounds (Gick & Derrick, 2009). However, most previous investigations have been conducted with English listeners, and it remains uncertain whether such multisensory integration can be shaped by linguistic experience. The current study investigates audio-aerotactile integration in phoneme perception for three groups: English, French monolingual and English-French bilingual listeners. Six step VOT continua of labial (/ba/ - /pa/) and alveolar (/da/ - /ta/) stops constructed from both English and French endpoint models were presented to listeners who performed a forced-choice identification task. Air-puffs synchronized to syllable onset and applied to the hand at random increased the number of ‘voiceless’ responses for the /da/ - /ta/ continuum by both English and French listeners, which suggests that audio-aerotactile integration can occur even though some of the listeners did not have aspiration/non-aspiration contrasts in their native language. Furthermore, bilingual speakers showed larger air-puff effects for English stimuli compared to English monolinguals, which suggests a complex relationship between linguistic experience and multisensory integration in perception.

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Booth: 16

Presenter: Soraya Lahlou

Title: Spindle trains are associated with cognitive performance in patients with Parkinson’s disease

Authors: S. Lahlou, J-F. Gagnon, J. Carrier, M. Sharp

Keywords: sleep; cognition; parkinson’s disease; EEG; sleep spindles

Abstract: Sleep spindles have been associated with cognitive performance across the lifespan and disease and might serve as a marker of cognitive state. In patients with Parkinson’s disease (PD), changes in sleep spindles have been associated with cognitive decline. Recently, trains of sleep spindles (i.e., ≥ 2 spindles within 6 seconds) have been proposed to play a role in sleep-dependent memory consolidation. Whether spindle trains are reduced in PD patients, and whether they are associated with cognitive performance remains unknown.

PD patients (n=58) and a preliminary sample of healthy older adults (n=15) underwent a comprehensive neuropsychological assessment and overnight polysomnography. Five cognitive domains were assessed: attention, executive functions, learning and memory, visuospatial abilities, and language. Trains of spindles were detected on artefact-free epochs of NREM-sleep. We performed two-way ANOVAs to compare spindle trains between groups, and Pearson’s correlation between spindle train measures and composite scores for each cognitive domain.

In preliminary analyses comparing spindle trains between PD patients and controls, number of trains, size of trains and proportion of spindles in trains were significantly decreased in PD compared to controls. In patients, lower number of trains during NREM-2 was associated with lower scores on composites of attention and executive function.

These preliminary results suggest that the organization of spindles into trains differs in PD patients compared to older adults, with fewer trains and fewer spindles occurring as part of a train in PD. Our results also suggest that these differences are associated with poorer attention and executive functions in this population.

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Booth: 17

Presenter: Elise Desbarats

Title: Investigating the mediating role of the NAc in musically induced analgesia

Authors: E. Desbarats, M. Roy, R. Zatorre

Keywords: music; pain; analgesia; reward

Abstract: How does music relieve pain? This project will use fMRI to examine the neurobiological mechanisms underlying music-induced hypoalgesia (HIA). Studies have shown that the most effective music for pain relief is appraised as pleasant or preferred, outperforming relaxing music, non-musical sound, and placebo. Furthermore, the nucleus accumbens, a structure that is indispensable to our sense of musical pleasure, also significantly contributes to pain cognition represented by the SIIPS pain neurosignature. To investigate the NAc as a potential mediator of HIA, participants will listen to self selected songs they find highly pleasurable and “scrambled” control versions of these songs, continuously rating the pleasure they experience. They will listen to these songs again in the MRI scanner, where each excerpt will be presented once with pain, once without. We will then examine the effects of self-selected music on ratings of musical pleasure, pain perception, activity in the NAc and reductions in the SIIPS neurosignature.

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Booth: 18

Presenter: Catherine Houde-Archambault

Title: The effect of background music on executive functions: a systematic review of the literature

Authors: C. Houde-Archambault, É. Ponton, A. Cloutier, N. Gosselin

Keywords: background music; inhibition; working memory; executive functioning

Abstract: This systematic review aims to bring together the currently available knowledge relating to music’s effect on executive functions in a systematic review. Four systematic and three non-systematic databases were surveyed up to 2022-07-22 to find studies exploring the effect of instrumental background music on the three core executive functions, namely inhibition, working memory, and cognitive flexibility, in healthy adults aged between 17 and 65 years old who were non-musicians. The article selection method followed the PRISMA Statement and yielded 35 studies, which were evaluated with an adapted checklist for estimating quality and risk of bias. In total, 16 studies related to inhibition (n=858), 23 to working memory (n=1748), and 3 to cognitive flexibility (n=681). For most (65.7%), the quality score was rated high, whereas for 34.3% the quality score was moderate. Most studies used classical music and recruited younger adults; university students were predominantly represented. Generally, the study results are heterogeneous, with some demonstrating a beneficial influence, a detrimental effect, or no significant effect of background music on performance. Study quality, adequacy between the tasks and executive function evaluated, emotional characteristics of music, and tempo appear essential in understanding the effect of background music on inhibition and working memory. Some imprecisions in the description of musical parameters or participant samples, and inconsistency in the tasks used to evaluate cognitive functions affected our ability to compare studies. Thus, we recommend the use of standardized measurement instruments to assess executive functions, as well as comprehensive reporting of musical parameters for future research.

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Booth: 19

Presenter: Dorothée Morand-Grondin

Title: L'influence de l'expertise musicale sur l'empathie

Authors: A. Dorothée Morand-Grondin, B. Beatriz Oliveira, C. Floris van Vugt, D. Simon Rigoulot

Keywords: expertise musicale; empathie cognitive; contagion émotionnelle; déconnexion émotionnelle; musique

Abstract: Depuis la production d’études suggérant que la pratique de la musique rend plus empathique, la définition de l’empathie a évolué pour mieux représenter ce construit. À ce jour, nous considérons trois principales composantes d’empathie : l’empathie cognitive (reconnaître les émotions d’autrui), la contagion émotionnelle (répliquer les émotions d’autrui) et la déconnexion émotionnelle (distinguer ses propres émotions de celles des autres). Ainsi, grâce à des instruments prenant en compte ces plus récentes composantes de l’empathie (Read the Mind in the Eyes Test, Multifaceted Empathy Test, Basic Empathy Scale in Adults), la présente étude vise à étudier le profil empathique de musiciens et non-musiciens. En utilisant des tests t corrigés, nous avons comparé les scores des musiciens (n=26) à ceux de non-musiciens (n=51) aux mesures d’empathie. Nous avons aussi, au sein des musiciens, testé l'existence d'un lien positif entre le nombre d’heures de pratique musicale et l’empathie par une corrélation de Pearson. Les hypothèses d'une différence entre les deux groupes et d'un effet du nombre d'heures de pratique ne sont pour l’instant pas supportées par les résultats, suggérant la nécessité d’offrir un nouveau regard sur cette relation.

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Booth: 20

Presenter: Anne-Sophie Puffet

Title: Audiovisual emotional integration of words and vocalizations: evidence from a new approach

Authors: A-S. Puffet, S. Rigoulot

Keywords: EEG/ERP; audiovisual emotions; emotional congruency; emotional vocalizations; emotional words

Abstract: Emotions are expressed through many sensory modalities (e.g., vision, auditory…). Analysis of electrophysiological components (mismatch negativity [MMN], and P300) shows that emotional words and voices are integrated quickly in the brain and the congruency (same emotion of voices and words) impacts cognitive processes. However, the chronology of these processes is unclear, as previous works used different paradigms and parameters to elicit these components. We adapted with emotional content an approach to evaluate multiple neural processes in a single paradigm and investigate the role of emotional congruency on the integration of audiovisual emotional information.

EEG of 24 participants (Mage=26.7years), reading common and uncommon emotional words in French (positive, negative, and neutral) and listening to emotional non-linguistic human vocalizations (same valences), were recorded. For 75% of trials, congruent neutral auditory-visual stimuli were presented. The other 25% contained auditory-visual stimuli varying as function of frequency and emotion of the word and the emotional matching status of the voice.

Two repeated-measures ANOVAs revealed a double interaction between emotion and congruency for MMN component (p=0.04) and between emotion and topography for MMN, P3a and P3b components (ps<0.001). In post-hoc comparisons, the amplitude of MMN in response to sad sounds is significantly higher when incongruent compared to congruent condition (p=0.036). The amplitude, of MMN and P3a components in frontal zone and of p3b in parietal zone, are significantly higher for neutral rather than emotional sounds (ps<0.001).

As previous works, these results suggested an early integration of the multimodal emotional information, with a quick detection of inconsistencies.

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Booth: 21

Presenter: Florence Landry-Lehoux

Title: Effet des accents régionaux sur la reconnaissance de la prosodie émotionnelle : création et validation d’une banque de phrases en français

Authors: A. Landry-Lehoux, F. B. Rolinat, A. C. Rigoulot, S.

Keywords: prosodie; accent; émotion; validation

Abstract: La prosodie ou ton de la voix est influencée par nos émotions et notre origine. Lorsqu’une personne possède un accent qui diffère du notre, cela peut affecter la reconnaissance de ses émotions. Cet effet a été démontré pour les accents étrangers. Toutefois, on ne sait pas s’il persiste dans le cas des accents régionaux d’une même langue. Le contexte montréalais se prête particulièrement bien à cette question, car Québécois et Français y cohabitent en grand nombre. Cette étude a comme objectif la création et validation d’une banque de phrases courtes dites dans 5 émotions différentes dans la langue française (Québec et France). Pour établir les profils acoustiques des Québécois et Français exprimant ces émotions, nous avons analysé les paramètres vocaux des enregistrements. Les résultats montrent que certains paramètres, comme la fréquence fondamentale (F0), Shimmer et SpectralSlope, varieraient entre Québécois et Français pour la colère, la honte et la joie.

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Booth: 22

Presenter: Beatriz Oliveira

Title: Étude de l’influence de l'expertise musicale sur la perception émotionnelle audiovisuelle: approche électrophysiologique

Authors: Oliveira, B., Morand-Grondin, D., Rigoulot, S.

Keywords: perception émotionnelle audiovisuelle; expertise musicale; électrophysiologie; go/no-go émotionnel

Abstract: En examinant la relation entre l'apprentissage musical et les émotions, l'objectif de notre étude est de caractériser comment l'expertise musicale pourrait influencer les processus d'intégration émotionnelle, faciale et musicale. Nous collecterons chez des musiciens ou non (20 participants de chaque groupe) des mesures comportementales (tâche de go/no-go émotionnel) et électrophysiologiques (EEG). Les participants effectueront deux tâches, selon que leur attention est dirigée sur l'identification des émotions (joie, peur et tristesse) dans l’effet de congruence émotionnelle (visages et musiques qui peuvent ou non exprimer la même émotion). Nous prévoyons que les musiciens devraient montrer une meilleure précision que les non-musiciens, ainsi qu'une amplitude de N170 dans le jugement des informations congruentes, parce qu'ils sont plus sensibles à ce type d'information. Des analyses de variance à mesures répétées seront effectuées pour analyser les facteurs intergroupes (musiciens, non-musiciens) et facteurs intra-groupes (émotion, congruence, tâche). Les résultats permettront de comprendre l'influence de l'apprentissage musical sur le déroulement temporel impliqué dans l'intégration des informations multisensorielles.

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Booth: 23

Presenter: Mehrdad Bahadori

Title: Transcutaneous vagus nerve stimulation and perception of time

Authors: M. Bahadori, N. Bhutani, S. Dalla Bella

Keywords: time perception; transcutaneous vagus nerve stimulation; anisochrony detection

Abstract: In recent studies, transcutaneous stimulation of the vagus nerve (tVNS) has been shown to improve cognitive functioning including executive functions. In turn executive functions (e.g., working memory) are linked with time perception, and engage partly common brain areas, such as prefrontal cortex, parietal cortex, and basal ganglia. Thus, tVNS may be expected to affect the processing of time. To test this hypothesis, we had 22 participants (16 females) perform an anisochrony detection task while stimulating the vagus nerve through the ear (cymba conchae). Participants were presented with sequences of 5 tones, and asked to identify whether each sequence was regular (same time interval between the tones) or irregular (deviation from isochrony on the 4th tone). The stimulation was delivered according to a staircase procedure, which calculated a threshold of anisochrony detection. Participants performed the task on one day while receiving tVNS, and another day with the sham condition. The results showed that tVNS improved the participants' ability to detect smaller time shifts compared to the sham condition. In conclusion, the results suggest an overlap between the neural circuitries stimulated via the vagus nerve and those subserving time perception, as the participants perceived smaller shifts in the anisochrony detection task.

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Booth: 24

Presenter: Agnès Zagala

Title: The ramp paradigm: a new protocol for uncovering individual differences in walking to an auditory beat

Authors: A. Zagala, N.E.V. Foster, F. van Vugt, F. Dal Maso, S. Dalla Bella

Keywords: auditory-motor synchronization; rhythm perception and performance; gait; individual differences

Abstract: Walking to the beat of an auditory stimulus seems effortless for most humans. However, recent studies suggest significant individual differences in the spontaneous tendency to synchronize to the beat. Some individuals (“responders”) tend to adapt their walking pace to the stimulus while others (“non-responders”) show little or no adjustment to the beat. This distinction remains to be empirically validated, and little is known about the mechanisms explaining these differences. Unfortunately, to date, there is no protocol sensitive to individual differences in adapting to rhythmic stimuli while walking. To fill this gap, we introduce the ramp paradigm, which allows to test whether a person adapts or not to a change in a rhythmic stimulus in a gait task. In this protocol, a participant is asked first to walk at preferred cadence without stimulation. After several steps, a metronome time-aligned to the footfalls is presented. While the trial unfolds, the metronome tempo progressively departs from the participant’s cadence by either accelerating or decelerating. Reliable measurement of the participant’s cadence is ensured by using force-sensitive resistors (FSRs) and a portable Teensy device. To distinguish spontaneous from intentional step synchronization to the metronome, instructions are also manipulated by asking the participant to synchronize, walk naturally or ignore the stimulus. The method aims to quantify the individual adaptation to tempo changes in a rhythmic auditory stimulus, allowing to objectively distinguish responders from non-responders. This will pave the way to the study of mechanisms driving individual differences in gait synchronization and facilitate personalization of rhythm-based interventions.

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Booth 25

Presenter: Antoine Guinamard

Title: Investigating implicit rhythmic abilities in children

Authors: Antoine Guinamard, Simone Dalla Bella, Sylvain Clément, Nicholas E.V. Foster, Valentin Bégel, Sonja A. Kotz, Séverine Samson, Delphine Dellacherie

Keywords: implicit timing; explicit timing; rhythm; children; executive functions

Abstract: Processing time, particularly rhythm, is essential for daily activities. These abilities are linked to cognitive development in childhood, and rhythmic deficits are found in many neurodevelopmental disorders. The rhythm of auditory events can be processed explicitly, when we judge the temporal properties of an auditory sequence, such as its regularity, or implicitly when temporal information is processed incidentally while performing a non-rhythmic task. Implicit rhythmic abilities are quite well documented in adults, but little is known about implicit rhythmic skills in children, or their relationship with explicit rhythmic skills and other cognitive functions. In this ongoing study we examine implicit and explicit rhythmic abilities in children and their links to attentional and executive functions. Children aged 7 to 13 complete a new gamified version of an implicit rhythmic task, as well as explicit rhythmic tasks and tests assessing attentional executive functions. We expect implicit rhythmic abilities to be differently related to age and executive functions than explicit rhythmic abilities. By providing a better understanding of these abilities in typically developing children, this study may pave the way for new diagnostic or interventional tools for children with neurodevelopmental disorders associated with rhythmic deficits.

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Booth: 26

Presenter: Francis Dufresne

Title: Can you beat the music? Piloting a rhythmic serious game to improve sensorimotor and executive functioning in children with autism

Authors: F. Dufresne, K. Jamey, H. Laflamme, N. E. V. Foster, M. Robert, K. L. Hyde, S. Dalla Bella

Keywords: beat perception and production; autism; serious game; executive functions

Abstract: Sensorimotor training is a promising approach to treat children with autism spectrum disorder (ASD). Children with ASD display sensorimotor deficits that can be associated with their cognitive, communication, and social skills. It is still unknown whether training children with ASD using a sensorimotor task (e.g., finger tapping to a rhythmic auditory stimulus) can improve their cognitive abilities, such as executive functioning. To test this possibility, we adapted a serious game on tablet ("Rhythm Workers"), implementing a gamified version of a paced tapping task. The game consists of tapping to the beat of music of increasing rhythmic difficulty. We conducted a proof-of-concept study testing feasibility of the protocol and game acceptability in children with ASD. In this at-home longitudinal protocol, 26 children aged 7-13 were randomly assigned to play either Rhythm Workers or a control game having similar auditory-motor demands, but without beat-synchronization, while monitoring compliance, motivation, and changes in rhythmic abilities and cognitive executive function tasks. The results showed high compliance to the protocol (playing for 300 minutes over two weeks) and game acceptability for both Rhythm Workers and the control game. The games were comparable in training time and motor activity (number of taps), and were rated similarly for perceived difficulty and motivation. These findings suggest that Rhythm Workers is comparable to the control game across important dimensions and is usable and accepted by children with ASD. This pilot study provides a suitable methodology to examine skill transfer in ASD in future studies of rhythm and executive functioning.

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Booth: 27

Presenter: Oren Gurevitch

Title: Psychophysiological correlates of absorption state during music perception

Authors: O. Gurevitch, M. Hove, S. Dalla-Bella, S. Krishna

Keywords: absorption; music perception; psychophysiology; neuroscience

Abstract: This research project aims to make a significant contribution to the field of neuroscience and music by exploring the induction and psychophysiological correlates of the state of absorption during music perception. This is an under-explored area of research. When people listen to music, they often experience a significant change in their mental states, which they report as a state of absorption. However, there is very little literature about how to formally conceptualize absorption, how to measure it, and how this state is correlated with various neural and psychophysiological measures. In this research, we plan to explore potential techniques that will allow us to capture both subjective and physiological aspects of the absorption experience and understand their linkage better. We aim to investigate the relationship between participants’ characteristics and tendency to be in state absorption. We will use the Absorption in Music Scale, Barcelona Music Reward Questionnaire, and Big Five personality test to measure absorption trait, music reward, and personality characteristics. We will include absorption state measurements using the Phenomenology of Consciousness Inventory, absorption state sampling using a self-report slider indicator, physiological measures (ECG, PPG, EDA, and respiratory activity), EEG, and eye-related parameters (eye-position and movements, pupillary diameter and blinks). By identifying measurable parameters that correlate with absorption, we hope to build a framework that connects absorption to other mental states and personality traits. Our research has the potential to significantly advance our understanding of the relationship between music and absorption, leading to improved interventions for better mental health.

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Booth: 28

Presenter: Hugo Laflamme

Title: Proof-of-concept of a beat-based serious game for telerehabilitation in children with ADHD: Effects on auditory motor synchronization

Authors: H. Laflamme, K. Jamey, S. Rigoulot, N. E. V. Foster, S. Lippé, S. A. Kotz & S. Dalla Bella

Keywords: rhythm; children; ADHD; auditory; sensorimotor

Abstract: Tapping to a musical beat requires self-monitoring while maintaining regular movements and filtering relevant from distracting musical information. This poses important motor and executive functioning demands. We investigated whether our serious game involving finger-tapping to music generalizes to auditory motor synchronization skills in children with Attention-Deficit Hyperactivity Disorder (ADHD), a disorder characterized by deficits in executive functioning and rhythmic abilities. To evaluate if this game is a good candidate for a larger scale study, we firsthand assessed its pleasantness and difficulty. This study validated an at-home longitudinal protocol in which 30 children aged 7 to 13 were randomly assigned to a beat-synchronization game (RhythmWorkers, tablet application) or an active control condition (Frozen Bubble game) that lacked tapping to the beat but involved comparable motor movement. Children were asked to play the game for 300 minutes over the course of 2 weeks. Pre- and post-training rhythmic abilities (Battery for the Assessment of Auditory Sensorimotor and Timing Abilities, BAASTA) were measured. Preliminary findings for 25 children showed both games were rated equally for difficulty and pleasantness (p>.38). After playing RhythmWorkers, the rhythmic abilities of children with ADHD improved for paced tapping (to music and a metronome; p < .05), compared to the children with ADHD playing the control game. These preliminary findings validate that playing Rhythm Workers generalizes to auditory motor synchronization skills in children with ADHD and has an excellent value in terms of pleasantness and an adequate level of difficulty.

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Booth: 29

Presenter: Mona Franke

Title: Synchronization type matters: articulatory timing in different rhythmic conditions in persons who stutter

Authors: M. Franke, S. Falk, P. Hoole

Keywords: stuttering; articulatory timing; finger tapping; paced speech

Abstract: While the cause(s) of stuttering still remain(s) unknown, the breakdown of fluency in persons who stutter (PWS) has been linked to malfunctioning timing mechanisms. Speaking with an external rhythm like a metronome can tremendously reduce the occurrence of stuttered disfluencies. However, it is unknown how inter-gestural timing (such as joint speaking and tapping) with or without an external rhythm is mastered by PWS.

This study investigates articulatory timing of four PWS and four persons who do not stutter (PWNS) in different conditions: Speaking and tapping (self-paced), speaking along with a metronome (externally paced), and speaking and tapping to a metronome (Metronome+Tapping). Using electromagnetic articulography, gestures of the articulatory speech onset and the finger taps were recorded and analyzed. This setting can test whether timing information from multiple channels (auditory, manual + articulatory rhythm) is strongly or weakly coupled in PWS and PWNS, which might improve articulatory stability in the former or deteriorate it in the latter case.

Results show that, compared to the metronome beats, finger taps were more closely aligned with the articulatory speech onset supporting the assumption of a close link between articulatory and manual motor systems. Furthermore, our results indicate timing differences between PWS and PWNS, since intervals between metronome beat and articulatory speech onset were shorter in PWS. The Metronome+Tapping condition also led to significantly shorter intervals between articulatory onsets and finger taps in PWS. Our results suggest that PWS time their speech later when synchronizing to a metronome possibly pointing towards difficulties in movement initiation.

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Booth: 30

Presenter: Olivia Bizimungu

Title: Neural mechanisms of sensorimotor integration in speech perception

Authors: O. Bizimungu, D. Ostry, P. Perrier, L. Ménard, S. Baillet

Keywords: speech perception; neuroimaging; multisensory integration; sensorimotor system; neural dynamics

Abstract: Speech perception is an active and flexible process which can be influenced by the listening context and inputs beyond audition. In this study, we employ a categorical speech perception paradigm and manipulate participants’ articulatory configuration by expanding their lip surface area.

This perturbation influenced perception of French vowels: shifting both the perceived boundary between vowels and the precision of these phonemic categories. Furthermore, the perturbation was accompanied by changes in oscillatory brain activity: with perturbation-induced modulations of beta-band (15-30Hz) power in bi-lateral frontal, temporal, and inferior-parietal areas. The observed neural dynamics are consistent with theories of predictive motor-to-auditory signalling occurring via mu rhythm (8 – 30 Hz) dynamics. These findings highlight the importance of sensorimotor brain systems in the active perception of speech; suggesting that articulatory representations activated during listening may guide phonemic processing.

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Booth: 31

Presenter: Nigel Ward and Maria Psomas

Title: Musical Anhedonia and The Sensation of Groove

Authors: N. Ward\*, M. Psomas\*, I. Romkey, N. Foster, S. Dalla Bella, V. Penhune

Keywords: groove, musical anhedonia, music perception

Abstract: “Groove” refers to the pleasurable desire to move to music. Previous work has found that ratings of desire to move and pleasure on groove stimuli are highly related to one another, but recent findings support the idea that the two may be separable. One study found that pleasure ratings fully mediate harmonic complexity's effect on desire to move ratings. Additionally, fMRI work has found that pleasure ratings are more associated with increased activation in ventral striatal areas, while desire to move ratings have been associated with increased activation in dorsal striatal areas. Musical anhedonia refers to those with a blunted ability to derive pleasure from music but can still derive pleasure from other areas of life. To explore the separability of pleasure and desire to move within groove, the current study compared groove ratings from those with musical anhedonia to a control sample. Groove stimuli varied in their rhythmic and harmonic complexity. Individuals with musical anhedonia were identified via the Barcelona Musical Reward questionnaire, screened for depression and assessed for average levels of anhedonia and sensitivity to punishment and reward. Contrast analyses indicated no differences in their groove ratings between those with musical anhedonia and controls. Further mediation analyses indicated that desire to move ratings fully mediate the effect of rhythmic and harmonic complexity on pleasure ratings in those with musical anhedonia. Results from the present study indicate that the pleasure derived from the sensation of groove may be different from other aspects of musical pleasure.

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Booth: 32

Presenters: Marin Hoh and Bryanna Campbell

Title: Investigating the relationship between auditory-motor synchronization and musical experience

Authors: M. Hoh\*, B. Campbell\*, M. Psomas,  F. Assaneo, V. Penhune

Keywords: auditory-motor synchronization; musical experience; statistical learning; rhythm discrimination

Abstract: Accurately perceiving and reproducing the timing of speech and music has been linked to enhanced language processing. Findings show that when asked to speak in time with a stream of syllables, approximately 50% of individuals spontaneously synchronized their speech to the syllables. These high synchronizers out-performed low synchronizers on a statistical word-learning task. High synchronizers also exhibited more music training and engagement. However, a direct link between music training and synchronization performance has not been explored.  Therefore, we tested musicians (N=13; 5-22 years of training) on the speech synchronization and statistical word learning tasks and hypothesized that longer training would relate to increased performances. We also assessed musicians’ rhythm and melody discrimination abilities and hypothesized that better rhythm discrimination would relate to increased synchronization. Results showed that all musicians were classified as high synchronizers, but we found no relationship between synchronization and word-learning performance.  Further, scores on the synchronization and word-learning tasks were also not predicted by years of music training nor by rhythm or melody discrimination ability. These results suggest that a minimum amount of music training is required to boost synchronization performance, but further training does not provide additional benefits.  This could be tested by extending our sample to a wider range of years of experience.  Second, good auditory synchronization ability may contribute to musical skill, and thus people who are high synchronizers are more likely to pursue training.  This hypothesis could be examined in a longitudinal design with children or adults undergoing music training.

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Booth: 33

Presenter: Theodora Nestorova

Title: Thinking about tension: neurogenic causes distinguishing primary muscle tension dysphonia (PMTD) from compensatory hyperfunction in singers in training

Authors: T. Nestorova

Keywords: muscle tension dysphonia; neurogenic; singing

Abstract: Background Information: There is lacking consensus among voice professionals on the boundaries of compensatory hyperfunction (known generally as tension in vocal pedagogy) versus named disorders such as Primary Muscle Tension Dysphonia (PMTD) for singers in training. Both involve habitual, excessive musculoskeletal constriction and muscular imbalance during voice production, resulting in inefficient and suboptimal phonatory output. (Van Houtte et al., 2011). Neither compensatory hyperfunction/singing tension nor PMTD are well-represented, standardized, or codified in singing voice science literature. Both are complex functional phenomena; originating from multiple causes and locations, and the terms are used generically, broadly, and sometimes interchangeably. A seminal terminological study on singing tension called for more research to facilitate greater consistency in the diagnosis and management of constriction, the study’s ultimate term for tension (Lemon-McMahon & Hughes, 2018).

Furthermore, diagnosing these tension conditions in singers is nuanced and complicated due to case-use specifications of the elite professional singing population and individual psychosomatic factors. Moreover, it is particularly complex in singers who are actively training, as building singing technique includes many co-influencing facets which may involve tension while efficient coordination is developed. The ability to distinguish these factors when recognizing and addressing tension is a lacking area in pedagogical publications.

Objectives: This collaborative research, conducted by a multidisciplinary team of a singer/vocal pedagogue, otolaryngologist, speech-language pathologist, and psychologist highlights the neurogenic underpinnings and closes the existing terminological gap surrounding tension in singers in training and accordingly provides interventions for vocal pedagogues, voice clinicians, and singers themselves.

Methodology: The convergences and divergences of compensatory hyperfunction and PMTD in singing are elucidated by decorticating neurogenic causes from a comprehensive literature review and by qualitative surveys from each professional’s empirical evidence comparing and contrasting these phenomena.

Results: Novel models for various archetypes, convergences, and divergences of these conditions are suggested based on the neurogenic basis of the disorders.

Conclusions: Practical applications for implementing a holistic, neurogenic considered diagnosis from both vocal pedagogues and voice clinicians working with singers in training who present with tension is offered.

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Booth: 34

Presenter: Adina Lorena Patru

Title: Sex differences in subjective cognitive decline

Authors: A. L. Patru, S. Boutin, S. Brambati

Keywords: subjective cognitive decline; elderly; sex differences; dementia; neuropsychology

Abstract: Subjective cognitive decline (SCD) is a self-reported  experience of cognitive decline in the context of normal performance in neuropsychological tests.  Many studies investigated sex-differences in the neuropsychological profile of people with SCD, but results are inconsistent. However, no studies have searched sex differences in the nature of cognitive complaints of people with SCD. The aim of this study is to characterize sex differences in the types of cognitive complaints between elderly with SCD and elderly without SCD using the Alzheimer’s Disease Neuroimaging Initiative database. Cognitive complaints were evaluated using the Everyday Cognition Scale. ANOVAs were performed to determine differences between men and women, with or without SCD in the severity of complaints for each of the 39 items of the scale. A Benjamini type correction was applied to correct for multiple comparisons. Covariables included in the analyses were age, education level, score at the Geriatric Depression Scale and the anxiety item score from the Neuropsychiatric Inventory Questionnaire. This study did not find any sex differences regarding types of complaints between elderly with SCD and those without despite the fact that some sex differences were found in the literature regarding the cognitive profile of SCD people.

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Booth: 35

Presenter: Stephanie Deschamps

Title: Effects of early language exposure on speech category learning

Authors: S. Deschamps, J.K. Chen, K. Sitek, B. Chandrasekaran, S. Baum, D. Klein

Keywords: speech category learning; fMRI; lexical tone

Abstract: International adoptees (IA) often experience early but discontinued exposure to their original birth language during infancy, prior to being adopted and acquiring the language of their new adopted family. Previous research with IA from China has shown that early but discontinued exposure to their birth language Chinese can result in maintained neural traces of Chinese phonology despite having no functional knowledge of the language at the time of testing (Pierce et al., 2014). Here, we build on this work by examining in what way IA from China can leverage their early Chinese phonological representations to exhibit a re-learning advantage for the perception of Chinese tones in adulthood. We recruited 3 groups of adult participants: 1) IA from China, adopted into French-speaking families, 2) French monolinguals (FM) without prior exposure to Chinese, and 3) French-Chinese bilinguals. Participants performed a Chinese lexical tone categorization task while in an MRI scanner. During this task, participants were presented with monosyllables produced using the 4 different Chinese lexical tones spoken by 4 talkers (2 male, 2 female) and were asked to categorize the stimuli, with lexical tone being the category of interest. Participants received minimal visual feedback (“Correct” or “Wrong”) after each trial. Preliminary examination of brain activation patterns revealed differences in initial tone-categorization learning strategies between the IA and FM groups. The behavioural and neural activation results are discussed in the context of theories of language development, the sensitive period hypothesis, and neuroplasticity.

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Booth: 36

Presenter: Can Kok

Title: Shifting the focus: reading behavior and gender expectations in CV evaluations

Authors: C. Kok, M. Yang, D. Titone

Keywords: gender bias; computational linguistics; psycholinguistics; implicit bias; eye tracking

Abstract: Prior research consistently demonstrated that a persistent gender disparity lies within academia, despite an increasing number of women receiving academic titles (Casad et al., 2021; Llorens et al., 2021). The gap widens at every stage of women’s academic careers, and it does not seem likely that gender parity will be achieved in some fields for even decades (Holman et al., 2018). While the concrete outcomes of these stereotypes and implicit biases are well documented, the cognitive mechanisms that potentially cause the biased outcomes remain unknown. Thus, this current pilot study was designed to fill the gap in research by examining possible cognitive and psycholinguistic mechanisms that guide biased evaluation outcomes. 8 LinkedIn-style CVs were created to investigate the effects of reading behavior and the role of language for hypothetical lab manager applications. The CVs were manipulated in terms of gender, quality, and gender association of trait words, to understand how CV evaluations will differ across conditions. To quantitatively evaluate the gender association of words in our stimuli CV, we used a derivative of the Word Embedding Association Test (WEAT) (Caliskan et al., 2017). Eye tracking and self-report questionnaire measures were used to assess evaluation outcomes of each applicant. The pilot study's results indicated that female CVs received more favorable evaluations than male CVs, contrary to findings in prior studies. Furthermore, CVs where applicant gender matched the gender association of trait words were generally evaluated more positively overall. Given these findings, we hope to increase our sample size and diversify our demographic population to disentangle our preliminary findings.

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Booth: 37

Presenter: Chaimaa El Mouslih

Title: Language evolution within simulated multilingual societies: evidence from the iterated learning paradigm

Authors: C. El Mouslih, V. Hodgins, P. Palma, D. Titone

Keywords: iterated learning; language evolution; cognitive processes; French-English bilingualism

Abstract: Previous iterated learning studies that studied language evolution in the lab have focused on monolingual populations. The present study aims at broadening the literature by examining how two populations of bilingual speakers influence the evolution of two types of artificial languages (French-like and English-like). We recruited 64 English-French bilingual participants; 32 participants were English-dominant, and 32 were French-dominant. Participants were split into 8 groups based on their L1, and each participated in two iterated learning tasks, one on each artificial language. The artificial languages were created in the lab and consisted of nonword-picture pairings combined with an audio file. The non-words in each alien language were made of the same syllables, but differed in the presence or absence of diacritics and in the pronunciation heard in the audio file. We used transmission error and systematicity as a measure of learnability and structure, respectively, and also measured number of unique words. Results indicated that while both languages increased in learnability and structure over generations, French drove an interaction effect at both the level of the language and the speaker. French-L1 participants applied greater structure over generations in both languages, French-like languages showed greater structure overall and also contained more unique words. These results show that both the speakers’ prior linguistic biases (i.e. their l1) and the intrinsic features of the language (e.g. French-like diacritics) influence linguistic cultural transmission. This is evidence for a bidirectional relationship between our cognitive processes and the languages that we speak.

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Booth: 38

Presenter: Ece Basoglu

Title: Exploring the trait-like and state-like effects on mentalizing

Authors: E. Basoglu, V. Hodgins, A. J. Martinez Iniesta, D. Titone

Keywords: mentalizing; bilingualism; inferences; social cognition; language diversity

Abstract: Mentalizing is a type of social cognition that helps people make inferences about others’ intentions and actions in a manner that can aid in navigating social interactions. Since previous studies have shown that bilinguals exhibit greater mentalizing capacities, the present study examines individual differences within bilinguals to see whether mentalizing is a trait-like ability based on language experiences or can be state-like, i.e. availability of cognitive resources can be influenced. Sixty-six bilingual adults were presented with 138 sentence pairs in three inference-type conditions: logical, mentalizing and incoherent. They were asked to rate them based on the coherence between the two sentences and the extent to which they engaged in mentalizing to connect the two sentences while their reaction times were being measured. We hypothesized that priming mentalizing was possible and expected to see a decrease in reaction times and an increase in mentalizing ratings when a mentalizing condition was followed by another mentalizing condition. We also speculated that the mentalizing ratings would steadily increase across trials because participants might get into a mentalizing state of mind as the study progresses. We found that compared to the first half of the study, participants were significantly faster to rate sentence pairs in mentalizing and coherence in the second half of the study, but there was no difference in ratings. Furthermore, there was no significant effect of previous trials on current trial ratings and reaction times. Overall, we concluded that mentalizing is a trait-like ability and is unaffected by state-like effects.

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Booth: 39

Presenter: Alessia Kalogeris

Title: Contextual self-evaluative judgements of bilingual language experience: are some self-evaluations more biased for some contexts compared to others?

Authors: A. Kalogeris, E. Hernández-Rivera, D. Titone

Keywords: bilingualism; language entropy; language experience; language proficiency; self-ratings

Abstract: In their day-to-day lives, people are constantly faced with the need to quantify and compare their skills to others. Consequently, many measures of bilingual experience assessing people’s perceptions are inherently subjective; based on self-report questionnaires. Such measures have been criticized in favour of objective measures of language skill (e.g., LexTALE). However, not all self-evaluative judgements of skill and behaviour are likely to be equally inaccurate. Currently, little is known about how individual and contextual frames-of-reference affect the accuracy of people's L1/L2 self-evaluative judgements. To test this, we analyzed language background and behavioural English reading comprehension data of 1,900 L1 and L2 English-French speakers across Canada (Montreal, Ottawa, Hamilton, Alberta) Data was collected as part of the ENRO multi-national project (Siegelman et al., 2023). Our results suggest that the concordance between people's self-evaluations and ground-truth measures of proficiency (LexTALE) is moderated by the socio-experiential context of language-usage. Self-evaluations of L1-vs-L2 proficiency were overall less accurate in locations with lower linguistic diversity (i.e., Hamilton/Alberta), but not for locations with higher linguistic diversity (i.e., Montreal). Interestingly, the concordance between self-reported L1/L2 language-usage and ground-truth measures of proficiency was reliable across Canada, validating the robustness of usage-based language experience measures (e.g., language entropy, L2 usage/exposure). Our findings show that, self-evaluative judgements of language proficiency can potentially yield biased self-reports, relative to individual experiences rooted in the broader sociolinguistic context in which people live and how people interact with such contexts. In contrast, usage-based language experience measures are inherently less self-evaluative, thus more robust.

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Booth: 40

Presenter: Dan Chen

Title: The role of bilingual language experience in numerical cognition and mathematical word problem solving

Authors: D. Chen, E. Hernández-Rivera, K. Tarin, M. Jang, G. Luk, D. Titone

Keywords: bilingualism; numerical cognition; psycholinguistics; word problem solving; individual differences

Abstract: Despite the intersection between language and mathematics, research unifying bilingualism, numerical cognition, and mathematical word-problems is scarce. Research in numerical cognition investigates numerical factors affecting numerical processing, yet discount linguistic context. Conversely, word-problem research targets comprehension processes, ignoring numerical factors. Crucially, both fields forgo psycholinguistic evidence for differences in how bilingual process numerical information embedded in discourse contexts in their L1 or L2. Consequently, little is known regarding how individual differences in general and math-specific language-usage impact non-/exact mathematical processing. Here, we aimed to investigate how differences in general and math-specific language-usage impact exact (addition) versus non-exact (comparison) numerical processes. Additionally, we examined whether math-specific language-usage predicted response patterns to correct or incorrect mathematical probes and whether reading measures (total reading time; TRT) predicted subjects’ decision-RTs to correct/incorrect probes. 57 French-English bilingual adults read two-sentence mathematical word-problems in a self-paced reading task. For each trial, subjects were asked to either add or compare two of three quantities embedded in the word-problem. Results show that only math-specific language-use, moderated decision-RTs. Greater math-specific language-usage led to faster decision-RTs for comparison, but not addition operations and neither of math-specific, nor general language-usage impacted decision-RTs to correct vs. incorrect probes. Interestingly, TRTs were negatively correlated with decision-RTs to probes. Higher TRTs were associated with faster decision-RTs for bilinguals with greater math-specific language-usage. We discuss implications of these results for the dominant models of bilingual arithmetic processing.

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Booth: 41

Presenter: Marie-Andrée Richard

Title: Relation between wanting to move and pleasure in a music listening task: considering individual differences and motor activity

Authors: M.A. Richard, J. Fortier, W. Azzi, N.E.V Foster, N. Gosselin, S. Dalla Bella

Keywords: music; pleasure; movement; individual differences

Abstract: Rhythmic music can evoke pleasure and a motivation to move due to factors such as arousal and familiarity. Despite the growing literature on the relation between pleasure and wanting to move, it is still unclear if this relation is influenced by the type of motor activity and by individual differences. In an online study, 480 participants (18 – 83 years old) listened to a randomly selected block of 24 songs from a total selection of 264 songs. For each song, participants rated the evoked pleasure, arousal (relaxing-stimulating), and familiarity. They also reported their wanting to move (WTM, low-high) for different motor activities: tapping, walking, running and dancing. Participants also reported their gender, age, and if they are a musician and a dancer. The results showed that pleasure and WTM are highly and positively correlated. WTM and pleasure decreased as a function of the intensity of the motor activities. Arousal and familiarity were moderately and positively correlated with pleasure and WTM. Dancers reported a higher WTM than non-dancers. Women reported higher scores for WTM and pleasure than men. No effect of age nor differences between musicians and non-musicians were found. Both pleasure and WTM were modulated by gender, motor activity and being a dancer. On the other hand, pleasure and WTM were preserved at older ages, and were not influenced by musicianship. These results allow a greater understanding of music-evoked pleasure and WTM, and the impact of individual differences, suggesting the need to consider these factors in future research.

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