



LA PRÉVENTION AU CŒUR D'UNE MEILLEURE SANTÉ
BETTER HEALTH THROUGH PREVENTION

6th Annual **PERFORM** Centre Research Conference

MANAGING CHRONIC CONDITIONS THROUGH
NUTRITION AND ACTIVITY

ABSTRACTS

May 10, 2019
Concordia University
Montreal, Canada



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Long-term physical exercise training program successfully reduces pain intensity and benefits psychological factors in individuals experiencing chronic low back pain.

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Introduction/Aim:

The Global Burden of Disease study (2016) reported that chronic low back pain (CLBP) is the most prevalent and disabling condition amongst numerous chronic illnesses. According to the guidelines provided by Airaksinen and colleagues (2006), supervised physical exercise intervention is an important first-step treatment of nonspecific chronic low back pain. Here, we investigated the impact of a 14-week long personalized physical exercise training on pain intensity, perceived disability and several psychological factors in people suffering from CLBP.

Methods:

Twenty-three participants (female - 16, male - 7, age range 22-72 years old) suffering from chronic low back pain were recruited to complete 14 weeks of cardiovascular training and muscle strengthening program. At the beginning and at the end of this intervention, we assessed their pain intensity following NIH (2017) guidelines and asked participants to complete several psychosocial questionnaires (Beck Depression Inventory, Pain Catastrophizing Scale, and Oswestry Disability Index).

Results:

Following a long-term physical exercise intervention, perceived pain intensity decreased significantly ($p=0.001$). Pain catastrophizing score ($p=0.004$), Oswestry disability index ($p=0.005$) and Beck depression index ($p=0.022$) showed a significant decrease.

Discussion/Conclusions:

Our findings suggest that a long-term physical exercise training substantially contributes in reducing pain and improves psychological factors in patients with chronic low back pain. In order to support our hypothesis further, we are looking forward to including results of a wait-list control group in our future analysis.

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keywords: chronic low back pain physical

Poster # 1

QST PREDICTORS OF PHYSICAL EXERCISE TRAINING EFFECTS ON CHRONIC LOW BACK PAIN

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Background and Aims: According to a recent systematic review conducted by the American College of Physicians, exercise therapy is one of the few interventions reliably showing positive effects in the management of chronic low back pain (CLBP). Unfortunately, we still know very little of the mechanisms underlying the therapeutic effects of exercise therapy, which makes it difficult to predict which patients are going to benefit more from exercise therapy. It has been hypothesized that CLBP may be partially maintained by central sensitization, and that quantitative sensory testing (QST) can be used to infer the degree of central sensitization. Here, we examined the predictive value QST on the effects of exercise therapy on CLBP.

Methods: Patients with CLBP ($n = 19$) were tested before and after a 14-week PE training program comprising three 60-minute weekly sessions. QST measures included 1) thermal pain thresholds (TPT), pressure pain threshold (PPT), sensitivity to pin-prick pain (PPP) and temporal summation of pin-prick pain (TS).

Results: The beneficial effects of physical exercise training on CLBP were predicted by lower signs of central sensitization before training, such as higher PPT ($R = -0.521^*$, $p = <0.05$), lower PPP sensitivity ($R = -0.524$, marginally significant effect), and lower TS ($R = -0.547$, $p = <0.05$).

Conclusions: Our findings suggest that central sensitization confers a poorer prognosis for the efficacy of PE training on CLBP.

keywords:

Poster # 2

Analysis of oxygen and glucose metabolism in hubs of resting-state brain functional connectivity

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Connector hubs are highly functionally connected regions of the brain, lying at the core of the brain's main connections. Hubs perform a crucial role in maintaining networks robustness and global information integration [1]. In this study, to characterize baseline metabolism of functional connector hubs we localized them from individual resting-state functional MRI data; using a method recently developed by our group: Sparsity-based Analysis of Reliable K-hubness (SPARK). SPARK allows estimating the number of functional networks associated with each voxel (K-hubness) as well as the unique possibility to identify what are the networks associated with each hub [2]. On the other hand, we estimated baseline cerebral metabolic rate of O₂ (CMRO₂) and the oxygen extraction fraction (OEF) using an Arterial spin labelling (ASL) method combined with generalized Quantitative O₂ imaging (QUO₂) MRI technique [4] using hyperoxic and hypercapnic gas manipulations. To study the glucose metabolism of the connector hubs a resting state positron emission tomography (PET) with 18F-fluorodeoxyglucose (FDG) tracer was acquired using a PET/CT GE camera. Here we are presenting preliminary data collected on five healthy subjects (3 males and 2 females, 25±5 years), for whom SPARK method was applied to extract hubs, baseline CMRO₂ and OEF were estimated using quantitative MRI, and relative the cerebral metabolic rate of glucose (rCMRGlu) map obtained from resting state PET data. In agreement with previous findings on glucose metabolism within hubs [3], our results are suggesting a power-law model between k-hubness and: rCMRGlu, CMRO₂, and OEF, confirming resting-state glucose and oxygen consumption efficiency for connector hubs when compared to non-hubs regions. Our results are suggesting a plateau effect for the relationship between the k-hubness and CMRO₂ and rCMRGlu which further confirm the efficiency of hubs metabolism, using the methods SPARK providing a realistic estimate of hubness.

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keywords: cmro oef asl fdg pet

Poster # 3

Interaction of DRD2/ANKK1 Taq1A genotype with in-store food displays on diet quality in a cohort of Quebec adults

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Background: The differential susceptibility hypothesis is a model of gene-environment interaction where individuals display differential responses to positive and negative exposures based on genetic variation. DRD2/ANKK1 Taq1A is a candidate gene for differential susceptibility, but its association with dietary outcomes according to everyday environmental food exposures has not been explored.

Objectives: Evaluate the interaction between DRD2/ANKK1 Taq1A genotype and exposure to neighbourhood in-store marketing strategies of healthful and unhealthful foods on diet quality.

Methods: Data from the CARTaGENE biobank (n=3,013) were temporally and geospatially linked to neighbourhood data on in-store displays of soft drinks, ice cream, and vegetables. The Canadian-adaptation of the Healthy Eating Index 2010 (HEI-C) was calculated from food frequency questionnaires. Generalized estimating equations adjusted for sociodemographic factors and energy intake were used to evaluate the interaction between the Taq1A variant and standardized food display measures.

Results: A significant interaction was observed between the Taq1A variant and ice cream display on HEI-C score (estimate: -1.03 (95 confidence interval (CI): -2.04, -0.01), p=0.048). Exposure to in-store ice cream displays was significantly and inversely associated with HEI-C among carriers of the Taq1A allele (relative risk (RR): 0.78 (95 CI: 0.61, 0.99, p=0.042), but there was no significant association for non-carriers (RR: 1.08 (95 CI: 0.93, 1.25), p=0.353). No other significant interactions were observed.

Conclusions: Our findings suggest that dietary associations with the retail food environment are partly moderated by genetics. The DRD2/ANKK1 Taq1A polymorphism is associated with response to the obesogenic environment, but further evaluation is needed for evidence of differential susceptibility.

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keywords: food environment gene environment interaction

Poster # 4

Greater presence of pro-inflammatory immune cells in visceral adipose tissue compared to subcutaneous adipose tissue in women undergoing bariatric surgery

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Studies using flow cytometry found macrophage and T-cells within adipose tissue (AT) that contribute to an inflammatory microenvironment. However, the immune cell profiles within different AT regions are not well characterized. Our objective was to compare the immune cell profiles of abdominal subcutaneous AT (SAT) and visceral AT (VAT) in women having bariatric surgery. Eleven women undergoing bariatric surgery were recruited from Hospital Sacre-Coeur in Montreal, QC. The average age and BMI was 40.6 ± 8.0 y and 47.1 ± 6.6 kg/m². AT biopsies were taken from VAT and SAT during surgery. Samples were digested using a collagenase/HEPES solution and the stromovascular fraction was isolated. Flow cytometry (BD FACSVerser) was used to characterize immune cells. SAT mass was greater ($p < 0.01$) than VAT, $36.5 \text{ kg} \pm 8.6$ vs $1.5 \text{ kg} \pm 0.56$, respectively. There was no difference in the number of CD68⁺ (macrophage) cells between VAT and SAT however, the number of CD68⁺CD206⁺ (M2-macrophage) was greater ($p = 0.03$) in VAT (1903.3 ± 535.5 cells/g tissue) than SAT (448.1 ± 197.5 cells/g tissue). VAT had more ($p < 0.01$) CD3⁺ (T-cells) (4061.7 ± 810.2 cells/g tissue) compared to SAT (1260.5 ± 240.4 cells/g tissue). The number of CD3⁺CD8⁺ (cytotoxic T-cells) and CD3⁺CD4⁺ (T-helper cells) was greater ($p < 0.01$ and $p = 0.02$, respectively) in VAT vs SAT (1500.0 ± 288.1 cells/g tissue vs 494.84 ± 93.7 cells/g tissue and 1579.37 ± 444.1 cells/g tissue vs 556.4 ± 145.53 cells/g tissue, respectively). Interestingly the proportion of CD3⁺ cells that were CD4⁺ and CD8⁺ was not different between depots. There was no difference in the number or proportion of CD45⁺CD16⁺ (natural killer cells), CD45⁺CD56⁺ (natural killer T-cells), CD45⁺CD19⁺ (B cells) or CD11c⁺CD11b⁺ (myeloid dendritic cells). In women undergoing bariatric surgery, VAT has a lower mass and greater presence of M2-macrophages and pro-inflammatory T-cells than SAT. The composition of the T cell population is similar in both depots.

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keywords: flow cytometry regional adipose tissue

Poster # 5

Cognitive or physical activity training improves attentional control through specific mechanisms

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Aging is associated with significant declines in attentional control, and previous studies have shown that aerobic training can improve healthy older adult's performance on executive functions. However, it is not yet clear how physical activity-induced improvements compare to cognitive training improvements in a cognitive dual task. To investigate this, 68 healthy sedentary participants over the age of 60 ($M=68.58$, $SD=4.68$) have been randomized to one of the three 12 weeks training programs (Aerobic (AE)=23, Motor Functions (MF)=24, Cognition(COG)=21). Before and after the training program, the participants underwent physical fitness tests, and cognitive evaluations (MMSE, and a computerized divided attention cognitive dual task - DT). The AE consisted of high intensity training on a recumbent bicycle. The MF consisted of full-body exercises focusing on coordination, balance, stretching, flexibility without raising the heart rate. The COG training consisted of Ipad exercises focusing on executive functions. Repeated measures ANOVAs revealed a decrease in DT cost only in the two physical activity groups ($F(2,65)=3.88$, $P<.03$), and no change in task set cost in either of the groups. On all components of the dual task, reaction time (RT) was improved only in the MF and COG groups ($F(2,65)=6.15$, $P<.00$ for dual mixed; $F(2,65)=12.54$, $P<.00$; for single mixed; $F(2,65)=14.00$, $P<.00$ for single pure), with COG having the highest improvement in all cases.

Although the cognitive training improved RT the most, the current results suggest that physical activity training might have a superior benefit in terms of DT cost in attentional control. Moreover, the results also suggest that softer, non-aerobic exercise programs can also be beneficial in improving dual task performance in older adults.

keywords: exercise cognitive training aging dual

Poster # 6

MEDICAL CANNABIS FOR COMMON SYMPTOMS AMONG CANCER PATIENTS IN QUEBEC, CANADA: THE CANNABIS PILOT PROJECT AT THE MCGILL UNIVERSITY HEALTH CENTRE

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Introduction: The role of medical cannabis (MC) as a complementary therapy to relieve cancer-related symptoms and enhance the quality of life of cancer patients is still under-investigated.

Methods: The Cannabis Pilot Project (CPP) accepted patients already receiving supportive care, but referred to the CPP because they did not achieve adequate symptom relief. We examined the safety and efficacy of MC to relieve nine symptoms measured using the revised Edmonton Symptom Assessment Scale (ESAS-r).

Results: Sixty-five patients have been enrolled (mean age 61 years; 52 female) in the CPP over seven months. By the second follow-up, a clinically meaningful improvement by one point in a 0-10 scale (0=no symptom, 10=worst possible symptom) was reported for all nine symptoms recorded by the ESAS-r (Figure 1). Mean ESAS scores improved significantly for tiredness, lack of appetite and wellbeing (Figure 2). Mild side-effects not requiring suspension of treatment (i.e feeling light-headedness in the morning) were reported by 15.5 of patients at 1st follow-up and 14.8 at 2nd follow-up.

Conclusion: Cannabis treatment seems to positively impact symptom burden in cancer patients, with clinically and statistically significant improvements for wellbeing, tiredness, drowsiness and lack of appetite.

keywords: cancer symptoms medical cannabis quebec

Poster # 7

Automatic Frame Selection Using MLP Neural Network in Ultrasound Elastography

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Ultrasound elastography estimates the mechanical properties of the tissue from two Radio-Frequency (RF) frames collected before and after tissue deformation due to an external or internal force. This work focuses on strain imaging in quasi-static elastography, where the tissue undergoes slow deformations and strain images are estimated as a surrogate for elasticity modulus. The quality of the strain image depends heavily on the underlying deformation, and even the best strain estimation algorithms cannot estimate a good strain image if the underlying deformation is not suitable. Herein, we introduce a new method for tracking the RF frames and selecting automatically the best possible pair. We achieve this by decomposing the axial displacement image, computed using Dynamic Programming (DP) [1], into a linear combination of principal components (which are calculated offline) multiplied by their corresponding weights. We then use the calculated weights as the input feature vector to a multi-layer perceptron (MLP) classifier. The output is a binary decision, either 1 which refers to good frames, or 0 which refers to bad frames. Our MLP model is trained on in-vivo dataset and tested on different datasets of both in-vivo and phantom data, where the ground truth was obtained by manual inspection of the strain image obtained using the Global Ultrasound Elastography technique [2]. Results show that by using our technique, we would be able to achieve higher quality strain images compared to the traditional methods of picking up pairs that are 1, 2 or 3 frames apart. The training phase of our algorithm is computationally expensive and takes few hours, but it is only done once. The testing phase chooses the optimal pair of frames in only 1.9 ms.

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keywords: ultrasound elastography multi layer perceptron

Poster # 8

Modulation of attentional allocation during cognitive-motor dual-tasking following cognitive or physical training in healthy older adults

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Background and Aim. Walking while simultaneously performing a cognitive task (cognitive-motor dual-tasking) predicts falls risk and cognitive impairment in older adults. While dual-task performance can improve following cognitive or physical training, less is known about how training modulates attention between cognitive and motor domains during dual-tasking. Additionally, it is unclear how individual differences in cognitive and physical functioning in older adults predicts change in dual-task performance following training. **Methods.** To investigate this, seventy-four healthy older adults were randomized to one of three training arms: Cognition (COG) = 27, Aerobic (AE) = 28, Gross Motor Abilities (GMA) = 27 over 12 weeks (1 hour, 3 x/week). Single and dual-task performance (gait speed, m/s; cognitive accuracy, %) was evaluated before and after training, using the 2-back task as a concurrent cognitive load. **Results.** Compared to baseline levels, we observed few changes in gait speed during dual-tasking following training ($d = 0.06$). However, dual-task cognitive accuracy improved ($d = 0.51$), which could suggest increased attentional efficiency. Individuals with lower baseline cognitive status (Montreal Cognitive Assessment, dual-task 2-back accuracy) and physical functioning (Timed Up and Go) showed greater improvements in cognitive accuracy dual-task costs. There were no differences across training groups. **Conclusions.** Results suggest that regardless of the type of intervention, attentional allocation between cognitive and gait domains during dual-tasking appears modifiable. Our results are clinically useful as they suggest that cognitive remediation or physical exercise for dual-tasking may be particularly beneficial to individuals with poorer cognitive and physical functioning. As cognitive-motor dual-tasking is common, the observed plasticity of attentional allocation in old age has important implications for improving the health and well-being of older adults.

keywords: aging executive function gait dual

Poster # 9

Hemodynamic correlates of changes in neuronal excitability: a simultaneous Transcranial Magnetic Stimulation (TMS) / functional Near Infra-Red Spectroscopy (fNIRS) study

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Introduction: Transcranial Magnetic Stimulation (TMS) is a non-invasive neurostimulation technique which depolarizes neuronal pools using a brief and intense magnetic pulse [1]. Paired associative stimulation (PAS) allows temporarily increasing or decreasing primary motor cortex excitability [2]. Near-infrared spectroscopy (NIRS) tomography reconstructs the oxy- and deoxy-hemoglobin concentration changes measured on the scalp along the underlying cortical surface [3]. The purpose of this study is to characterize the hemodynamic correlates associated with PAS related changes of cortical excitability.

Methods: Eight healthy right-handed male participated to this study. NIRS montage was designed using an optimal montage over the right "hand knob" cortical area [4]. Three experimental sessions were considered in different days: excitability increase, decrease and SHAM. Prior to and after each session, we performed 75 single pulse TMS and finger tapping tasks. NIRS responses were individually reconstructed along the cortical surface, using the Maximum Entropy on the Mean (MEM) framework [5]. Reconstructed maps and time courses of oxy- and deoxy-hemoglobin concentration changes were then compared to access the effects of excitability changes on voluntary hemodynamic responses.

Results: We observed increased excitability for 4 out of 6 PAS25 sessions along with reconstructed HbO/HbR maps amplitudes increases. When decreasing brain excitability using PAS10, we found MEP decreases in 2 out of 3 sessions together with decreased NIRS responses. For all SHAM sessions, MEP, HbO and HbR ratios were not exhibiting any effect.

Conclusions: Our results suggest that excitability changes induced by PAS are accompanied by changes of hemodynamic activity measured using NIRS in the primary motor cortex. We therefore demonstrated the concept that hemodynamic induced by voluntary task does indeed vary along with the brain excitability changes.

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keywords: nirs tms pas neuronal excitability

Poster # 10

SEX MODERATES THE RELATIONSHIP BETWEEN AORTIC STIFFNESS, COGNITION AND CEREBROVASCULAR REACTIVITY IN HEALTHY OLDER ADULTS

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Introduction: It is well established that arterial stiffness (AS) is an independent predictor of cardiovascular disease (CVD) and has been associated with changes in cerebrovascular reactivity (CVR) and cognitive decline in aging¹. Specifically, men with increased AS show reductions on executive function (EF) tests compared to women². Decreased EF is also linked with reductions in CVR³. Interestingly, the relationship between AS and CVR is more complex, where some work shows decreased CVR with increased AS⁴, and others demonstrate preserved CVR with higher AS⁵. Here, we investigated the possible role of sex on these relationships.

Methods: Acquisitions were completed in 48 healthy older adults (31 females, 63 ± 5 years) on a 3T MRI. Pseudo-continuous arterial spin labeling using dual-echo readouts (TR/TE1/TE2/flip angle = 2000ms/10ms/30ms/90° with 4x4x7mm, 11 slices, post-label delay=900ms, tag duration=1.5s) data were collected during a hypercapnia challenge (5mmHg CO₂ change, during two, 2 min blocks). CVR was calculated as the %CBF signal per mmHg change in end-tidal CO₂. Aortic PWV data was acquired using a cine phase contrast velocity encoded series during 60 cardiac phases with a velocity encoding of 180cm/s through plane. PWV in the aortic arch was computed between ascending and descending aorta. Statistical analyses were done using IBM SPSS 24.0.

Results: A moderation model test controlling for age and white matter hyperintensity volume revealed a significant direct effect of PWV on CVR ($\beta=1.630$, 95 CI [.654, 2.607]), as well as PWV on EF ($\beta=-.998$, 95 CI [-1.697, -.299]). Sex moderated the relationship between PWV and CVR ($\beta=-1.013$, 95 CI [-1.610, -.4169]), and PWV and EF ($\beta=.447$, 95 CI [.020, .875]).

Conclusion: Together, our results indicate that the relationships between PWV, CVR and EF is complex. Future work should investigate the role of hormones variations (e.g., menopause) on these relationships to better personalize CVD prevention strategies.

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keywords: arterial stiffness cerebrovascular reactivity cognition

Poster # 11

A Longitudinal Study Examining the Acute to Chronic workload ratio in university runners: a preliminary evaluation of performance and injury

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Recent evidence suggests that a significant increase in athlete workload can decrease performance and increase the chance of injury. A novel method to monitor the internal training load is the acute:chronic workload ratio (ACWR), which has been assessed mostly in team sports. The purpose of our study was to calculate ACWR in runners and measure the possible association with injury, well-being, and performance. We collected data over a 9-wk period on 7 runners (27, 57). Athletes received a daily notification via a mobile app to answer questions regarding training volume, rate of perceived exertion (RPE), level of soreness, fatigue, enjoyment, and stress. A 2km time trial on week 1 & 6 was used to measure performance. We calculated the daily session rate of perceived exertion (sRPE). Compared to other studies our average weekly sRPE loads were higher due to the demands of the sport (7280.7 ± 2944.5 AU). Using the cumulative sRPE load values of 1-wk data over the average weekly load of a rolling 4-wk period we computed the ACWR, which previous research suggests an ideal ratio around 0.8-1.3, however our ratios were low ($.219 \pm .076$). We observed no significant change in the athlete's level of stress or enjoyment. However, there was a decreasing trend in fatigue from week 1-4 ($p=0.082$) and in soreness over the last 4 weeks ($p=.080$). Only one athlete's time trial didn't improve, which seems to correspond with a high daily training load leading up to the trial (579.1 AU). In addition, another runner suffered an injury, which corresponded with a change in training load. The key findings of our study are that this app provides the necessary information to generate the individual athletes internal training load and enables clinicians and coaches to monitor the athlete's response to the prescribed training. Future studies using this app are needed to evaluate the sRPE and ACWR in individual sports to minimize the risk of injuries and enhance the athlete's performance.

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keywords: workload injury rate perceived

Poster # 12

Adipose α/β -hydrolase domain-6 is a negative modulator of adipose thermogenesis and its inhibition promotes metabolically healthy obesity

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Obesity is a rapidly growing threat to the global health and activation of energy expenditure processes in the brown adipose tissue (BAT) and white adipose tissue (WAT) may provide solutions. Pan-deletion of the lipase α/β -domain hydrolase-6 (ABHD6) demonstrated the therapeutic potential of ABHD6 inhibitors against obesity/type-2-diabetes; though the precise role of ABHD6 in the adipose metabolism remains unexplored. ABHD6^{flox/flox} mice were bred with Adipoq-Cre/ERT2 mice to obtain mice deficient in the enzyme in adipose tissues (AT-ABHD6-KO). Control and KO mice were fed a normal diet (ND) or a high fat diet (HFD) for 12 weeks. For thermogenesis studies, ND mice were kept either at room temperature or exposed to cold temperature (4°C) for 24h. Results show that adipose ABHD6 expression level correlates with adiposity in WAT from HFD mice and in visceral fat depot from patients with obesity. AT-ABHD6-KO mice on ND showed similar phenotype as controls at room temperature, but were resistant to cold induced hypothermia. The enhanced energy expenditure in cold was in part due to accelerated glycerolipid/fatty acid futile cycle in visceral adipose and oxidative metabolism in BAT. Under cold-exposure 2-monoacylglycerol (MAG) levels were increased in the WAT from KO mice. The mRNA expression of PPAR α /PPAR γ target genes were induced by 2-MAG treatment. In addition, we found that 2-MAG is also capable of activating PPAR α in transactivation studies, suggesting that PPAR activation by accumulating 2-MAG contributed to thermogenic mechanisms in the cold exposed AT-ABHD6-KO mice. KO mice on HFD displayed healthy-obese characteristics, including improved insulin sensitivity, elevated WAT beta-oxidation, lower liver TG content, and improved systemic and WAT inflammation. The results indicate that ABHD6 negatively modulates the adipose thermogenic program and AT-ABHD6 deletion protects from cold induced hypothermia and also promotes a healthy-obese phenotype in HFD fed mice.

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keywords: lipolysis abhd thermogenesis obesity lipid

Poster # 13

Hearing loss and cortical atrophy in older adults with (or at risk for) dementia: How strong is the relationship?

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Hearing loss (HL) in older adults has been associated with cognitive decline and higher risk for dementia. However, the underlying link with brain structure remains largely unknown. Using data from the COMPASS-ND dataset, we investigated the relationships a) between HL (HL category based on pure-tone thresholds at 2kHz and speech-in-noise thresholds) and working memory (WM, sentence repetition) and b) HL and cortical volume (controlling for education, age, sex, and intracortical volume) in older adults with different degrees of cognitive impairment, namely subjective cognitive impairment (SCI, N=24), mild cognitive impairment (MCI, N=59), and Alzheimer's dementia (AD, N=19).

SCI: There was no evidence for a relationship between HL and WM, but greater HL (i.e., higher HL category) was associated with lower gray matter volume in temporal and frontal regions ($R^2=.23$). MCI: HL was not significantly associated with WM or cortical volume. AD: Higher speech-in-noise thresholds were related to lower WM performance ($R^2=.25$) and to lower right hippocampal volume ($R^2=.28$). Our data provide evidence for a link between HL and working memory in AD only. Furthermore, our results reveal a moderate relationship between HL and brain atrophy in SCI and AD. This research contributes to better understanding the association between HL and neurodegeneration.

keywords: hearing loss cortical decline cognition

Poster # 14

What motivates FitBit users?

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Introduction

Wearable technology to track physical activity (PA) is gaining popularity, but there is limited evidence that these devices are associated with PA levels and how they relate to PA motivation, which is a critical factor for sustained PA participation. Based on self-determination theory tenets, PA motivation is on a continuum ranging from no motivation (amotivation) to external and introjected motivation to intrinsic motivation. Contextual factors related to feedback and reinforcement, such as wearable technologies, may impact motivation yet the association between activity tracking, motivation, and PA has not been studied.

Methods

This cross-sectional study assessed participants (n=627, 55 female) from the Nicotine Dependence in Teens study. The association between activity tracking, motives, and meeting PA guidelines was assessed using the PROCESS macro for multiple mediation.

Results and analysis

Of 627 participants, 33 (n=207) reported past-year tracking, with no difference by sex. Activity trackers did not walk more (255 vs. 269 min; p=0.603) or participate in more moderate-to-vigorous PA (248 vs. 268 min, p=0.94), and they were less likely to meet PA guidelines (40 vs. 60, p=0.001) than non-trackers. Activity tracking was significantly positively associated with external, introjected, and intrinsic motivation. The direct effect of activity tracking on PA behavior was significant (effect = .58, 95 CI = .17 to .99) as were the indirect effects mediated by external (-), introjected (-), and intrinsic (+) motivation.

Conclusions

Wearable devices may support greater participation in PA by enhancing intrinsic motivation but also may reduce PA participation by enhancing external and introjected motivation which are in turn related to lower levels of PA. The function of activity trackers on motivation over time needs to be further studied.

keywords: activity tracking physical activity motivation

Poster # 15

The Effects Of A Short-Term High-Fat Diet On Glutathione Levels And Inflammation In Oxidative Skeletal Muscles Of Young Rats

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Obesity and ensuing disorders are increasingly prevalent in a young population. High-fat diets (HFD) and diet-induced obesity have been shown to induce oxidative stress and inflammation while altering metabolic homeostasis in many tissues, including the striated skeletal muscle. We previously observed that 14 days of HFD impairs contractile functions of the soleus (SOL) oxidative skeletal muscle (Andrich et al., 2018). However, the mechanisms underlying these effects are not yet clarified. In order to determine the effects of a short-term HFD on skeletal muscle glutathione metabolism and inflammation, young male Wistar rats (100-125 g) were fed a regular chow diet (RCD) or HFD for 14 days. Reduced (GSH) and disulfide (GSSG) glutathione levels were measured in the SOL muscle. The expression of genes involved in the regulation of glutathione metabolism, oxidative stress, antioxidant defense and inflammation were measured by RNA-Seq. We observed a significant 25 decrease of GSH levels in the SOL muscle, but similar levels of GSSG as well as the GSH:GSSG ratio in both groups. Further, we observed a 4.5 fold increase in the expression of pro-inflammatory cytokine interleukin 6 (IL-6), as well as a significant increase in the expression of other proteins implicated in the inflammatory process (ANGPTL4, CIDEA, FATP1). We hereby demonstrate that a short-term HFD significantly lowers GSH levels in the SOL muscle and this effect could be mediated through the increased expression of IL-6. Further, the skeletal muscle antioxidant defense could be impaired under cellular stress. We surmise that these early alterations could contribute to HFD-induced insulin resistance observed in longer protocols.

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keywords: high fat diet skeletal muscle

Poster # 16

The Effects of Cardiolipin on Vascular Smooth Muscle Cell Dedifferentiation and Migration

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PURPOSE:

Early phases of atherosclerosis involve smooth muscle cell (SMC) dedifferentiation and alterations in protein composition while the late, irreversible stages, are characterized by SMC migration and subsequent formation of a 'neointima'. This occlusion leads to blood flow obstruction which, when destined to the cardiomyocytes, could induce myocardial infarction. Apoptotic cardiomyocytes release cardiolipin (CL), a phospholipid, into the systemic circulation. We have shown that physiological concentrations of CL inhibit endothelial cell migration. The objective of this project was to investigate the impact of CL on SMC dedifferentiation and migration

METHODS:

We used adult, male C57Bl/6 mice. Aortas were extracted and incubated in medium containing physiological CL concentrations (1 and 10 μ M) at 37°C for 48 hours. We then quantified markers of dedifferentiation (calponin, α -actin, and MMP14) using immunoblotting to study the impact of CL.

We also investigated SMC migration using a wound model in which the conjoining of a simulated injury was measured over six days

RESULTS:

The immunoblotting results showed a significant dose-dependent drop in calponin, while the other dedifferentiation markers remained unchanged. The migration assay revealed that CL inhibits SMC migration.

CONCLUSIONS:

Our results suggest that physiological concentrations of CL have a targeted effect on calponin, but does not affect dedifferentiation. The significantly wider gaps observed in the CL-treated plates indicate the potent effect CL has on inhibiting SMC migration. Since SMC migration is considered the key step in the atherogenesis, our migration assay data suggest that CL has the potential to prevent the progression of the disease into its irreversible stages. Thus, we suggest the potential involvement of CL in future development of anti-atherosclerosis therapeutics

keywords: cardiolipin vascular smooth muscle cells

Poster # 17

A short-term high-fat diet alters lipid metabolism in the skeletal muscle of young rats

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INTRODUCTION: We have previously shown that a short-term high-fat diet (HFD) impairs contractile function in the soleus (SOL) muscle, which is primarily oxidative. Our results also indicated that this effect was not associated with changes in skeletal muscle fiber phenotype or insulin signaling but rather with hypertrophy of intramyocellular lipid droplets and altered lipid metabolism.

AIM: This study was designed to determine how altered lipid metabolism and the accumulation of definite lipid entities influence mechanisms related to muscle contractility.

METHODS: Young male Wistar rats (100-125 g) were fed HFD or a regular chow diet (RCD) for 14 days. Following sacrifice, both SOL and the extensor digitorum longus muscle (EDL: primarily glycolytic) were collected to measure the expression of genes involved in lipid metabolism (transcriptomics: RNAseq) as well as the production of distinct lipid species (lipidomics: LC-MS/MS and IMS) which could impair skeletal muscle function.

RESULTS: The expression of approximately 90 genes were found to be modified by the HFD. From these genes, the vast majority were associated with lipid metabolism. Most of the triacylglycerol species analyzed were found to have a significantly higher concentration in HFD rats. Overall, we found that significant changes in both non-esterified fatty acids and acyl-carnitine species were observed in rats fed the HFD.

CONCLUSION: The change in lipid metabolism that occurs after two weeks of obesogenic diet in male Wistar rats seems to contribute to impairments in muscle contractile function, and this precedes a change in fiber type and insulin signaling.

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keywords: hfd muscle contractility gene expression

Poster # 18

Catastrophizing in athletes is correlated to pain and changes in physiological variables during a painful cold pressor task

Matylda Lentini, Concordia University; Scalia, J., Touma, F., Jhaji, A., Darlington, P.J., Dover GC.

Catastrophizing is a psychological construct that causes people to experience more pain with the same noxious stimulus, for example during a cold pressor test. It is unclear if athletes catastrophize in a similar manner to non-athletes, and moreover athletes often use cryotherapy as part of their rehabilitation, therefore anything that can influence the amount of pain during cryotherapy would be of interest to clinicians. The purpose of our study was to use a cold pressor test (CPT) to evoke pain in athletes and measure the relationship between catastrophizing, pain, and physiological variables. Participants: Thirty-six male rugby athletes participated in the study (age 24.0 ± 4.6). We assessed catastrophizing and pain by the pain catastrophizing questionnaire and a 0-10 numeric pain rating scale. All physiological measures including heart rate, systolic blood pressure, and diastolic blood pressure were measured via a Nexfin®-Monitoring System. Results: During the CPT participants experienced a significant increase in pain (0 to 4.1 ± 2.2), systolic blood pressure (126.7 ± 16.5 to 149.7 ± 23.4) and diastolic blood pressure (76.9 ± 8.3 to 91.9 ± 11.5) all with $p < 0.001$. Heart rate decreased significantly from during CPT to post CPT (70.1 ± 11.0 to 64.1 ± 9.0). In addition athlete's catastrophizing was significantly correlated to pain during the CPT ($r = 0.397$, $p = 0.017$). Catastrophizing and pain was also correlated with the change in heart rate that occurred during the testing ($p = 0.003$). A significant linear regression indicated that pain and catastrophizing explained 29 of the variance of the change in heart rate ($p = 0.003$).

Conclusion: Catastrophizing will cause athletes to feel more pain during the same noxious stimulus, which is similar to the general population. In addition, athletes with higher catastrophizing will experience a greater physiological response to a noxious stimuli. The change in physiological variables may be an option for an objective measure of pain in the future.

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keywords: pain related fear heart rate

Poster # 19

Association between food insecurity and glycemic control among youth with type 1 diabetes in Haiti

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Objective: Food insecurity may challenge optimal pediatric diabetes management, especially in low-income countries where pre-mixed NPH/Regular insulin regimen prevail. We evaluated the relationship between food insecurity and hemoglobin A1c (A1c) in Haitian youth with type 1 diabetes (T1D) in Haiti.

Methods: Cross-sectional study from 07-12/2017 of youth aged 0-27 years with T1D at one pediatric chronic disease clinic in Haiti where medical care, insulin and supplies are provided free of charge. We used the World Food Program-Haiti questionnaire to calculate a Food Consumption Score (FCS). Recent A1c values were retrieved from the medical record. We used linear regression to examine the relationship between FCS and A1c.

Results: 68 patients (33 male; mean age 17.5 ± 4.8 y; mean diabetes duration 3.2 ± 3.1 y; mean BMI z-score -0.83 ± 1.1 ; 32 rural residence) were included. 15 (22%) patients had poor or borderline FCS. Carbohydrates were not consumed daily by 42, although over 90 consumed fat daily, and 47 ate sugar on three days a week or more. Low consumption (<3 days per week) of vegetables and meat was reported in one third, and of dairies and fruit in more than two thirds. Mean recent A1c was 11.1 ± 2.6 and only 13 (19%) had A1c values <8 while 28 (40%) had values >12. A1c was not predicted by FCS ($p=0.60$). Instead, higher BMI z-score ($p=0.04$) and older age ($p=0.003$) predicted lower A1c. In a model adjusted for age ($p=0.001$), sex ($p=0.11$) and diabetes duration ($p=0.33$), BMI z-score remained marginally significant ($p=0.08$). **Conclusions:** In this cohort of Haitian youth with diabetes, food insecurity and poor food composition are common. Glycemic control is very poor but is not predicted by FCS. Higher BMI as a possible marker of adequate nutrition and insulin adherence associates with improved glycemic control. Prospective studies should evaluate food insecurity in light of social determinants (poverty, stress, stigma, education) as predictors of glycemic control.

keywords: food insecurity type diabetes haiti

Poster # 20

Handgrip strength and perceived exertion are related to performance in female university athletes

Alexa Roussac, Concordia University; Bondoc, J., Dover GC.

Handgrip strength is commonly used to measure health status, however there is some preliminary evidence to suggest handgrip strength is also correlated to performance measures. Workload measured by rate of perceived exertion (RPE) may also be related to athletes' performance. There is limited data on the hand grip strength and performance in female athletes. The purpose of this study was to examine the relationship between hand grip strength, rating of perceived exertion, and performance in female athletes. Thirty female athletes participated in the study (18 hockey and 12 rugby). We used a handgrip dynamometer to measure athletes' right and left handgrip strength on a weekly basis during group workout sessions and we measured the RPE using a modified Borg scale. Over the course of 6 Weeks the RPE for the women's' hockey practice and workout reduced significantly (Practice: 6.1 ± 1.9 to 3.9 ± 0.8 , $p=0.001$; and Workout: 4.7 ± 1.0 to 2.8 ± 1.0 , $p<0.001$). There was also a concurrent increase in handgrip (Right: 32.1 ± 4.2 to 36.3 ± 5.3 , $p=0.001$; Left: 30.6 ± 5.4 to 33.1 ± 5.3 , $p=0.049$). However, in the rugby athletes, there was a simultaneous increase between handgrip (Right: $p=0.001$; Left: $p=0.013$) and workout RPE ($p=0.040$). Hand grip strength was significantly correlated to vertical jump height (Right: $r=0.418$, $p=0.019$, Left: $r=0.437$, $p=0.014$). Conclusion: Handgrip strength increased over the course of the 6 weeks of testing for all athletes. Handgrip readings were higher when RPE was lower for the hockey athletes, which may be related to their time of season approaching playoffs. The rugby athletes' change in RPE may also be due to their time in the 7s season. This is the first study to show a relationship between handgrip and vertical jump in female athletes. Previous studies have suggested that hand grip strength may estimate the performance of an athlete, but clinicians should be wary about when in the season they complete the handgrip testing.

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keywords: grip force vertical jump pull

Poster # 21

Overnight declarative memory retention is associated with coupling between slow-waves and gamma power during slow-wave-sleep in older adults.

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Cross-frequency coupling (CFC) refers to a synchronization of distinct brain oscillations and may reflect a neural mechanism underlying memory consolidation processes[1]. Recent studies suggest that CFC between NREM sleep slow oscillation (SO) and spindle activity is positively associated with memory consolidation in both young and older adults, and that age-related declines in SO-spindle CFC are associated with poorer memory[2,3]. Current studies of memory and sleep often focus solely on SO-spindle CFC. Memory performance has also been associated with increased gamma activity, such as theta-gamma CFC in wakefulness[4] and gamma coherence in post-learning NREM sleep[5]. However, there is a paucity of studies that examine memory consolidation in relation SO-gamma CFC in NREM sleep. In turn, this study tested a hypothesis that greater SO-spindle and SO-gamma CFC during NREM sleep are each positively associated with better memory in older adults, both during post-learning sleep, and as a measure of relative change from a non-learning baseline. Twenty healthy seniors (M(SD) age=69.05(5.39) years; 12 female) completed two overnight polysomnography sleep recording visits, separated by at least one week. The second visit included a 40-item word-pair associates task, with pre- and post-sleep recall tests. Measures of CFC during slow-wave-sleep were quantified from central (Cz) EEG data between detected SOs (0.5-1.75Hz) and sigma power (10-16Hz; adapted), and SOs and gamma power (50-100Hz). Greater SO-sigma and SO-gamma CFC after learning were each associated with better overnight word-pair recall stability, with SO-gamma showing a stronger effect. A greater relative increase in SO-gamma CFC between study nights was also positively associated with recall stability. Findings add to a growing literature about CFC during sleep and memory, and offers novel evidence for a potentially salient role of SO-gamma CFC in the overnight retention of declarative memories in older adults.

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keywords: sleep memory consolidation cross frequency

Poster # 22

Sensory loss and cognitive function in older adults at different stages of cognitive impairment

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Sensory loss in older adults has been associated with declines in cognition and, in some cases, with the development of dementia (Albers et al., 2015; Lin et al., 2011; Clemons et al., 2006). Using preliminary data from the COMPASS-ND study, we examined sensory differences (hearing, vision, olfaction) and the potential associations of sensory with cognitive function in groups with Alzheimer's disease (AD; N=17), mild cognitive impairment (MCI; N=55), and subjective cognitive impairment (SCI; N=18). The SCI group scored better on most neuropsychological measures compared to the other groups, as did the MCI group compared to AD. Controlling for age, sex, and education, we observed differences in contrast sensitivity (SCI, MCI>AD; $p=0.08$), and olfaction (SCI, MCI>AD; $p=0.11$). There were no differences among groups in reading acuity, audiometric hearing loss category nor speech-in-noise threshold on a digit triplet test (DTT). Partial correlations were analyzed for the MCI group. Olfaction (Brief Smell Identification Test) was associated with measures of memory (Rey Auditory Learning Test), executive function (Stroop), and working memory (digit span forward & backwards). Measures of vision were associated with measures of visual attention (Trial Making A). Cognitive measures were not associated with audiometric category nor DTT thresholds. These results highlight sensory-cognitive interactions in individuals at prodromal stages of dementia.

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keywords: cognitive impairment dementia sensory loss

Poster # 23

Walking and rhythm: Factors that promote gait improvement in aging

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The regularity of walking is related to risk for falls and is central to the safety and autonomy of Canadian seniors. Research on patients with Parkinson's Disease (PD) shows that walking to an auditory beat (rhythmic auditory cueing - RAC) can help support a more regular and stable walking pattern¹. However, a secondary task can also have negative effects on gait². The purpose of this study is to investigate the impact of RAC with varying levels of complexity in healthy older adults. As part of a larger study, healthy older (n = 4) and younger (n = 6) adults completed a walking task and a listening task separately and simultaneously (dual-task condition). The listening task had 3 levels of complexity. In the Simple condition participants synchronized their steps to a series of low tones, in the Moderate condition, to a series of low tones and high tones, and, in the Complex condition, to a series of low and high tones, while also responding via a manual clicker each time they heard a particular pattern of tones. Dual-task costs (DTC) were calculated to quantify the impact of varying levels of complexity of the listening task on stride time variability. A positive DTC suggests that stride time variability is increased in a particular condition relative to walking alone, suggesting that the gait pattern is less steady³. Contrary to our predictions, dual-task costs decreased with increasing task complexity ($F = 10.25$, $p = .002$, $\eta^2p = .59$). Gait was facilitated in the most complex condition (DTC = -2.06), compared to the moderate condition (DTC= 8.68, $F = 5.3$, $p = .06$, $\eta^2p = .43$) and the simplest condition (DTC = 17.92, $F = 15.47$, $p = .01$, $\eta^2p = .69$), where dual-task costs were observed. In previous research, individual differences in rhythmic ability predicted response to RAC⁴. These preliminary results suggest that the complexity of a secondary listening task can also modulate the effect of RAC, positive or negative, on gait in healthy older adults.

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keywords: gait cognition aging dual task

Poster # 24

The influence of fear avoidance on acute concussion symptoms: a case series

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The number and severity of symptoms of a sport related concussion vary significantly. Recently, there is more evidence for fear avoidance being associated with the number of reported concussion symptoms. While there is some data on post-concussion syndrome, most concussions resolve within 7-10 days. Therefore, the purpose of our case series was to assess acute concussions in athletes using the SCAT5 as well as fear avoidance, catastrophizing, depression, and anxiety.

Patients: Seven college and university level athletes participated in the study. During the study we noted that two subjects had significantly higher symptom and severity scores compared to the other subjects.

Treatment: We assessed all of the athletes' concussions using the SCAT5, overall general health using the Short Form General Health Survey (SF36), pain catastrophizing using the Pain Catastrophizing Scale, and fear avoidance using the Athlete Fear Avoidance Questionnaire.

Outcomes: All seven of the subjects were concussed and missed time from practices and games due to this injury. However, five subjects had a very low number of symptoms and low symptom severity scores, and presented with lower catastrophizing, lower athlete fear avoidance, and lower anxiety scores. Subjects 6 and 7 had: a high number of symptoms, a higher symptom severity score on the SCAT5, higher catastrophizing, athlete fear avoidance, and anxiety.

Conclusion: Previous research has suggested that elevated catastrophizing was correlated to more symptoms and prolonged symptoms in chronic concussed participants. The two subjects in our high symptom group had: more symptoms, higher severity of symptoms, higher catastrophizing and higher athlete fear avoidance scores.

Clinical bottom line: This case series suggests that athletes with higher fear avoidance will present with more symptoms and with higher symptom severity. More studies are needed to evaluate the relationship between fear avoidance and acute concussion symptoms.

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keywords: mild traumatic brain injury scat

Poster # 25

Ventilatory outcomes during a VO₂max test are related to measures of cerebral vascular health in aging

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Fitness measured by VO₂max, has been related to cerebral vascular health in aging, where those with higher VO₂max have increased cerebral blood flow (CBF)[1]. Yet VO₂max alone, may not be an effective outcome given the exhaustive effort required[2]. Submaximal outcomes like ventilatory efficiency (VEff), could provide a more pragmatic option. VEff is the relationship between volume of CO₂ (VCO₂) removed and ventilation (VE) at a certain metabolic rate[3]. It is calculated prior to ventilatory threshold (VT), the point where VE increase is disproportionate to O₂ consumption[2]. Here, we aimed to further understand the relationships between submax VO₂ outcomes, CBF, and aging. Methods: 14 older adults (4 males; 68.6 years) completed an MRI scan on a 3T. An anatomical, 1mm³ MPRAGE acquisition (TR/TE/flip angle = 2300ms/2.98ms/9°) and a pseudo-continuous arterial spin labeling (pCASL), (TR/TE1/TE2/flip angle = 4150ms/10ms/30ms/90° with 14 slices, post-label delay = 1500ms, tag duration=1.5s) during hypercapnic challenge (5mmHg end-tidal CO₂ change, 3min block) were collected. Segmentation of GM was completed with SPM. CBF data was quantified using an in house script. VO₂max tests were completed on a separate day out of scanner. VT was identified when VE no longer increased linearly with VO₂. Partial correlations were used with sex as a covariate. Results: VEff was inversely related to CBF during hypercapnia, whereas VT VO₂ and end tidal partial pressure of CO₂ were positively related to hypercapnic CBF. VO₂max was not related to CBF during hypercapnia. Resting CBF was significantly correlated with VO₂max, as well as VO₂ at VT. Conclusions: These results indicate that submaximal outcomes collected during VO₂max could provide unique insight to the relationship between fitness and cerebral vascular health, particularly for higher risk populations where VO₂max tests may not be safe. Future work should explore these relationships in larger samples and diseased populations.

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keywords: aging cerebral blood flow fitness

Poster # 26

Associations among lumbar multifidus muscle characteristics, body composition and injury incidence in collegiate rugby players

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Background: There is a growing body of evidence suggesting an association between low back pain (LBP) and paraspinal muscle morphology and function. However, no study has investigated the relationship between muscle characteristics, especially the lumbar multifidus, and body composition in collegiate rugby players, and examined whether such parameters are associated with LBP and lower limb injury.

Objectives: To examine the relationship between LM morphology, function, echo-intensity, and body composition among a group of male and female collegiate rugby athletes. A secondary objective was to examine whether LM characteristics are associated with LBP and lower limb injury.

Methods: LM muscle ultrasound assessments were acquired in 34 Concordia rugby players (14 males, 20 females). LM CSA and thickness were assessed bilaterally at the L5-S1 level in a prone and standing position, at rest and during a submaximal contraction task. Body-composition measures were obtained using dual-energy X-ray absorptiometry. Self-reported questionnaires were used to obtain LBP and lower-limb injuries history.

Results: LM CSA was significantly associated with body composition measurements. LM echo-intensity was strongly associated with total body fat, and significantly greater in females. Greater LM thickness change during contraction was significantly associated with lower body fat. Players who reported LBP in the previous 3-months showed a significantly smaller thickness change during contraction in the standing position ($F=5.21$, $p=0.03$). LM CSA side-to-side asymmetry was significantly greater in players who reported having a lower-extremity injury in the previous 12-months ($F=4.98$, $p=0.03$).

Conclusion: The influence of body composition on LM morphology in athletes cannot be ignored and warrants further investigation. This study also provides preliminary evidence of an association between LM morphology, LBP and lower limb injury incidence in collegiate rugby players.

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keywords: multifidus low back pain ultrasound

Poster # 27

Effects of sleep deprivation on functional connectivity and performances during cognitive tasks

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OBJECTIVE: Sleep deprivation (SD) is common in modern society, but the neural mechanisms underlying its impact on cognition remain unclear. The default mode network (DMN) is activated at rest and deactivated in response to tasks (3). Previous studies have reported reduction in connectivity in the DMN during cognitive tasks when sleep deprived (1,2). This is the first study to investigate both the effects of SD and recovery nap on performance of cognitive tasks and functional connectivity patterns within the DMN.

METHOD: 18 healthy young adults were scanned using fMRI (3T GE; TR=2.5 secs) during the following three states: non-SD, total SD, and after an hour recovery nap. A repeated measures ANOVA test was performed to compare performances at working memory (N-back), attention network task (ANT), and psychomotor vigilance tasks (PVT), as well as functional connectivity between the regions of the DMN (medial prefrontal cortex, bilateral inferior parietal lobe, and posterior cingulate cortex) for each task, between the three different states.

RESULT: When comparing SD to non-SD state, there was a significant decrease in working memory, attention, and vigilance performance ($p=0.006$, 0.005 , 0.016 respectively). An hour nap following total SD allowed for partial recovery in working memory, attention, and vigilance performances ($p=0.010$, 0.010 , 0.021 respectively). There were no significant changes in brain connectivity within the DMN during each task across the different states (all $p>0.05$).

CONCLUSION: SD had a negative impact on cognitive performances, which partially improved after a recovery nap. There were no changes in brain connectivity within the DMN between the three states, which suggests that DMN connectivity is resilient to the effects of SD, in contrast to previous findings. Further analysis will investigate changes in connectivity within and between other brain networks during cognitive tasks to further elucidate the neural correlates of sleep deprivation.

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keywords: sleep deprivation cognition fmri connectivity

Poster # 28

A prehabilitation program promotes functional recovery before and after hepatobiliary and pancreatic cancer surgery

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Introduction: Prehabilitation aims to increase physiologic reserves prior to facing the stress of surgery. No studies have evaluated the impact of a multimodal prehabilitation program on functional exercise capacity in hepatobiliary and pancreatic cancer patients undergoing surgery.

Methods: A single-centre, parallel-arm randomized controlled pilot trial was conducted. Patients were randomly assigned to receive either prehabilitation or rehabilitation. The prehabilitation group followed a trimodal program comprising exercise (once-weekly supervised and home-based), nutritional counselling with whey protein supplementation, and relaxation exercises initiated 4 weeks before surgery. The rehabilitation group received the same trimodal program (minus once-weekly supervised exercise) initiated immediately after surgery. Both study arms continued the program for 8 weeks after surgery. The primary outcome was the 6-minute walk test (6MWT).

Results: Thirty-five patients were randomized to receive prehabilitation (n=17) or rehabilitation (n=18). At baseline, both groups were comparable in age, sex, and 6MWT. The prehabilitation group demonstrated a clinically meaningful improvement with a statistical trend towards improvement (+19.63 m [SE 0.25]; p=0.061) in 6MWT from baseline to pre-op. The rehabilitation group experienced a statistically and clinically significant decrease in mean 6MWT from baseline to the 4-week post-op assessment (-23.72 m [SE, 0.36]; p=0.035), whereas the prehabilitation group was able to maintain their baseline walking capacity (-0.11 m [SE 0.32]; p=0.991). From 4 to 8-weeks post-op, the rehabilitation group significantly improved (p=0.001) and returned to baseline levels, while the prehabilitation group stayed at their baseline level.

Conclusion: Integrating trimodal prehabilitation during pre-op oncological care leads to clinically meaningful improvements in 6MWT prior to surgery and expedites the return to baseline 6MWT after surgery

keywords: prehabilitation hepatobiliary pancreatic cancer

Poster # 29

Fine tuning U-Net for ultrasound image segmentation: which layers?

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Training a deep convolutional neural network from scratch is challenging, especially in medical applications, where annotated data is scarce and expensive. An alternative to full training is fine tuning another network which has been trained on a large dataset for another application. The common approach in fine tuning is to keep the first layers of the network (layers associated to more basic and simple features) unchanged, and to modify the very deep layers (layers associated to more specific and complex features). This approach originates from the assumption that basic features of the datasets are similar, and more specific features of the datasets should be tuned in order to get appropriate results in a different application. However, since the appearance of ultrasound images is drastically different, this assumption may not hold true. In this study, we investigated the effect of fine-tuning different layers of a U-Net which was trained on segmentation of natural images to breast ultrasound image segmentation. Dice, F2, and rand scores were used to validate the results on a 5-fold cross validation. Tuning the contracting part and fixing the expanding part resulted in substantially better results in terms of all scores when compared to fixing the contracting part and fixing the expanding part (Dice score: 0.80 ± 0.03 vs. 0.72 ± 0.04 , F2 score: 0.81 ± 0.03 vs. 0.74 ± 0.05 , rand score: 0.78 ± 0.03 vs. 0.71 ± 0.05). Furthermore, we showed that starting to fine tune the U-Net from the first layers and gradually including more layers will lead to a better performance compared to the time when we fine tune the network from the deep layers and come back to first layers. In ultrasound image segmentation, it may therefore be more appropriate to fine tune the first layers rather than deep layers. First layers learn lower level features (including speckle pattern, and probably the noise and artifact properties) which are critical in automatic segmentation in this modality.

keywords: ultrasound segmentation transfer learning

Poster # 30

Short- and Long-Term Changes in Cognitive Function After Exercise-Based Rehabilitation in People with Chronic Obstructive Pulmonary Disease (COPD)

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Objective: To compare, in people with COPD, the effects of 12 weeks of continuous high-intensity training (CTHI), continuous training at the ventilatory threshold (CTVT) and high-intensity interval training (HIIT) on cognition, and the maintenance of these effects after 1-year. **Methods:** Participants were randomly assigned to CTHI, CTVT, or HIIT and underwent 12 weeks of three times weekly training on cycle ergometers. Sessions included a 10-minute warm-up, an intensity phase, and a 5-minute cool-down. The intensity phase for CTHI consisted of 25 minutes of pedaling at 80 of the peak wattage (W_{peak}) measured on a previous test. For CTVT, the intensity was the heart rate reached at the ventilatory threshold, while HIIT consisted of 30-second intervals at 100 of W_{peak} and unloaded pedaling. Session duration for CTVT and HIIT was calculated using metabolic equations to ensure comparable total amounts of work as for CTHI. Assessments were made at baseline (week 0), program completion (week 12) and 1 year after baseline (year 1). For cognition, participants completed a battery of neuropsychological tests assessing attention, executive functions, verbal learning and memory, visuospatial abilities, and processing speed. Global cognitive function was assessed using the Montreal Cognitive Assessment (MoCA). **Results:** Thirty-six participants (64 women, mean age: 67.5 ± 9 years) with moderate airflow obstruction (FEV_1 : 59 ± 17 of predicted value) were randomised. MoCA scores were unchanged from week 0 to week 12 to year 1 (mean \pm SD: 25.67 ± 3.25 to 25.56 ± 3.59 to 26.27 ± 3.24 , respectively), suggesting stable global cognitive functioning. In all intervention groups combined, effect sizes for short and long-term changes in cognitive scores were small. Between intervention groups, changes were heterogeneous across and within cognitive domains. **Conclusion:** In COPD, 12 weeks of training led to small changes in certain cognitive scores with heterogeneous changes between exercise protocols.

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keywords: copd exercise pulmonary rehabilitation cognitive

Poster # 31

Assessing the deficit in function of injured patients seeking treatment at an Athletic Therapy Student-Run Clinic

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Student-run clinics are designed for students to deliver care, which are beneficial by providing an integral interaction between education and community engagement. The severity of injury or deficit in function in patients seeking treatment at a student run clinic is unknown, especially for an Athletic Therapy clinic. The purpose of our study was to measure the deficits in function due to injury in patients seeking treatment at a student-run Athletic Therapy Clinic. Participants: Ninety-nine patients (64.6 women, 35.4 men) with various injuries participated in this study. Main outcomes: Before the first appointment with a student therapist, patients completed a questionnaire to assess their level of function. We used one of three scales: The Disabilities of the Arm Shoulder and Hand (DASH) for upper extremity injuries, The Lower Extremity Functional Scale (LEFS) for lower extremity injuries, and the Oswestry Disability Index (ODI) for low back injuries. The scores for each scale were converted to a percentage where a lower value indicates a greater deficit in function. Participants with lower extremity injuries (64.0 ± 21.3) are significantly less functional than patients with upper extremity injuries (77.7 ± 16.5 , $p = .006$). In addition, women with lower extremity injuries were significantly more disabled than men ($p = .043$). There was no difference in functional deficits between men and women with low back injuries ($p = .708$). A significant linear regression indicated that women with a lower extremity injury will be the most disabled patient treated at the clinic ($R^2 = .159$, $p = .003$). The deficit in function due to injury in patients at this student-run clinic are similar to those seen in private clinics. Our results suggest that education for students treating patients at an Athletic Therapy clinic needs to focus on lower extremity injuries in women. Future research should evaluate the improvement in function at the time of discharge.

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keywords: disability low back pain lefs

Poster # 32

The effects of an integrative dance program on postural stability for adults living with developmental disability

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Individuals living with developmental disability (DD) have been shown to have reduced postural stability during quiet standing due to impairments in the integration of vestibular, visual and somatosensory systems [1,2]. This difficulty in integration and postural stability is accentuated during conditions of sensory deficit (i.e. eyes closed) [1]. Dance interventions have shown positive effects on increasing postural stability in those living with autism spectrum disorder [3]. Thus, the aim of this project was to evaluate the effect of a 12-week integrative dance class on the postural stability of adults living with DD.

22 experimental and 11 control subjects were recruited. Pre and post testing of postural stability was carried out using a Wii Balance Board® (Nintendo Co. Ltd., Japan) analyzing center of pressure (CoP) sway area and velocity under four test conditions: eyes open, eyes closed and right and left unilateral stance. Participants in the experimental group completed a 12-week integrative dance course and post was completed by all participants. Statistical significance was set at $p < 0.05$.

After 12 weeks those who participated in the dance class had significant reductions in the CoP sway area ($p=0.01$) and CoP horizontal velocity ($p=0.03$) during the eyes closed condition. No reductions in CoP sway area or velocity were seen in the other three test conditions. As the specific diagnoses of participants were varied, the lack of significance during these other conditions may be attributed to this. Future studies should also aim to determine how specific dance interventions can benefit adults living with DD in everyday situations with sensory deficit.

The findings indicate that dance programs can have positive impacts on increasing postural stability during periods of reduced visual input. It is hoped that with this increase, the risk of falls for individuals living with DD is decreased, promoting increased participation in activity and improved quality of life.

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keywords: intellectual disability dance postural stability

Poster # 33

Movement skills Assessment Tool: A Validation Study Using a Modified Delphi Method

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Background: Physical activity is integrated and promoted in preventive health programs due to the health-related benefits. The popular physical literacy model promotes lifelong physical activity by improving levels of confidence, knowledge, and motor competence.

Poor motor competence is associated with a sedentary lifestyle and is a risk factor for musculoskeletal injury.

Assessment of physical literacy and motor competence are mainly focused on motor development factors, but Injury prevention techniques are not considered in these assessments. This project validated a series of locomotor skills to create a movement skill assessment tool to fill the gap between physical literacy and injury prevention assessments.

Objective: To establish the face and content validity of four locomotor skills, each with four evaluation criteria, to create a movement skill assessment tool for 8-12-year-old children. This tool will assess motor competence and identify movement patterns that present risk factors for musculoskeletal injury.

Methods: We used a modified Delphi method to survey an international expert panel of clinicians, researchers, and practitioners (n=22). Several rounds of surveys were used to reach consensus on the validity of proposed locomotor skills and evaluation criteria. Consensus was reached when 75 or more of the experts scored "Agree" or "Strongly Agree" using a 5-point Likert scale.

Results: In the first and second rounds, the experts reached consensus on the validity of eight Locomotor skills and 53 evaluation criteria. In the third round, the experts ranked the locomotor skills and evaluation criteria to identify the top four skills and evaluation criteria to create the assessment tool.

Conclusions: This study has provided preliminary validity evidence for a movement skills assessment tool with an injury prevention approach. Future research will evaluate other psychometric properties of this assessment tool and assess injury outcomes of an intervention.

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keywords: physical literacy injury prevention movement

Interaction Between a Polygenic Risk Score for Fasting Insulin and Socioemotional Development in Children

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While the co-morbidity between metabolic and psychiatric disorders is well-established, the mechanisms are poorly understood, and exposure to early life adversity is a common developmental risk factor. There is high co-occurrence of several psychiatric diseases with insulin resistance. Our hypothesis is that the genetic profile associated with higher fasting insulin interacts with postnatal adversity, influencing anxiety and related outcomes (Dominique task) in children. We calculated a PRS for fasting insulin in children from the MAVAN cohort (Scott et al 2012) and estimated their adversity exposure using a cumulative score involving different environmental variables. Interactions between fasting insulin PRS (p threshold $p=0.001$) and adversity exposure were significant for general anxiety and phobia according to the differential susceptibility framework, in which the high ePRS group had higher or lower anxiety ($\beta=0.9233$, $p=0.005$) and more or less phobia ($\beta=0.4214$, $p<0.005$) according to the exposure to higher or lower environmental adversity respectively. Differential susceptibility states that individuals may vary both by exhibiting poor responses when exposed to adverse environments, and disproportionately benefiting from positive settings. Enrichment analysis on Metacore shows the genes included in the PRS are enriched for regulation of insulin secretion as expected ($p<0.001$). A fasting insulin polygenic score can moderate the impact of different environment exposures on the onset of anxiety and phobia.

keywords: eprs psychiatric disorders insulin resistance

Poster # 35

Developing a translational polygenic risk score of differential susceptibility.

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The differential susceptibility hypothesis postulates that malleable or "plastic" individuals are hyper-responsive to the environment; supportive environments will promote positive behavioral outcomes, while adverse environments will result in behavioral problems. To empirically test whether malleable individuals share common transcriptional patterns of gene expression, we calculated a polygenic risk score (PRS) for environmentally responsive genes in mice (C57BL6/J). RNA sequencing of ventral dentate gyrus tissue revealed common patterns of genes transcription in mice exposed to environmental enrichment (P21-P77) or mice that displayed social avoidance behavior in response to adult chronic social defeat. This PRS score was weighted using the GWAS for Major Depressive Disorder (MDD) and tested on children within the MAVAN cohort. Results revealed a significant interaction between the PRS score and CBCL Anxiety problems ($\beta = -809.6$, $p < 0.001$), such that individuals with high PRS based on environmentally responsive genes were less likely to develop anxiety in supportive contexts, or more likely to develop anxiety in adverse contexts ($p < 0.001$). Importantly, this pattern did not persist in individuals with low PRS of the same gene network ($p > 0.05$). These data confirm that individuals who display behavioral plasticity share common gene networks that lead to susceptibility or resilience in respond to the environment.

keywords: differential susceptibility eprs

Poster # 36

Voluntary running exercise attenuates pain and reduces pathological nerve sprouting in degenerating intervertebral discs in a mouse model of low back pain

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Introduction: Persistent low back pain (LBP) causes more global disability than any other condition. Due to the limitations of medications, patients seek alternative treatments such as exercise, yoga and meditation.

SPARC (Secreted Protein, Acidic, Rich in Cysteine), an extracellular matrix protein, plays important roles in intervertebral disc (IVD) integrity. SPARC-null mice display accelerated disc degeneration associated with behavioral signs of axial and radiating LBP (Millecamps et al., 2015) and local nerve sprouting (Miyagi et al., 2014). In this study, we investigated how increased physical activity relieves LBP symptoms and pathological innervation in the SPARC-null mouse model.

Methods: 8-month old SPARC-null and age-matched wild-type control mice had free access to a running or secured (sedentary) wheel for 4 months. Behavioral assays were performed to assess axial (grip test) and radiating (von Frey & acetone tests) discomfort. Lumbar IVD height and shape were analyzed by X-ray images. Innervation in lumbar discs was measured by PGP9.5- and CGRP-immunohistochemistry (-ir).

Results: Axial and radiating pain in SPARC-null mice were reduced by running. X-rays confirmed altered disc shape and reduced disc height in SPARC-null mice; running reversed the former. The increased nerve fiber density observed in degenerating SPARC-null discs returned towards normal values following running.

Conclusion: This study addresses the beneficial effects of running for LBP and its underlying mechanisms. In a pre-clinical model of LBP, both increased disc innervation and behavioural signs of pain were reversed by voluntary running exercise.

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keywords: low back pain disc degeneration

Poster # 37

Translational approach showed an interaction between a gene network affected by betamethasone in non-human primates and adversity conditions influencing anxiety response in a healthy child cohort

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Exposure to stress during the life has consistently been associated with the development of emotional disorders, however, the precise role of stress released glucocorticoids remains unclear in this context. Our aim was to use non-primate animal data to create a biologically relevant polygenic score and investigate its interaction with environmental stressors in the development of anxiety in a child community-based birth cohort (MAVAN, evaluated at 6 years of age). We used RNA-sequencing data from posterior dentate gyrus (pGD) of adult female *Macaca fascicularis* after chronic Betamethasone (glucocorticoid) or saline injections for 8 consecutive days in two cohorts: Vietnam and Singapore (N=6/group each cohort). Enrichment analysis showed that upregulated genes by betamethasone compared to saline are involved in apoptosis, while downregulated genes are involved in immune response, cell-matrix interactions and proteolysis (FDR<0.05, Metacore®). A common gene list comparing the two cohorts was used to create an expression-based polygenic risk score (ePRS), weighing each SNP by the slope of gene expression (GTex). Linear regression analysis showed a significant interaction between ePRS and environmental adversity for the Koala task (measures anxiety and fear levels, $\beta=0.44$; $P=0.02$), in which the high expression group varied in anxiety levels according to the exposure to adversity. In conclusion, variations in the expression of the gene network associated with response to betamethasone in the pDG of macaques predict resilience or susceptibility to adversity on the development of anxiety in a community sample of girls.

keywords: adversity conditions betamethasone anxiety gene

Poster # 38

Effects of a gene network associated with leptin signaling on eating behavior: a translational approach

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Exposure to early adversity is associated with eating behavior and body weight regulation, but the mechanisms are yet to be investigated. We propose a translational approach to study interactions between early life adversity and eating associated with the leptin receptor gene (LepR). We submitted Wistar rats to Maternal Separation (MS; from 2nd to 14th postnatal days (PND); 3 h/day) or a Maternal Deprivation (two 24-hour periods on 9th and 11st PND). At 60th PND, consumption of standard chow was assessed and expression of LepR was analyzed in the hypothalamus by RT-PCR. Based on the animal data, we created an expression-based polygenic risk score (ePRS) reflecting variations in the function of the LepR gene network in different brain regions and investigated its interaction with postnatal adversity on satiety (Child Eating Behaviour Questionnaire) in 4y.o. children (MAVAN cohort). In rats, MD decreases chow intake in adulthood ($P=0,001$), and MS showed a trend towards increase in the hypothalamic expression of LepR ($P=0.08$). In children, there are an interaction between adversity and prefrontal cortex-based LepR-ePRS (48 months) and amygdala-basead LepR-ePRS on satiety (72 months) ($\beta=0.16$; $P=0.008$ and $\beta=-34.6$; $P=0.01$ respectively), and to on responsiveness to food (48 months) effect of the ePRS on Nucleus Accumbens-basead LepR-ePRS (ePRS ($\beta=68.019$; $P= 0.04$)). These results indicate that the impact of postnatal adversity on eating can be moderated by gene networks associated with leptin signaling.

keywords: eating behavior neonatal stress gene

Poster # 39

Sequenom sequencing identifies SNPs associated with anhedonia and fearfulness in rats

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Genome-wide association studies identify risk genetic loci associated with pathophysiology of psychiatric disorders in human. However, current animal models of psychiatric disorders introduce extreme manipulations such targeted null mutations or overexpression, which do not reflect the more subtle effects of SNPs on gene expression. We probed candidate regions of the outbred Long-Evans rat genome for single nucleotide polymorphisms (SNPs) associated with anhedonia and fearfulness using Sequenom sequencing. We found that rs198664367 (Ampk) and rs13448419 (Creb3l1) were significantly associated with fearfulness and anhedonia behaviors, respectively. Animals with CA genotype in Ampk gene show increased total center time in novelty suppressed feeding (NSF) test compared to CC genotype. Animals with GC genotype in Creb3l1 gene show increased latency to food in NSF compared to GG genotype. Furthermore, different genotypes of rs198862086 (Nr3c1) differentially mediate the effect of postnatal maternal behavior on fearfulness of offspring. For AA genotype, there is a positive association between maternal care and total center time in NSF in adult males, but not in females. For AT and TT genotypes, there is a negative association between maternal care and total center time in NSF in adult females, but not in males. These findings provide evidence of SNP association as well as interaction between genetic variations and early life environment for phenotypic outcomes in rats and provide a model for the study of the biological mechanisms underlying genotype - phenotype associations.

keywords: anhedonia fearfulness single nucleotide polymorphism

Poster # 40

Effects of Aerobic Training on Smooth Muscle Cell Mitochondrial Respiration in Diabetic Subjects

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INTRODUCTION: Diabetes mellitus (DM) induces mitochondrial (MITO) dysfunction which subsequently leads to cardiovascular (CV) complications - the leading cause of death for diabetics. CV health and insulin sensitivity are initially targeted through lifestyle changes including diet and exercise. In healthy subjects, exercise training produces outcomes directly related to favorable MITO adaptations: enhanced density, greater respiratory capacity, and elevated protein expression. These modifications translate directly into increased energy metabolism, augmented substrate oxidation, and improved training performance

AIM: The objective of this study was to analyze the effects of a long-term aerobic exercise program on MITO oxidative capacity and respiration in the vessels of Type 1 DM subjects.

METHODS: Healthy male C57B1/6 mice were randomly assigned to the DM sedentary group (DCON), DM exercise group (DEX), healthy sedentary group (HCON), or healthy exercise group (HEX). DM was induced prior to the onset of the 4-week protocol via a peritoneal injection of streptozotocin. Mice were euthanized and the aortic vessels were harvested for immunoblotting and high resolution respirometry to examine oxidative phosphorylation.

RESULTS: Analyses indicate that long-term exercise training triggers a reduction in MITO protein expression in all complexes of the MITO electron transport chain in the DEX group compared to the DCON. The HEX group did exhibit MITO improvements versus the HCON. There was also no evidence indicating significant change in glucose-based substrate efficiency for the DEX mice.

CONCLUSION: The findings report the novel benefits of exercise in the vasculature of the HEX mice compared to the HCON. The DM group saw no benefits of training, and instead showed a reduction in MITO proteins. As a result, further examination is required behind the mechanistic pathway linked with DM-induced CV complications due to exercise training.

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keywords: vascular health mitochondrial dysfunction diabetes

Poster # 41

Effects of AAV-Cre mediated knockout of the circadian clock gene Per2 on cardiomyocyte function

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Circadian clocks generate daily oscillations of biological functions, ranging from molecular processes to rhythms in physiology and behavior. Proper function of this internal time-keeping mechanism is vital to provide an intrinsic temporal order of biological functions within the organism and to time physiological and behavioral processes appropriately, with respect to the 24-h environment.

Beside the master circadian pacemaker within the mammalian brain that maintains and synchronizes the timing of biological functions in accordance with the environment, peripheral clocks reside in various organs throughout the body to set tissue specific rhythmic functions of biological processes, such as in the heart. Strikingly, disruption of clock function on both, cellular and organismal level has been linked to cardiac dysfunction.

In this pilot study, we aim to further the understanding of the role of the circadian clock, or core components of the clock, in the incidence of cardiac dysfunction. For this, adeno-associated virus (AAV) mediated delivery of Cre recombinase was performed to knockout the circadian clock gene Period2 (Per2) within mouse cardiomyocytes, and several physiological parameters and tests were assessed. Mice receiving AAV-Cre viral vectors showed a trend towards higher body weights and reduced performance in exercise tasks as well as cardiomyocyte metabolic function compared to controls. Overall, the results suggest that targeted knockout of the circadian clock gene Per2 affects physiology and cardiomyocyte function, however, the underlying mechanisms need to be further elaborated.

keywords: circadian clock cardiomyocytes per

Poster # 42

Initial Findings on Age-Related Sensory Loss in Older Adults with (or at Risk for) Dementia

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Previous literature on associations between hearing and visual impairment (i.e., sensory loss) and cognitive decline suggests that substantive sensory loss increases the risk for developing Alzheimer's dementia. Given that the sensory-cognitive relationship in individuals with or at risk for dementia is unknown, the purpose of this study was to characterize the frequency and degree of sensory loss in a Canadian sample using measures of visual acuity (i.e., MNRead Acuity) and contrast sensitivity (i.e., MARS Letter Contrast Sensitivity) to assess visual functioning, and measures of hearing loss (i.e. audibility of 2kHz pure-tones at 25dB HL and 40 dB HL) and speech-in-noise perception thresholds (i.e., the Canadian Digit Triplet Test) to assess hearing functioning. Using data from the COMPASS-ND dataset, we conducted preliminary analysis exploring sensory loss in groups diagnosed with subjective cognitive impairment (SCI; N = 24), mild cognitive impairment (MCI; N = 59), and Alzheimer's dementia (AD; N = 19). On measures of visual acuity and contrast sensitivity, most participants were characterized as having normal visual acuity and contrast sensitivity (79 of SCI, 56 of MCI, 32 of AD), whereas others had low contrast sensitivity and high visual acuity or vice versa (13 of SCI, 23 of MCI, 42 of AD) and both low contrast sensitivity and visual acuity (5 of MCI, 16 of AD). On measures of hearing loss, most participants were categorized as having no or mild hearing loss (83 of SCI, 74 of MCI, 73 of AD), with others having mild to moderate hearing loss (4 of SCI, 7 of MCI, 5 of AD) and moderate to severe hearing loss (13 of SCI, 17 of MCI, 21 of AD). Furthermore, vision measures were strongly and positively correlated with hearing measures. Besides providing baseline data for longitudinal changes, this research sets the groundwork for further examining the relationship between sensory and cognitive functions in these clinical populations.

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keywords: cognitive decline dementia aging compass

Poster # 43

Childhood-onset obesity exacerbates cellular senescence in abdominal but not femoral preadipocytes

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Cellular senescence is a state of cell growth arrest characteristic of the aging process. Obesity is often viewed as an accelerated form of aging, and interestingly, adults with persistent obesity from childhood are at especially high risk of age-related diseases. Accordingly, we aimed to determine whether the age of obesity onset affects markers related to cellular senescence in abdominal (AB) and femoral (FEM) adipose tissue of young adults.

We collected subcutaneous AB and FEM adipose tissue from 3 women with childhood-onset (CO) obesity (mean [SD] age: 32 ± 6 years; body mass index = 33 ± 2 kg/m²) and 3 women with adult-onset (AO) obesity (age: 33 ± 2 years; body mass index = 35 ± 2 kg/m²) via needle aspiration. We measured senescence-associated- β -galactosidase (SA- β -gal) activity in adipose tissue, and used immunofluorescence staining to quantify the protein abundance of γ H2AX (marker of DNA damage), PML nuclear bodies (marker of cellular stress), and P21 (marker of a committed senescent state) in cultured preadipocytes.

The majority of AB and FEM preadipocytes stained positively for γ H2AX and PML in both groups. In the abdominal preadipocytes only, the women with childhood-onset obesity had a 2-fold higher protein abundance of γ H2AX ($p = 0.04$) and a greater proportion of P21-positive cells (CO: 22 ± 8 ; AO: 7 ± 2 ; $p = 0.05$) than women with adult-onset obesity. Age of obesity onset did not affect the SA- β -gal activity in both AB and FEM adipose tissue.

We conclude that there is evidence of adipose tissue cellular senescence in young adults with obesity, regardless of when they developed obesity. However, adults with childhood-onset obesity have exacerbated DNA damage and cellular senescence in abdominal preadipocytes. This finding may in part explain the increased risk of age-related diseases in this population.

keywords: obesity aging adipose tissue cellular

Poster # 44

A biologically-informed polygenic score identifies endophenotypes and clinical conditions associated with the insulin receptor function on specific brain regions

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Background: Activation of brain insulin receptors modulates reward sensitivity, inhibitory control and memory. Variations in the functioning of this mechanism likely associate with individual differences in the risk for related psychopathologies (ADHD, addiction, dementia), which is in agreement with the high co-morbidity between insulin resistance and psychopathology[1]. The genetic architecture of these neurobiological mechanisms can be explored using large-scale genetic studies. We propose a novel, biologically informed genetic score reflecting the mesocorticolimbic and hippocampal insulin receptor-related gene networks, and investigate if it predicts endophenotypes (impulsivity, cognitive ability) in community samples of children, and psychopathology (addiction, dementia) in adults.

Methods: Lists of genes co-expressed with the insulin receptor in the mesocorticolimbic system or hippocampus were created. SNPs from these genes (post-clumping) were compiled in a polygenic score[2] (termed IR-PRS) using the association betas described in a previously published GWAS (ADHD[3] in the mesocorticolimbic score and Alzheimer's [4] in the hippocampal score). Across multiple samples (n = 4502) the mesocorticolimbic or hippocampal specific insulin receptor polygenic scores were calculated, and their ability to predict impulsivity, risk for addiction, cognitive performance or presence of Alzheimer's disease was investigated.

Findings: The biologically-informed IR-PRS score showed better prediction of child impulsivity and cognitive performance, as well as risk for addiction and Alzheimer's disease in comparison to conventional polygenic scores for ADHD, addiction and dementia.

Implications: This approach creates a novel genomic measure to identify genetic vulnerability for childhood behavioral phenotypes that predict later neuropsychiatric conditions in community-based samples, highlighting possible targets for therapeutic efforts and detection of at-risk individuals.

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keywords: gene network prs insulin receptor

Poster # 45

Personalized 3D fNIRS reconstruction of hemodynamic responses elicited by dual tasks involving walking and arithmetic calculation

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Functional Near-Infrared Spectroscopy (fNIRS) is a non-invasive imaging modality that measures brain activity through changing concentrations of oxy- [HbO] and deoxy- hemoglobin [HbR]. This pilot study aims at investigating the use of personalized fNIRS and local 3D reconstruction to measure the hemodynamic response during simultaneous walking and arithmetic in adults.

Personalized fNIRS consists of modeling the propagation of infra-red light in a subject specific head model for optimal placement of sources and detectors and 3D reconstruction of HbO and HbR response along the underlying cortical surface (1). The selected regions of interest are the left and right Inferior Frontal Gyri (IFG), as suggested in (2); brain regions associated with arithmetic. The left and right IFG was delineated on each participants' anatomical T1 MRI using the Brainnetome Atlas for the placement of fNIRS sensors. The single task consisted of a block design arithmetic task (sequential subtraction of sevens from a random 3-digit number) during 20 blocks of 30s. For dual task, the same arithmetic task was performed during continuous walking. NIRSSTORM software package was used for channel space analysis of fNIRS signal; motion correction, Modified Beer Lambert Law and block averaging. The Maximum Entropy on the Mean approach was used to reconstruct fluctuations of HbO and HbR response. The first participant exhibited a significant HbO increase during single task and HbO decrease elicited by the dual task. Data from the second participant was rejected from analysis due to motion artifacts. The results obtained from the first participant are in agreement with previous literature; suggesting HbO decrease associated with dual task. Demonstrating this result at the single subject level with 3D reconstruction insists that the brain response indeed originates in the bilateral IFG. Whereas we demonstrated feasibility, accelerometer data will be used to detect and correct for motion artifacts.

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keywords: fnirs arithmetic dual task hemodynamic

Poster # 46

Global degree centrality (degC) in resting-state functional MRI is higher in nodes near veins and decreases over distance

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Introduction: Resting-state functional MRI (rs-fMRI) assesses functional connectivity in the brain, based on synchronous fluctuations in the blood oxygenation level dependent (BOLD) signal between brain regions. Draining veins may however introduce bias in the localization of brain activation [1]. The relationship between veins and rs-fMRI metrics in nearby nodes is unclear. Here, we use high resolution venograms and rs-fMRI to investigate the impact of draining veins on degree centrality maps (DegCM), where the scores represent the number of connections to other nodes.

Method: DegCM were created from rs-fMRI data from 16 participants across 5 sessions, using a multiband EPI sequence on a 7T MRI. DegCM were computed using the fastECM algorithm [2]. Maps were smoothed (2.4mm) and registered into MNI space. The 5 scans for DegCM were averaged for each participant.

Vessel maps were obtained by segmenting [3] quantitative susceptibility maps [4] from a flow-compensated 3D gradient echo sequence, and co-registered using ANTs [5] across the scans. Average vessel partial volume maps were converted to distance maps, and vessel diameter maps were propagated over 40mm to correlate the diameters to DegC scores over distance. We explored the link between draining vein location, diameter, and DegC.

Results/Discussion: Correlations showed distance had a greater influence on DegC than diameter, with DegC decreasing with distance. Larger veins showed a slower decrease with distance in DegC compared to smaller veins, i.e. DegC near veins of 0.3-0.6mm and 1.2-1.5mm diameter decrease by 58.2 and 13.5 across a 30mm distance, respectively, indicating a systematic bias on connectivity metrics from the relationship between vessel diameter and draining area.

Conclusion: This work demonstrates the influence of veins on a BOLD-based connectivity metric, DegC. Our results indicate that DegC is higher closer to veins, and DegC near veins may reflect the average from the veins' draining area.

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keywords: bold degree centrality venous bias

Poster # 47

Application of the Distributed Lag Models for Examining Associations Between the Built Environment and Obesity Risk in Children

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Objective: Although some features of the built environment (BE) are associated with nutritional behaviors and physical activity (PA) in children, the literature is mixed. Traditionally, a fixed, pre-specified spatial scale (such as census tracts) or circular/network buffers is used. Incorrect selection of the geographic scale can lead to biased estimation, and Distributed Lag Models (DLM) were proposed as an alternative. DLM coefficients follow a smooth association over distance, and a pre-specification of buffer size is not required. The study aims to compare the DLM with a traditional linear regression model.

Methods: Data were from the first follow-up (F1: 2008-11, mean(age)=11.6 years) and second follow-up (F2: 2012-16, mean(age)=16.8 years) of the QUALITY cohort, non-movers (n=281). BE features included the Retail Food Environment: the number of fast-food restaurants and convenience stores, and the Recreational Facilities Environment: the number of parks, sport fields or fitness facilities. DLMs with 100m ring-shaped areas centered on the residential locations were created. Outcomes included age- and sex- adjusted BMI z-scores and daily minutes of Moderate to Vigorous Physical Activity (MVPA, measured using a triaxial activity monitor). Models were compared with Akaike Information Criteria (AIC).

Results: The number of fast-food restaurants was associated with an increase in BMI z-score up to 600m at F1 and up to 900m at F2, the number of convenience stores - up to 1600m at F2 only. No significant association between the Recreational Facilities Environment and MVPA were detected. The DLM-estimated associations and SE were smaller than with the traditional linear regression models, the AIC suggested DLMs were better model fit.

Conclusion: The DLMs can help build empirical evidence of the most appropriate spatial scale for a given child's age. Nevertheless, additional research in different populations, age and physical activity indicators groups is warranted.

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keywords: built environment obesity physical activity

Poster # 48

Weight bias internalization: Relationships with physical activity, sedentary behavior and psychological well-being

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Objectives: The objective of this study was to investigate the relationship between weight bias internalization (WBI) (i.e. self-stigma based on weight), physical activity (PA), sedentary behavior and psychological well-being.

Methods: Data on demographics, WBI, PA, sedentary behavior, life satisfaction, emotional well-being and body satisfaction were collected from a sample of adults (N=170, 52.9 female; age 45.4±16.9 yrs; BMI 26.7±5.5 kg/m²) from the PERFORM Centre. WBI was assessed using the Weight Bias Internalization Scale, which assesses the extent to which an individual experiences feelings of self-blame for weight-related stigma and applies negative stereotypes onto themselves. Minutes of the past week's sedentary behavior was assessed using the Sedentary Behavior Questionnaire, and moderate to vigorous intensity PA (MVPA) was assessed using the International Physical Activity Questionnaire. Body satisfaction was assessed using the Body Shape Satisfaction Scale, emotional well-being was assessed using the Positive and Negative Affect Scale, and life satisfaction was assessed using the Satisfaction with Life Scale. The association between WBI and the dependent variables were tested in separate multiple linear regressions after adjusting for age, sex and race.

Results: For every unit increase in mean WBI, minutes of MVPA, life satisfaction, body satisfaction, and positive emotions decreased (B: -0.10, -0.45, -0.73, -0.19, respectively, all p<0.05), while minutes of sedentary behavior and negative emotions increased (B: 5.76 (p<0.015), 0.31 (p<0.0001), respectively).

Conclusions: WBI is negatively associated with healthy behaviors and psychological well-being in adults. These results demonstrate how WBI can have significant implications on one's psychological well-being and healthy lifestyle behaviors. Future research should focus on longitudinal data to obtain a more comprehensive understanding of these relationships.

keywords: weight bias physical activity psychological

Poster # 49

Effect Of Exercise Training Combined With Dietary Caloric Modification On Body Weight And Arm Volume In Women With Breast Cancer-Related Lymphedema: Preliminary Results.

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Introduction: Breast cancer-related lymphedema (BCRL) is a chronic complication following treatment of breast cancer (BC) and often leads to women becoming sedentary resulting in weight gain and a worsening of the lymphedema. Currently, it is unknown if a combination of exercise training and dietary modification results in a reduced overall body weight and limb volume. **Objective:** To observe if exercise combined with dietary modification results in a reduction in body weight and affected arm volume. **The primary outcomes of this study are body weight and arm volume after 10 weeks of a 22-week intervention program.** **Methods and procedures:** Twelve women were recruited and allocated to either 1) BCRL (n=7) or a post-BC without lymphedema (n=5). Body weight and arm volume were obtained at baseline and at 10 weeks. Participants received breakfast and lunch meals (total calories=770 cal) for 5 days/week over the 10 week period. The participants followed an exercise program, supervised by kinesiologists twice a week, one hour each session for 10 weeks. **Results:** There was a significant decrease in body weight (baseline; 90.03±18.53 vs. 10 weeks; 86.23±16.18 kgs; p<0.05) and arm volume (baseline; 3376.06±840.67 vs. 10-weeks; 3106.92±723.96 cm³; p<0.05) in the BCRL group. Furthermore, there was a significant difference in body weight between groups (BCRL; 4.16±2.74 vs post-BC; 0.44±1.97 ; p<0.05), but no difference in arm volume between groups (BCRL; 8.50±5.82 vs post-BC; 4.47±4.44 ; p>0.05). **Conclusion:** These preliminary results indicate that combining exercise and diet modification may be an effective strategy to reduce body weight and arm volume in women with BCRL.

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keywords: breast cancer lymphedema exercise dietary

Poster # 50

Evidence for counter-current heat exchange during localized hand cooling using infrared thermography.

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Background: When exposed to cold, the body uses thermoregulatory mechanisms to maintain temperature homeostasis in the core. The limbs may undergo a physiological mechanism known as counter-current heat exchange where warm arteries exchanges heat with cooler veins, which has been previously demonstrated in aquatic waterfowl. How thermogenesis in the core is coupled to warming in the limb is not completely understood in humans.

Objectives: To describe temperature changes in the core (thorax) and limb (hand), during acute localized cooling. To determine if thermogenesis in the thorax is temporally related to the cooling and rewarming of the exposed limb.

Methods: Thirty healthy human participants completed a cold pressor test (CPT) by immersing their right hand up to wrist level in 4 °C water for three minutes. Body mass index was estimated from height and weight. Skin temperatures of the cold-exposed arm and thorax were measured by infrared thermography at baseline, during CPT, and in recovery phase. Pain and stress were self-reported throughout the test. Cardiovascular responses were monitored by pulse wave analysis.

Results: The CPT increased systolic blood pressure, diastolic blood pressure, heart rate, and self reported pain and stress scores. Hand and forearm skin temperatures were decreased by CPT, except for the antecubital fossa which was slightly increased. In recovery phase, the hand warmed up while forearm (including antecubital fossa) cooled down. The thorax skin temperatures increased during CPT at supraclavicular fossa, sternal, and mediastinal regions, and remained elevated in recovery phase.

Conclusions and relevance: During localized hand cooling, thermogenesis in the thorax contributes to counter-current heat exchange in the limb. This information will help understand cold exposure in an uncertain climate. It applies to people such as cold weather laborers, military personnel and those living and working in northern communities.

keywords:

Poster # 51

The role of glycogen in proliferation of human helper T cells

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The immune system protects the body against infections and cancer. A type of lymphocyte called helper T cell (Th) plays a vital role in coordinating immune responses. When presented with an antigen, Th cells proliferate, differentiate and produce cytokines. Activation of Th cells is metabolically demanding. T cells require large amounts of glucose from their environment as they proliferate¹. These pathways support rapid cell division². Excess glucose is stored in the liver as glycogen granules and has been found in non-hepatic cells^{3,4}. With an increase in glucose uptake in Th cells, surplus must be stored for later use. Currently, there is very little knowledge on glycogen dynamics in Th cells. We test the importance of glycogen in Th cell proliferation and cytokine production. PBMCs were isolated from venous blood of healthy human participants. CD4+CD3+ cells were negatively selected for obtaining purity over 96%. Th cells were activated using anti-CD3 and anti-CD28 antibodies. Glycogen was stained with periodic acid Schiff. Proliferation was assessed using CFDASE dye and flow cytometry. Cytokines were measured by ELISA. Glycogenolysis was inhibited by glycogen phosphorylase inhibitor. We demonstrated isolated Th cells contained glycogen granules. Comparing signal intensity in Th cells activated in vitro, we found they accumulate a significantly ($p < 0.0001$) greater amount of glycogen compared to at rest. The α -amylase control digested glycogen as expected. Glycogen granules were observed in activated Th cells. In activated PBMCs, the inhibition of glycogenolysis attenuated proliferation and cytokines. T cells play a vital role in the adaptive immune system, however, very little is known about their metabolic pathways. We are among the first researchers to explore glycogen dynamics in Th cells. This newfound understanding on how Th cells manage their metabolic needs during an immune response could aid in the development of immunomodulatory treatments.

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keywords: glycogen helper cell immunometabolism

Poster # 52

Individual Differences in the Use of Visual Speech Cues and Sentence Context to Aid Speech Perception under Noisy Conditions in Young and Older Bilinguals

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Background noise is often present during speech perception. Nevertheless, most people perceive speech successfully, suggesting the existence of supporting mechanisms. Visual speech cues (e.g., lip movements) and context (e.g., semantic information) improve speech perception in noise [1-2]. These effects are well documented in native listeners, but little is known for non-native listeners who may have less developed linguistic knowledge (e.g., smaller vocabulary) in their second language [3]. Additionally, older bilinguals may be at a particular disadvantage, as they have to contend with sensory changes such as presbycusis and/or a decline in visual acuity.

We are investigating the extent to which young (18-35 years) and older (65+) French English/English-French bilinguals benefit from visual speech cues and context in their first (L1) and second language (L2). Participants were presented with audio-video recorded sentences in noise (twelve-talker babble) and asked to repeat the terminal word of each sentence. Half of the sentences offered a moderate level of contextual information (e.g., "In the woods, the hiker saw a bear."; MC) while the second half offered little context (e.g., "She had not considered the bear."; LC). The sentences were presented in three modalities: visual, auditory, and audiovisual.

Preliminary results show greater accuracy in L1 compared to L2. Within each language and modality, participants were more accurate for MC compared to LC sentences. Additionally, participants were most accurate in the audiovisual modality. The benefits associated with visual speech cues and sentence context was moderated by working memory and L2 fluency. These results suggest that individual differences in cognitive abilities play a role in speech perception in noise and should be taken into account when choosing optimal ways of communicating important information to non-native listeners.

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keywords: speech perception bilingual aging cognition

Poster # 53

Auditory Discourse Processing in Bilingual Older Adults: An ERP Analysis

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Little research has been conducted in how bilingual older adults process language at the level of discourse. Even normal aging is accompanied by cognitive changes. Among them are declines in working memory (WM) capacity. These declines may make understanding spoken language more challenging, perhaps more so in one's second language (L2). To that end, the current study seeks to examine how bilingual older adults process discourse through contrasting the predictions of two competing theoretical frameworks of language comprehension. First, capacity theory, which predicts increased sensitivity to lexical-level cues due to L2 processing increasing the demands on WM capacity. The other is the noisy channel model, which predicts increased sensitivity to discourse-level cues in L2 due to an increased reliance on general world knowledge and discourse context when processing speech. In addition, we examined the effects of individual differences in WM capacity on discourse processing.

We tested 13 older adult bilinguals (60-83 yrs) in an experimental paradigm consisting of three sentence discourse stories. We examined ERP responses to a target word that was either congruent or incongruent with the discourse context or lexically associated or unassociated to a prime word. Participants also completed two working memory tasks, the Operation Span task, and the Listening Span task, which was completed in French and English. In L2, we observed a consistent N400 effect when either discourse congruence or lexical association was manipulated, however, it was not observed when both were manipulated. These findings can be interpreted within the context of and provide support to the capacity model. We also observed that participants with lower WM capacities were more sensitive to manipulations in both lexically associated and discourse congruent conditions than those whose capacities were larger, indicating the importance of working memory in discourse processing.

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keywords: aging bilingualism discourse working memory

Poster # 54

The Association Between the Relative Autonomy Index Score and Minutes of Physical Activity

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Background: The Relative Autonomy Index (RAI) was devised to calculate a person's relative autonomy, with higher scores indicating greater internal motivations to perform healthy behaviours (such as physical activity [PA]). Amotivation (a lack of interest in engaging in an activity) has been traditionally ignored in RAI, but recent research has suggested incorporating it into the calculation. Although previous research has shown that men and women differ in their PA, whether the associations based on this updated RAI with PA also differ by sex are unknown.

Objective: To determine the association between the updated RAI score and PA and to determine whether results differ by sex.

Methods: Data were from the Nicotine Dependence in Teens study (n=857; 54 male, mean age: 24.1, 23.8; and mean BMI: 24.5, 23.7 for males and females, respectively). PA was measured with the International Physical Activity Questionnaire short form, and defined in minutes of moderate, vigorous, or moderate-to-vigorous intensity PA (MVPA) in the past week. The RAI score was used: as a continuous variable and as a binary variable (>0: high motivation, <0: low motivation). The associations between the RAI measures and PA intensity were modeled in multivariable linear regression adjusting for age, marital status, annual income >\$20,000CAN and body mass index (i.e., based on measured height and weight). Analyses were stratified by sex.

Results: In adjusted regressions, compared to low RAI scores, higher scores were significantly associated with moderate, vigorous, or MVPA intensities in the full sample (B=41.1, 91.7, 133.2, respectively, all p<0.05) and in females (B=1.6, 3.7, 5.3, respectively, all p<0.05), but only with vigorous PA in males (B=88.39, p=0.01).

Conclusion: Results show that higher internal motivation is associated with increased PA, particularly among women. Research assessing whether RAI predicts changes in PA over time from longitudinal studies is needed.

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keywords: self determination theory physical activity

Poster # 55

Development of a Preference-Based Weight-Related Quality of Life (WRQL): an obesity-specific quality of life measure to evaluate the effectiveness of various obesity treatments

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Background: Few obesity-specific outcome measures exist and none are suitable for the comparative effectiveness of different obesity-interventions and for the elicitation of utility values used in the assessment of cost effectiveness.

Objectives: The development of a descriptive system for a weight-related quality of life index.

Methods: A total of 201 patients were enrolled in the NL Bariatric Surgery Cohort Study. In addition to demographic and clinical data, health-related quality-of-life data were collected at baseline using the Impact of Weight on Quality of Life (IWQoL-Lite) and two generic questionnaires, the EuroQoL-3D (EQ-5D) and the Short Form-12 (SF12). A mapping exercise was performed by three raters using the Delphi technique to identify the International Classification of Functioning, Disability and Health (ICF) codes that best describe the content of the items and most relevant health attributes of the IWQoL-Lite, EQ-5D, and SF12 were identified. Rasch analysis was applied to the draft 48-item instrument to identify the best performing items and associated response options. The best item was selected using the threshold map.

Results: The sample was young (mean age 43± 9.0) and predominantly female (81.6). The prototype PBWRQL index consisted of seven dimensions (i.e., health attributes: Physical Function, Mood, Usual activity, Pain, Vitality, Shortness of Breath, Swollen Ankles) with three response options per attribute. Regression coefficients consistently decreased between response levels showing that for each item the response options provided the same discriminative ability. A scoring algorithm was estimated using a simple additive formula. PBWRQL demonstrated known-group validity between different clinical subgroups.

Conclusion: This study produced a brief obesity-specific prototype index based on items impacted upon by severe obesity and demonstrate the potential to discriminate the health impact of the condition.

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keywords: obesity speci measure health

Poster # 56

The effect of low back pain and lower-extremity injuries on multifidus muscle morphology and function in college soccer players

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Background: The lumbar multifidus muscle (LMM) plays a critical role to stabilize the spine. While LBP is a common problem in soccer players, few studies have examined LMM characteristics in this athletic population and their possible associations with LBP and lower limb injury.

Objectives: 1) To investigate the LMM characteristics in male and female collegiate soccer players and their potential association with LBP and lower limb injury, 2) to examine the relationship between LMM characteristics and body composition measurements and 3) to examine seasonal changes in LMM characteristics.

Methodology: LMM muscle ultrasound assessment were acquired in 27 soccer players (12 females, 15 males) from Concordia University during the preseason, and 18 players at the end of the season. LMM cross-sectional (CSA), echo-intensity and function (e.g. contraction) were assessed bilaterally in prone and standing position, at the L5-S1 spinal level. A self-reported questionnaire was used to assess the history of LBP and lower limb injury . Dual-energy x-ray absorptometry (DEXA) was used to acquire body composition measurements.

Results: Side-to-side asymmetry of the LMM was significantly greater in males compared to females. LMM thickness when contracted in the prone position and LMM cross-sectional area was also significantly greater on the left side in male players. The LMM thickness change during contraction in the prone position was significant greater in players who reported having LBP in the previous 3-months. LMM CSA and echo-intensity were positively correlated to total body fat . There was a small significant decrease in LMM thickness at rest in the prone position over the course of the season.

Conclusion: The results provide new insights with regards to LMM morphology and activation in soccer players and their associations with LBP body composition measurements. Exercise intervention trials in rehabilitation of LMM should be further investigated.

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keywords: lumbar multifidus muscle ultrasound imaging

Poster # 57

Combined Effects of Acute Exercise and Sleep on Recognition Memory in Young, Sedentary Adults

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Research has shown that exercise & sleep independently benefit memory by improving retention. Whether those effects are synergistic remains to be tested. We aim to test the idea that a nap & a single exercise session may have synergistic effects on memory. Methods: Participants underwent medical/psychological evaluations, sleep screening, 10-day diary/actigraphy and fitness testing. The study involved a between-subject design with 4 groups: 1. exercise+nap, ExNap 2. Nap only, NoExNap 3. Exercise, ExNoNap & 4. no exercise or nap, NoExNoNap. During procedure, participants were provided with a lunch after undergoing 40min of cycling, followed by a study session (13h30) & 60min nap (14h00). At re-test (17h00) subjects completed a recognition task whereby 45 of the previously studied photos were intermixed with 45 foils. Participant's task was to indicate the previously presented photos by pressing a key on a computer. Polysomnography was used to monitor sleep. The outcome variables were accuracy, responses & sleep metrics (N3, N2, total sleep time, awakenings, sleep latency, spindle and slow-wave activity). Results: The data in 115 healthy, young adults (Mage23±3.3.9SD yrs) showed a significant group difference on accuracy, $p < 0.03$. Posthoc t-tests revealed that the ExNap ($n=27$) was more accurate than the NoExNap ($n=29$) and ExNoNap ($n=30$) groups alone, $M \pm SD$ 83.8±2.9 vs. 81.1±5.4, 78.6±10.3, $p < 0.05$ respectively. A trend was observed between the ExNap vs NoExNoNap ($n=30$) groups 81.9±4.1SD, $p = 0.058$. Improvements in ExNap accuracy were associated with increases in the number of N2+N3 spindles ($r = 0.46$, $p < 0.02$). No significant association were seen between performance & other sleep variables. Conclusion: The results demonstrate a synergistic effect between exercise & sleep. These data support our hypothesis and suggest that acute exercise and a nap may improve recognition over a nap or exercise alone.

keywords: cognitive performance exercise daytime nap

Poster # 58