

Gender differences in beliefs about physical activity in a Western Canadian adolescent sample

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Patterns during adolescence indicate a decrease in physical activity compounded by lower levels of activity exhibited among females compared to males. Thus an understanding of gender differences in physical activity motivation and participation is needed to develop effective interventions. **PURPOSE:** To determine gender differences in physical activity beliefs on intention and behavior using the Theory of Planned Behaviour (TPB). **METHODS:** One hundred and fifty-seven students (male=97, female=60; mean grade=9.97, SD=0.94) from grades 9-12 completed self-reported measures of intention, behavioral-, normative-, and control- beliefs and a one-month follow-up of physical activity behaviour (Godin Leisure-Time Exercise Questionnaire). **RESULTS:** Compared to girls, boys had larger (Fisher Z, $p < .05$) intention-belief correlations with physical ability/skill, benefits to social interaction, physical fitness, mental health, resources, weather as a barrier, and norms from one's father ($q = .16$ to $.37$). In contrast, girls had larger intention-belief correlations than boys for pain as an anticipated outcome, and norms from siblings and friends ($q = .22$ to $.29$). For belief-behavior relationships, boys had larger ($p < .05$) correlations for school work as a barrier, and other plans as barriers ($q = .17$ to $.23$), compared to girls who reported larger correlations for skill/ability, opportunity as a barrier, and norms from friends ($q = .24$ to $.36$). **CONCLUSION:** Gender differences were found at the physical activity belief level for both exercise intention and behavior relations. Future research should consider developing interventions that target both the needs of boys and girls to effectively increase their physical activity adoption and adherence. A focus on belief-behavior differences by gender would suggest that interventions for boys should focus on time barriers and planning, while interventions for girls should pay special attention to physical activity skill development, more opportunities, and including friends in these activities.

Effects of rhythmic leg movement on corticospinal tract excitability and H-reflex modulation in a forearm muscle

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Rhythmic arm cycling leads to suppression of H-reflexes in arm and leg muscles. Additionally, concomitant with reduced H-reflex excitability, we have shown a reduction in corticospinal excitability to the forearm flexor carpi radialis (FCR) muscle. The nature of any reciprocal relationships between the effect of rhythmic leg movement on FCR reflex and corticospinal excitability is currently unknown. We hypothesized a measurable

effect of rhythmic leg movement on H-reflex and corticospinal excitability in the arms. The current study was designed to determine the extent to which rhythmic movement of the legs can alter reflex transmission (Experiment 1) and excitability of corticospinal projections examined with transcranial magnetic stimulation (TMS) (Experiment 2) to arm muscles. For experiment 1 FCR H-reflex recruitment curves were developed during static leg and rhythmic leg movement conditions while the FCR was contracted and relaxed. Results from this experiment suggest that there was a significant effect of rhythmic leg movement on reflex transmission in FCR. Also, the results show that there is generally no difference between the activity state of FCR on reflex transmission during leg cycling. Experiment 2 used TMS to produce motor-evoked potentials (MEP) in FCR with and without leg cycling while the FCR was contracted and at rest. Also, subthreshold TMS was used to condition H-reflexes produced at the same current intensity with and without leg cycling while FCR was contracted and at rest. The MEP results show a significant increase in corticospinal excitability during cycling compared to static conditions with a similar result during rest and contracted conditions. The effect of TMS conditioning was significant when the FCR muscle was relaxed while the effect of leg cycling was significant only during contraction of FCR. The results suggest a differential regulation of spinal and supraspinal excitability dependent upon the activity state of the muscle under study. The results also further support the idea of a loose neural coupling between the arms and legs during rhythmic movement.

Coupling between arm and leg movement during “reduced” human locomotion: evidence from Hoffmann reflexes in a leg extensor muscle

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There is evidence for neural linkages between the arms and legs that modulate reflexes when the limbs are stationary. However, characterization of these linkages is uncertain when the arms and legs are both rhythmically active (e.g. when walking). Examination of such interactions is difficult during locomotion because of the challenge in isolating the independent effects of the arms and legs. To address this concern, we used a “reduced” walking model of combined arm and leg (A&L) cycling to examine the separate effects of rhythmic arm (A) and leg (L) movement on soleus H-reflexes. It was hypothesized that both A and L movement would contribute significantly to suppression of H-reflex amplitude during A&L. Thus we predicted an interaction between arm and leg rhythmic movement control. Subjects were seated in a recumbent A&L cycle ergometer and instructed to maintain a low-level contraction in their right soleus muscle. To evoke an H-reflex, single 0.5 ms square-wave pulses were delivered pseudorandomly every 2-5 seconds to the right tibial nerve. Electromyography (EMG) recordings were taken from the soleus muscle to detect H-reflex and M-wave amplitudes, and from tibialis anterior, vastus lateralis and anterior deltoid muscles to detect background EMG. H-reflex recruitment curves were developed during rhythmic 1Hz cycling with A, L, and A&L. Various measures of H-reflex amplitude were taken from the recruitment curves, including modulation of 50% H_{max} . Results suggest that the conditioning effect of A was

less than that for L and A&L, while the effects of L and A&L were generally equivalent. We suggest that there is a measurable interaction between arm and leg movement on H-reflex amplitude during “reduced” locomotion. The comparable modulation of soleus H-reflex amplitude in the conditions where the legs were moving (L and A&L) further support the suggestion that the movement state of the limb in which a reflex pathway is studied is the primary determinant of reflex output.

Effect of rhythmic arm movement on soleus H-reflex amplitudes after stroke

Y. Barzi, E. P. Zehr

Spinal reflex pathways normally operate under the control of descending pathways from supraspinal centers. Recent experiments have indicated a neural coupling of upper and lower limb muscles during various locomotor activities such as walking, cycling, and swimming. Specifically, rhythmic arm movement at a frequency of ~1 Hz suppresses the amplitude of the soleus H-reflex in stationary legs in a neurologically intact population. This suppression is greater when the movement frequency is increased to ~2 Hz. After stroke, the development of spasticity is common and is referred to as hyperexcitability of stretch reflexes. As an electrical analog of the stretch reflex, the H-reflex can be used as an indicator of exaggerated stretch reflexes. If rhythmic arm movements suppress the amplitude of H-reflexes in the legs, it could potentially be used as a rehabilitation technique to reduce spasticity in the legs after stroke. Additionally, it has been suggested that the spinal reflex excitability is reduced due to the effect of aging. To rule out any aging effect on the H-reflex pathway, a neurologically intact age-matched group was also recruited. The purpose of this study was to test for suppressive effects of arm cycling on the amplitude of soleus H-reflexes after stroke. 16 Stroke subjects with a history of single (> 6 months) stroke and 13 neurological intact age-matched subjects were recruited. Subjects sat in a chair with their legs stabilized and data was collected with their arms at rest and during arm cycling. For the cycling trials, subjects used an arm ergometer at two different frequencies: a frequency of 1 Hz and the highest frequency possible. H-reflexes were evoked in the legs using single square-wave pulses delivered simultaneously to both tibial nerves at the popliteal fossae. Electromyographic signals were recorded from soleus, tibialis anterior, vastus lateralis, posterior deltoid, and biceps brachii muscles bilaterally using surface recording electrodes. For all trials, H/M recruitment curves (RCs) were collected. The RC from the rest trial was compared to the RCs from the 1 Hz frequency and fast rate cycling trials. Results suggest that the effect of arm cycling on soleus H-reflex amplitudes is weaker after stroke when compared to the neurologically intact subjects. This could indicate that this reflex pathway is less sensitive to modulation, or that interlimb connections are not as active after stroke.

School Health in Trinidad and Tobago: *PhotoVoice* as a means of exploring youth health issues

A. Sum

Children's health issues, such as obesity, diabetes and HIV/AIDS, have become an increasing concern in the Caribbean. In Feb. 2007, an interdisciplinary team of students and faculty from the University of Victoria and the University of Saskatchewan partnered with the University of the West Indies and the Trinidad and Tobago Ministry of Education to help map out the current issues that affect the health of school-aged youth. A case study was conducted to seek perspectives from multiple stakeholders regarding the Physical Education curriculum and health needs of school-aged youth. Meetings, focus groups and interviews were held with Curriculum Officers, P.E. teachers and students, to attain a wide range of perspectives. *PhotoVoice*, a participatory action research method, was the principle method used to engage students in exploring the health issues that exist in their homes, schools and communities. Nine senior level students from three local high schools participated in the *PhotoVoice* project, as well as in discussion groups and a National Symposium on Children's Health. The major themes and recommendations derived from the various forms of engagement with policy makers, administrators, teachers and students were forwarded to the Trinidad & Tobago Ministry of Education and Association of Universities and Colleges of Canada. *PhotoVoice* proved to be an empowering tool, which allowed students to identify and act upon health issues that affect their daily lives.

Long-lasting suppression of the leg muscle reflex produced by rhythmic upper limb movement and was cancelled out by the cutaneous input.

B. Javan

Plasticity in spinal networks has been proposed as a mean to permit motor skill learning and recovery after central nervous system disorders. This plasticity is significantly driven by input from the periphery (Wolpaw, J.et.al. (2006) *Prog.Neurobio*). For instance, attenuation of soleus H reflex (electrical analogue of the stretch reflex) can last beyond the period of different types of conditionings via putative presynaptic inhibition (Brooke, J. et.al, (1997) *Prog Neurobiol*, 51, 393-421). Interestingly, rhythmic arm cycling can also attenuate soleus H reflex via interlimb connections and presynaptic pathways (Frigon, A., et. al., (2004) *J Neurophysiol*, 91, 1516-1523). However, it remains to be studied if this attenuation is maintained beyond the period of arm cycling. In this study, we hypothesized that excitability of H reflex pathway would remain suppressed after cessation of arm cycling. Subjects were seated with their trunk and feet fixed at a neutral position. Using an arm ergometer, they cycled at 1Hz for 30min. H-reflexes were evoked via stimulation of tibial nerve on the popliteal fossa with the intervals of 5 minutes, starting prior to the cycling and continued during cycling and up to 30 minutes after

termination of cycling (n=12). Besides soleus muscle, electromyography was recorded from tibialis anterior, vastus lateralis and biceps femoris to assure that leg

Municipal Recreation Food Environment Audit in British Columbia, Canada

L. Bridgewater

Approximately 50 million visits to recreation facilities occur annually in British Columbia (BC). Evidence shows that children are spending more time in structured activities or daycare which are often provided by recreation centers. As such, recreation facilities have become a potential environment of influence on children's health. The purpose of this research was to describe the characteristics of the municipal recreation environment in BC that may affect the eating behaviours of children. The Municipal Recreation Food Environment Audit Tool (MRFEAT) was piloted and then mailed to a census sample of recreation facilities that are registered BC Recreation and Parks Association members (n = 373). 30.56% of the facilities responded (83/373). Only 14.4% of recreation facilities had policies to monitor food sales in snack bars, vending machines, or food provided to children in recreation programs. Policies largely related to allergenic foods. 76% of facilities had contracts with food or beverage suppliers. 47% had food and/or beverage advertising on site, and 27.7% had corporate food or beverage companies sponsor programs or events in their facility. Chocolate bars and chips made up the majority of snacks sold in vending machines, (66% of items) while 56% of beverages sold were sugar sweetened drinks. Vending 'healthier option' foods were lower in price, with an average price difference of 25 cents. Conversely, in snack bars, healthier options were more expensive, with, on average a 50 cent price difference over five items. Despite a low response rate the audit provided valuable information for planning initiatives.

Hypervolemia, thermoregulation and exercise performance under severe heat stress.

M. Nelson

The purpose of this study was to determine if the ingestion of sodium citrate (CIT), and the subsequent expansion of plasma volume, would have a direct effect on thermoregulation and physiological function during a simulated 1-hour time trial (TT) under severe heat stress. Eight subjects, aged 24.9 years ($SD \pm 4.4$), were studied under the following three conditions: (1) HCIT (0.2 g/kg sodium citrate), (2) LCIT (0.1 g/kg sodium citrate), and (3) CNT (Gatorade). Blood samples, taken before and during exercise, were analyzed for hematocrit (Hct), haemoglobin (Hb), bicarbonate (HCO_3^-), base excess (BE), pH, sodium (Na), potassium (K), and glucose (GLU). Rectal temperature (T_r) and skin temperature (T_{sk}) was also recorded. Heart rate and psychophysical strain were also measured throughout each TT. Plasma volume significantly increased after ingesting HCIT compared to the other two trials. There were

no differences in mean body temperature, physiological strain, cardiovascular strain or psychophysical perception. The ingestion of HCIT appears to improve cycling performance despite no difference in physiological measurements. HCIT reduced split times, better maintained power output over the TT, and improved time total cycling time.

Hierarchical error processing during motor control

O. Krigolson

Motor control appears to depend on a system of hierarchically organized neural mechanisms for error evaluation. Our previous research (Krigolson & Holroyd, 2006) has shown that medial-frontal cortex evaluates high-level motor errors (i.e., whether or not a movement goal has been achieved). While there is a large body of literature associating posterior parietal cortex and the cerebellum with the online control of movement and low-level error evaluation (i.e., trajectory adjustments), to date there have been a limited number of brain imaging studies examining these neural substrates. In the present study we recorded event-related brain potentials (ERP) from participants engaged in a discrete manual aiming task. Interestingly, the results of the present study identified several electrophysiological components with a parietal scalp distribution. Furthermore, the results of the present study support our hypothesis that error processing during motor control is hierarchical in nature with different levels of errors being evaluated by different neural substrates.

Suppression of soleus H-reflex amplitude is graded with frequency of arm cycling

S. Hundza

Rhythmic arm cycling significantly suppresses the soleus H-reflex in stationary legs. At an increased frequency (2 Hz) of arm cycling the soleus H-reflex amplitude is attenuated more than at a 1 Hz frequency. However, the specific nature of the relationship between frequency of arm cycling and H-reflex modulation in the legs remains unclear. In particular, whether an identifiable threshold frequency of arm cycling can be determined at which the amplitude of the H-reflex significantly differed from the static arm trials is unknown. This study examined the effect of a broad range of arm cycling frequencies on the soleus H-reflex amplitude. We hypothesized that graded increases in the frequency of rhythmic arm cycling would produce graded increases in the suppression of the soleus H-reflex amplitude, thus identifying an arm cycling frequency where the soleus H-reflex amplitude significantly differed from that found in the static arm trials. In 11 neurologically intact participants soleus H-reflexes were evoked with tibial nerve stimulation during static control and rhythmic arm cycling trials. A constant M-wave was maintained for the 5 static and 19 cycling trials. The cycling trials ranged in movement frequency from 0.03 - 2.0 Hz. Peak to peak amplitudes of the soleus H-reflexes were

determined off line and normalized to the maximum M-wave determined from individual M-wave – H-reflex recruitment curves. The results show a significant inverse linear relation between arm cycling frequency and soleus H-reflex amplitude. At an average threshold cycling frequency of .8 Hz the soleus H-reflex amplitude significantly differed from static due to the suppressive effect of rhythmic arm cycling. The results of this study confirm the influence of rhythmic arm movement on the excitability of reflex pathways in static legs as well as demonstrate that faster upper limb movement increases the influence on these interlimb connections. Thus it may be important to incorporate the influence of the frequency of rhythmic movement (i.e. achieving a threshold level) therapeutically to engage the appropriate neural pathways.

The effects of a tailored health promotion intervention program on the physical activity behavior and stage of readiness for people with intellectual disabilities

M. Lynnes

People with intellectual disabilities have an increased risk of health concerns due to a lack of physical activity and increased sedentary behavior (Pitetti, & Campbell, 1991; Draheim, Williams, & McCubbin, 2002). This study will examine the affects of a tailored intervention program on the physical activity behavior, physical fitness and the stage of readiness to participate in a physical activity program. 10 participants with mild to moderate intellectual disabilities will participate in a 6 week tailored intervention program which will include warm ups, introduction of skills and resources, cool downs and discussion of resources in the community, the importance of physical activity and the development of future goals.

A birth of inactivity? A review of parenthood and physical activity

K. Bellows

Objective: To unite the existing research on physical activity (PA) and parenthood in order to establish direction for future research and improve existing PA intervention programs. *Data Source:* Studies were obtained via academic databases and manual searching of bibliographies. *Study Inclusion and Exclusion Criteria:* Articles were limited to: English peer-reviewed journals, published from 1989-2006; studies including PA among adult parents. *Data Extraction and Synthesis:* Major findings from 30 studies were summarized based on common subtopics. Statistical information was highlighted, and effect size established when possible. A summary effect size was calculated for parental PA. *Results:* Parenthood and PA involvement showed a negative relationship ($d = 0.35$). Mothers were generally found to be less active than fathers. Significant associations were found between barriers and parental PA. There were inconsistent findings among the studies regarding the relationship between PA and

marital/employment status as well as number/age of children. Finally, the use of theoretical models in this topic area has been limited. Conclusions and So What: Overall, the results suggest that parents may be an important intervention focus in PA campaigns, but this research area has largely been focused on mothers, has a limited amount of theory-based work, and has relied too heavily on cross-sectional designs and self-report PA measures. Based on these limitations, as well as emerging trends, recommendations for future research are outlined. This unique population is important in future PA promotion development, and a synthesis of the research to date aids in a thorough understanding of this populations' PA levels and issues. Key Words: Parenthood, physical activity, review, inactivity, gender, parents. Indexing Key Words: Format: literature review; Research Purpose: descriptive; Study Design: content analysis; Outcome Measure: themes in literature to date; Health Focus: fitness/physical activity; Strategy: review; Target Population: adults; Target Population Circumstances: parents.

Sustaining an active school model: Exploring internal and external factors that affect the ongoing implementation of Action Schools! BC

F. van der Heyden

The adoption and implementation of health promotion interventions can be successful; however they may lose momentum and dissipate overtime. Therefore investigating program maintenance over time is crucial for long-term impacts on the rise in childhood obesity. The Actions Schools! BC (AS! BC) initiative uses a 'whole school' model aimed to decrease childhood obesity by providing more opportunities for more children to make healthy choices more often. The purpose of this study is to examine implementation levels of the AS! BC initiative; exploring contextual factors that facilitate or impede ongoing implementation. The study will explore the program's sustainability within schools. A multiple methods approach will be used. Degree of implementation will be categories into two levels, high and low based on the number of program objectives being met. Surveys eliciting information about the organizational climate will be administered to the AS! BC 2004 registered school's teachers and principals. Semi-structured interviews will also be conducted to explore the contextual factors (regional and school level facilitators and barriers) which influence the degree of implementation. Descriptive case profiles will be developed to identify the factors that lead to the various implementation levels. This research will help build our understanding of how to stimulate positive programmatic and policy, changes in schools supporting the sustainability of evidence-based interventions.

Application of exercise induced hypervolemia to 2000m rowing ergometer performance

J. Brotherhood

In elite sport, athletes train according to specific paradigms in order to achieve optimal performance on a given day, or series of days. Prior to this training is undertaken to make specific adaptations by overloading and stressing the targeted area. 1-3 weeks prior to competition, training volume is reduced and intensity is maintained or increased in an attempt to fully realize, and possibly enhance the training adaptations made. (Mujika 2004) This process is commonly referred to as taper. Acute plasma volume expansion occurs following the appropriate high intensity exercise stimulus in both trained and untrained athletes. (Gillen 1991 & Nagashima 1999) This hypervolemia may enhance performance through an increase in cardiac output. (Warburton 2000) Prior investigations using both infused and exercise induced expansion have found mixed results on performance as well as VO_2 max. (Warburton 2000) Rowing is a sport in which absolute VO_2 max is highly correlated with performance. (Jurimae 2002) Therefore, if improvements in cardiac output are present, we should see improvements in 2000m ergometer test performance. The purpose of this investigation is to couple taper with exercise induced hypervolemia to see its resulting impact on 2000m rowing ergometer performance compared to a traditional taper.