North American Society for the Psychology of Sport and Physical Activity

Virtual Conference

June 9–11, 2021

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### Distinguished Scholar Award

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### Early Career Distinguished Scholar

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### President's Award

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Keynote Speakers

Human Kinetics Lecture

**The Struggle for Safe Sport**

*Gretchen Kerr, University of Toronto*

Athletes’ experiences of maltreatment in sports, particularly with respect to sexual and psychological abuse, have drawn significant public attention and scholarly scrutiny. Research on athlete maltreatment has burgeoned recently, addressing the prevalence and types of harms experienced and the effects of these experiences on athlete health and well-being. Evidence also highlights the barriers existing for athletes in reporting their experiences — barriers that athletes have addressed by initiating social media campaigns to share their stories of maltreatment. Simultaneously, sport organizations have responded to high-profile cases by developing policies, codes of conduct, and educational programs, all with a focus on preventing and addressing abuse, neglect, bullying, harassment, and discrimination, or what has become known as Safe Sport. But, Safe Sport is about more than the prevention of harms. Instead, at its core, Safe Sport is about realizing the potential and promise of sport as inclusive, welcoming, rights- and values-based, and fulfilling. The Safe Sport journey has involved a culture shift, characterized by challenges to long-held assumptions and practices about athlete development, and a call to bring sport practices into alignment with those used in other domains that involve young people. Along this journey, resistance has been seen from those who feel unjustly targeted by the Safe Sport movement, and who are fighting to maintain autonomy and the ability to self-regulate in the interests of podium finishes, public image, sponsorships and revenues, and liability concerns. This presentation will address the current state of research evidence on Safe Sport, the ways in which research has been used to inform (or not) Safe Sport initiatives, the successes of the Safe Sport movement, and the challenges that persist.

**Keynote Speaker: Motor Development**

**Hop, Step, Jump: Genes, Brains and Motor Development**

*Deborah Dewey, University of Calgary*

Motor development is foundational to early childhood development. It is the primary way that infants and young children learn about their environment. When we think about motor development, we typically consider the significant changes we see in motor behavior from infancy through childhood and into adolescence. These changes are due to a complex interplay of genetic factors, neurobiology, early environmental exposures and individual experiences. They can result in an individual who shows “typical motor development” or one who displays problems in motor functioning. In this presentation, I will present research from my lab and others on the genetics of motor development. I will also discuss my research that has examined associations between brain development and motor development in typical and atypical populations. Further, I will highlight my ongoing research that is examining the effects of prenatal and early childhood environmental exposures on children’s motor development. I will conclude this talk with a discussion of the importance of multidisciplinary research in advancing our understanding of motor development and developing interventions for improving motor outcomes in atypical populations.

**Keynote Speaker: Motor Learning and Control**

**Competition Between Parallel Sensorimotor Learning Systems**

*Reza Shadmehr, Johns Hopkins University*

Learning of movements benefits from two parallel brain mechanisms: one that has access to explicit knowledge and benefits from coaching, and another that relies on implicit, unconscious correction. However, it is unclear how these systems interact: does enhancing one system’s contributions, for example through instruction, impair the other, or do they learn independently? Surprisingly, there appears to be competition between implicit and explicit learning, both struggling to learn from the same error in performance. As a result, when the explicit system increases its response, errors are siphoned away from the implicit system, thus reducing its learning. It appears that during sensorimotor adaptation, behavior is shaped by competition between parallel learning systems.

**Keynote Speaker: Sport and Exercise Psychology**

**Intersecting Race, Identity, and Sport for Black Males: Reflections on Research**

*Rhema Fuller, University of Memphis*

Matters of diversity, inclusion, and equity in sport continue to be a topic of interest for scholars and practitioners. The North American Society for the Psychology of Sport and Physical Activity (NASPSA), for example, convened a task force in Summer 2020 to address such issues. Likewise, NASPSA has an anti-racism statement posted on its website in which the organization details its commitment to social justice in sport, exercise, performance, rehabilitation, and activities of daily life. Drawing on findings from my research, as well as the research of others, I will discuss matters of diversity, inclusion, and equity in sport and physical activity pertaining to Black male athletes. Specifically, I will present key findings and perspectives related to the intersection of sport, identity, and education for this vital demographic group. Further, I will discuss opportunities for future for research and practice that can be utilized to further promote the positive development of Black men and boys in and through sport and physical activity.
A series of serendipitous events characterizes my career in academia. I have had as many failures as successes and made as many mistakes as good decisions. Consequently, I have learned much along the way. Although my graduate education focused on motor learning and control, most of my research has focused on infant motor development and its role in psychological development. The shift in focus coincided with my transition from a graduate student to a PhD graduate who accepted a “temporary” position teaching motor learning and motor development classes to undergraduate students. Hearing a keynote address by Joseph Campos at the NASPSPA conference in Asilomar in 1995 on the role of self-produced locomotion on infant psychological development solidified the shift. Joe’s address resonated with me profoundly and launched the enduring friendship, collaboration, and program of research that has dominated my scholarly agenda for the last 25 years. In the current presentation, I share why I believe this line of research is so important, what we have learned over the last 25 years, what we still need to learn, and how the original line of research bifurcated into new lines of research. I describe some of the triumphs, some of the failures, some of the regrets, and my hopes for the future. My scholarly adventures have reaffirmed my belief in the indivisibility of motor learning, control, and development. I hope young scholars will recognize this indivisibility because I believe we can make much greater progress in our understanding of behavioral change if we honor the connections among the domains and find new ways to explore learning and control in the context of development. A final message I hope to convey in the presentation is the value of mentorship and collaboration. I would not have experienced anywhere near the success I have enjoyed were it not for my outstanding mentors and collaborators. I strongly urge all young scholars to seek out mentors and collaborators who are as interested in the young scholar’s development as they are in advancing scientific knowledge.

The NASPSPA Outstanding Student Paper Award Recipients

Motor Learning and Control

A Bayesian Analysis of Wakeful and Sleep-Dependent Motor Memory Consolidation From Single-Session Mindfulness Meditation

James Brown, University of South Australia; Maarten A. Immink, Flinders University; Alex Chatburn, University of South Australia; David L. Wright, Texas A&M University

There is increasing interest in mindfulness meditation for memory augmentation. For example, post-training meditation has been shown to promote wakeful motor memory stabilization in experienced meditators (Immink, 2016). We investigated the effect of single-session mindfulness meditation on wakeful and sleep-dependent forms of motor memory consolidation in mediation naïve adults (N = 20, 9 females, M_{age} = 23.7 years ± 3.4). Immediately after serial reaction time task (SRTT) sequence training, participants completed either a 15-minute focused attention meditation (N = 10) or a control listening task. They were then exposed to interference through novel sequence practice. Performance on the trained sequence was tested following a 4-hour wakeful period and again after sleep. Bayesian inference was applied to group comparison of mean reaction time (RT) across training, interference, wakeful and post-sleep time points. Bayes factors (BF) were obtained from Bayesian independent samples t-tests conducted in JASP, a free statistical package. Weak evidence was present for group RT differences at the start (BF = 0.546) and end (BF = 1.13) of training. There was moderate evidence (BF = 6.33) that relative to control, meditation reduced training to interference negative transfer. Enhancement of wakeful consolidation from meditation was supported by strong evidence (BF = 13.0). Wakeful offline learning occurred following post-training meditation (M_{DRT} = -22.1 ms, CI: -38.6, -5.7) but not control conditions (M_{DRT} = 28.6 ms, CI: -5.6, 62.7). No evidence was found for group differences in sleep-dependent performance improvement relative to training (BF = 0.787) or wakeful test (BF =...
Post-training mindfulness meditation states reduce novel sequence interference and expedite wakeful offline sequence learning. Importantly, previous meditation training is not required to obtain wakeful consolidation gains from post-training mindfulness meditation.

**Sport and Exercise Psychology**

**Association Between Parent Reported Persistent Emotional and Behavioral-Related Symptoms and Health-Related Quality of Life of Adolescent Athletes**


Persistent sport-related concussion (SRC) symptoms in adolescents are associated with lower health-related quality of life (HRQOL). However, the association between specific persistent SRC symptom domains and HRQOL is unknown. This study examined the association between parent reported emotional and behavioral-related symptoms (EBS) and HRQOL one month post-SRC. This study was a prospective cohort of adolescent athletes presenting to a concussion clinic within three days post-SRC and completing a one-month follow up. The independent variable was parent reported presence (yes/no) of any EBS (feeling irritable, depressed, frustrated/impatient, restless, reduced tolerance to stress/emotion, poor concentration, and fear of permanent symptoms) one month post-SRC (Rivermead Postconcussion Symptoms Questionnaire). Dependent variables were parent-reported physical, psychosocial, and total PedsQL™ scores (higher scores indicated higher HRQOL). Separate multivariable linear regression models were used to assess the association between parent reported EBS (yes/no) and HRQOL (physical, psychosocial, and total scores); controlling for age, sex, and concussion history. Estimated adjusted mean differences (MD) and 95% confidence intervals (CI) were used to assess associations; MDs with a 95% CI excluding 0.0 were considered statistically significant. Overall N = 332 adolescents presented to the study clinic three days post-SRC; n = 223 (73.80%) completed the one month follow up and were used in these analyses (Mage = 14.28±2.09 years, 59.02% male, 90.64% Caucasian, 31.84% with concussion history). At one month post-SRC, 53.06% of athletes had parent-reported presence of at least one EBS. At one month post-SRC, parent reported EBS were associated with lower HRQOL (adjusted MD = -14.16, 95% CI = -18.48, -9.84), and total HRQOL (adjusted MD = -14.53, 95% CI = -18.04, -11.02). Findings suggest targeted interventions may be needed for those with EBS at one-month post-concussion to improve HRQOL. Funding source: National Operating Committee on Standards for Athletic Equipment.
Symposia
Motor Development Symposium
The David Sugden Symposium on Typical and Atypical Motor Development

This symposium is organized in memoriam of David Sugden (1945-2019), who contributed widely to the area of typical and atypical motor development. David’s official university title was ‘Professor of Special Needs’ at the University of Leeds in the United Kingdom, where he spent the major part of his career. Four presentations will highlight David Sugden’s contributions and impact to the field of human motor development. A first presentation by Wade provides a historical perspective and highlights the applied character of his research, namely the creation of motor assessment tools as the necessary basis for empirical motor development research. The second part by Whitall and Clark describes Sugden’s legacy as it relates to the processes of typical motor development – both in controlling and coordinating motor skills as well as in the learning of motor skills. The next presentation by Tseng and Konczak describes the lasting impact of his work by showing how the motor skill assessment instruments Sugden jointly developed with colleagues in the UK helped to establish a link between the proprioceptive dysfunction and observable motor deficits in children with Developmental Coordination Disorder. Zwicker concludes the symposium by highlighting how David left a legacy for clinicians and researchers who work with children with DCD.

David Sugden: Recognizing the Need for Objective Measures of Motor Skill Assessment
Michael G. Wade, University of Minnesota

During his academic career, the late David Sugden made important contributions to the study of children labelled as ‘atypical’. This presentation provides a historical perspective of his research activity, his role in developing assessment instruments such as the Movement Assessment Battery for Children, and his translational activity in making available to educational professionals ideas and programmatic insights in both educating and improving the lives of young children who have a range of movement difficulties.

David Sugden: On Understanding the Underlying Processes of Motor Skill Development
Jill Whitall, University of Maryland; Jane E. Clark, University of Maryland

David Sugden is best known for his work on children with special needs, especially those with Developmental Coordination Disorder. But he also made significant contributions to our understanding of the underlying processes of motor skill development. While much of the early research in motor development was descriptive in the (Clark & Whitall, 1987), Sugden and other moved the attention from “what” developed to the “why” and “how” of development. In 1980, he published two papers, one on developmental strategies in motor and visual short-term memory and one on movement speed in young children. In 1985, he and Jack Keogh wrote a seminal text, “Movement Skill Development.” This work marked the start of what would continue to be Sugden’s significant efforts on the underlying mechanisms of motor development both in typically developing children as well as those with movement difficulties. Not surprisingly, Sugden extended his efforts to intervention strategies and assessment instruments that probed motor learning and control processes.

David Sugden: Are Proprioceptive Deficits an Underlying Feature of Developmental Coordination Disorder?
Yu-ting Tseng, National Tsing Hua University; Jürgen Konczak, University of Minnesota

Developmental Coordination Disorder (DCD) is a neurodevelopmental disorder characterized by impairments in movement coordination that become manifest when executing fine motor skills or as balance and locomotor problems. There has been a long-standing debate, as to whether the motor problems observed in DCD are due to impaired processing of proprioceptive signals necessary for motor control. Until recently, the available evidence was inconclusive partly because the notion of impaired proprioception was implied indirectly from results of sensorimotor tests, not somatosensory tests. We here report on a series of recent studies from our group that used established methods of sensory psychophysics to determine abnormal upper limb position sense and haptic perception in twenty children with DCD and corresponding samples of typically developing children and healthy young adults. The results show unequivocally that DCD is associated with proprioceptive and haptic dysfunction. Using the Movement ABC as an easily obtainable motor measure helped us to correlate the degree of motor deficit with the extent of the observable proprioceptive deficit in our sample of children with DCD.

David Sugden: Leaving a Legacy for Clinicians and Researchers Who Work With Children With DCD
Jill G. Zwicker, University of British Columbia

One of the pivotal moments for research in DCD came after an international DCD meeting in Banff in 1995, when it was agreed that developmental coordination disorder, or DCD, would be the preferred term to describe children who have difficulty with motor coordination and motor learning that significantly affects their daily function. Being a key person in this forward movement in the field, David subsequently authored guidelines for assessment and intervention following the Leeds Consensus meeting of international colleagues in 2006. These hallmarks were the beginning of increasing awareness of the disorder and bringing together colleagues to publish international clinical guidelines for the management of DCD in 2012 and again in 2019. Despite these efforts, DCD remains under-recognized, under-diagnosed, and under-treated. To bridge this gap, Zwicker is conducting a program of research designed to facilitate diagnosis, identify and treat children at risk of DCD in their early years, increase awareness of how DCD affects participation and quality of life, explore brain differences in children with DCD, and determine how rehabilitation intervention changes the brain and functional outcomes of children with DCD. This presentation will highlight findings from this body of work and outline clinical implications and future research directions to build on David’s legacy.

Motor Development Symposium
A Critical Analysis of Fidelity Within the Motor Skill Intervention Literature: Implications for Future Research
Jacqueline D. Goodway, The Ohio State University; Danielle Wadsworth, Auburn University

A key criteria of methodological quality in any intervention is the issue of intervention fidelity (IF). Fidelity refers to the extent to which the
Intervention fidelity (IF) has historically been poorly enacted in the motor skills intervention (MSI) literature and raises the risk of type 1 and 2 errors. However, without appropriate evaluation of IF it is not possible to determine if lack of intervention effects are due to poorly conceptualized interventions or inappropriate implementation that does not follow intervention protocols. Across the education and health literatures there is considerable variability in the conceptualization and measurement of IF, but these literatures are much more sophisticated in their understanding and measurement of IF. This presentation will draw from health and education to identify the core constructs and conceptual frameworks of IF linking these concepts to the MSI literature. IF refers to the extent to which the intervention was delivered as designed by end users in authentic contexts. Usability and feasibility refer to the willingness and ability of the end user to learn and be able to implement the intervention effectively and efficiently within the constraints of the natural context. First we will synthesize a number of fidelity frameworks in the educational literature (Durlak & DuPre, 2008; Durlak, 2010; Dusenbury et al., 2003; Warren, Fey & Yoder, 2007) defining and providing examples of the core constructs of: 1) dose, 2) adherence, 3) exposure, 4) quality of delivery, 5) participant responsiveness, and 6) program differentiation. Second we will summarize the NIH Behavior Change Consortium Treatment Fidelity Workgroup recommendations in 5 key areas applying these recommendations to the MSI literature: 1) treatment design and alignment with theory, 2) standardizing interventionist training and documenting training outcomes, 3) monitoring intervention delivery to the intervention core principles, 4) receipt of the intervention by evaluating participants’ understanding of information provided, and 5) enactment of the intervention ensuring that participants use the skills taught. We will conclude with recommendations for IF in future research in the MSI literature.

Exploring Core Constructs and Conceptual Frameworks for Motor Skill Intervention Fidelity: Lessons Learned From Other Literatures

Jacqueline D. Goodway, The Ohio State University; Danielle Wadsworth, Auburn University; Ali Brian, University of South Carolina; Sarah Wall, Eastern New Mexico University

Intervention fidelity (IF) refers to methodological strategies used to monitor and enhance the reliability and validity of behavioral interventions. This should occur in the design, implementation and assessment of interventions, however, fidelity is often neglected in the dissemination of intervention findings. Over the past several years we have examined multiple methods to assess our IF. The purpose of this presentation is to describe our IF measures and discuss the pros of cons of using such measures. Method: We will describe two mastery motivational climate (MMC) interventions targeting preschool children who reside in a rural impoverished area. We utilized multiple strategies in the design, implementation and assessment of the interventions to ensure IF between and within our interventions. The interventions were designed to 1) ensure the same treatment dose within conditions by providing the same duration and frequency of intervention, 2) ensure equivalent dose across conditions and standardize training though multiple strategies including ensuring that teachers meet a priori performance criteria, ensuring providers train together, and using the same teachers for the duration of the intervention. During the interventions to ensure treatment fidelity we measured adherence to treatment protocol through observation and video assessments and reduced differences within treatment through observations and video assessments. Results and discussion: Overall, we have found that our interventions meet TARGET structures over 96% of the time. Furthermore, we have been able to identify key differences in TARGET structures that are different between MMCs and free play. We have also identified that the focus of our interventions directly effects participants’ outcomes. However, we are deficient in ensuring participant comprehension and ability to perform all behavioral skills. Furthermore, we have not been able to discriminate for intervention time within treatments due to absences and/or classes arriving late or leaving early.

Determining the Fidelity of Mastery Climate Motor Skill Intervention for Children With Delays

Nadia Cristina Valentini, Universidade Federal do Rio Grande do Sul

Background: Determining the fidelity of an intervention is a crucial methodologic requirement of any sound prevention or compensatory program. The purpose of this study was to provide an overview of the procedures and results adopted for systematically assessing the fidelity of the Mastery Climate motor skill intervention implemented by experts in Brazil. Method: Several strategies were taken to ensure Mastery Climate fidelity regarding the conceptual model, teachers’ training, and supervision of the intervention and adherence to protocols. Results and Discussion: (1) a clear description of the theoretical model underlying the mastery climate intervention was achieved through 45-60 hours training (presentations, seminars, assigned readings) using the TARGET structure (Task, Authority, Recognition, Group, Evaluation, Time); (2) teachers with experience working with the target population achieved higher indexes of children’s adherence (above 80%); (3) high assessment reliability (.80 to .100) were obtained after a minimum of 30 hours-training; (4) the intervention protocol was consistently implemented over time (12 to 24-week interventions; 2/ week; 60 minutes lesson; teacher/child ratio 1/24-32); (5) children’s exposure, measured by the time spent practicing each skill needed to be consistent to improve performance (range in minutes: run 15-45, gallop 40-120, hop 70-210, jump 70-210, leap 50-150, slide 30-90, skip 50-150 strike 50-150, bounce 50-150, catch 90-270, kick 40-120, throw 90-270, roll 40-120); (6) adherence to protocol content and process highlight the high
levels of agreement for the teacher’s behavior (Task = 96-98%; Authority 98-100%; Recognition 89-95%; Groups 88-92%; Evaluation 85-96%; Time: 98-100%); and (8) children appropriate motor engagement with success increased (from 80% to 100%) and without success decreases were observed. Conclusion: The results showed an overall consistency concerning the teachers’ intended behavior and protocol implementation for the pedagogical and theoretical foundations of a mastery climate. Funding source: This work was funded by the CAPES and CNPq.

Determining the Fidelity of a Non-Motor Expert-Led Playground-Based Motor Skill Intervention

Kara K. Palmer, University of Michigan; Katherine Q. Scott-Andrews, University of Michigan; Katherine M. Chinn, University of Michigan; Leah E. Robinson, University of Michigan

Background: The purpose of this study was to determine the fidelity of a high-autonomy, playground-based motor skill intervention implemented by a non-motor expert. Methods: Preschoolers completed a 1350-min high-autonomy, playground-based motor skill intervention that was integrated during recess on the playground at a single-preschool center. Each day, the children received a skill demonstration of 3-4 motor skills with accompanying equipment and had the option to engage in motor skill stations added to the playground. Intervention sessions were implemented by a non-motor expert who had 6-hours of training prior to the intervention by an expert in pediatric motor development. The non-motor expert completed a daily fidelity check, and the motor-expert completed a secondary check to assess agreement in 25% of sessions. The checks included alignment with pedagogical strategies and intervention schedule, photographic documentation of skill station set-up, and observation of children’s and teachers’ behaviors. Results: The non-motor expert and motor expert had >90% agreement on days where both measured fidelity. Photographs supported that 100% of the motor skill stations were set up correctly. The intervention followed the lesson plan in 93.2% of the sessions. Children used the stations for skill practice during 74.6% of the sessions and used the equipment for activities other than skill practice in 89.8% of the sessions. Teachers provided unsolicited skill instruction in 33.9% of sessions. Discussion: The fidelity checks show that the non-motor expert was able to implement the playground-based motor skill intervention, intervention design/stations were set up correctly, and children participated in the intervention. Fidelity checks were limited in that the primary implementer of the intervention completed the checks. Strengths of the fidelity checks included daily photographs to objectively document intervention set-up and using a secondary rater in 25% of intervention sessions. Additional review and recommendations for assessing fidelity will be discussed. Funding source: Rackham Graduate School Post-Candidacy Research Award, University of Michigan.
Free Communications: Verbal and Posters

Motor Development Abstracts

Associations Between Tests of Motor Competence and a Military Fitness Test

T. Cade Abrams, University of South Carolina; Bryan Terlizzi, University of South Carolina; David F. Stodden, University of South Carolina; Amy F. Hand, University of South Carolina; Giovanna Leone, The Citadel; Kyle Silvey, Neuro Force One Inc.; Ryan S. Sacko, The Citadel

Secular decline in physical fitness (i.e., cardiovascular, muscular strength and endurance) have been identified as risk factors of future US physical military readiness (PMR). The development of motor competence (MC) during childhood and adolescence is an important underlying factor impacting physical fitness into adulthood. The purpose of this study is to investigate the relationship between MC and PMR in young adults. Participants from two colleges in the southeastern US (N=91; f = 22; Mage = 18.9±2.04 years) enrolled in Reserve Officers’ Training Corps completed the US Army Combat Fitness Test (ACFT) (hex-bar deadlift, sprint-drag-carry, push-ups, standing power throw, leg tuck, two-mile run). Participants’ scores for each subtest were summed to create a non-gender specific PMR composite score based on US Army 2020 point values. Participants were also assessed on eight tests of MC including locomotor – standing long jump, vertical jump, hopping speed; object manipulation – throwing speed, kicking speed, throw-catch task; and total body coordination and balance – walking backwards on balance beams [WBBB] and supine-to-stand time, with raw scores used for data analysis. Pearson correlations were used to determine associations between the eight MC scores and composite ACFT scores. Significance was assessed at p <.05. Statistically significant correlations between MC raw scores and ACFT composite scores were: standing long jump, r = .74; vertical jump, r = .74; hopping speed, r = .47; throwing speed, r = .62; kicking speed, r = .53; throw-catch task, r = .45; WBBB, r = .22; supine-to-stand time, r = -.32. Locomotor and object manipulation MC skills demonstrated moderate to strong associations to PMR, as assessed by the composite ACFT scores, while lower correlations were demonstrated with MC tests of total body coordination and balance. These data indicate MC developed across childhood and adolescence into young adulthood, may provide a strong foundation of physical fitness and PMR for future generations of the military.

Adapting to COVID-19 Constraints: Assessing Motor Development in a Virtual Research Setting

Maria J. Ayoub, Boston University; Laura Keegan, Boston University; Simone V. Gill, Boston University

With the onset of the COVID-19 pandemic and consequential cessation of in-person data collection, motor development researchers have faced a multitude of challenges in collecting kinematic, spatiotemporal, and behavioral data, particularly within clinical populations. These circumstances have required the reconsideration of how motor development studies can be reimagined within a virtual research setting, without the need for in-person visits and motion analysis equipment. This presentation will discuss how a project within a large funded center grant, with the aim of assessing gross motor control in minimally verbal children with Autism Spectrum Disorder, was restructured to allow for remote, virtual data collection. The project was reimagined in a way that continued to meet overall grant aims and quantify many of the original constructs of interest. The original study involved assessing spatiotemporal gait parameters and gait kinematics during flat ground walking and obstacle negotiation via the Zeno Walkway and MotionNode inertial measurement units. To recreate these tasks in a format suitable for Zoom Video Communications™, we removed the aspects requiring IMUs and obstacles, and had participants walk back and forth along a premeasured space in their home. Parents were able to assist in experimental set-up and administration by viewing a training video explaining the tasks and laptop setup beforehand, and measured the walking space with a measuring tape we provided in the mail. The convenience of collecting data at home with minimal equipment also permitted parents to easily arrange sessions around their family schedules. In addition to these advantages, virtual data collection has allowed us to rediscover the qualitative and quantitative value of quantifying movement via Datavvy video coding. This updated methodology has supported the continued collection of valuable movement data while minimizing COVID-19 risk among researchers and participants, and may have positive implications for conducting virtual motor development research in the post-COVID-19 era. Funding source: National Institutes of Health.

A Systematic Review of Longitudinal and Experimental Evidence Providing New Insight for Motor Competence and Health

Lisa M. Barnett, Deakin University; Elizabeth K. Webster, Augusta University; Ryan M. Hulteen, Louisiana State University; An De Meester, University of South Carolina; Nadia C. Valentiní, Universidade Federal do Rio Grande do Sul; Mathieu Lenior, Ghent University; Caterina Pesce, University of Rome “Foro Italico”; Nancy Getchell, University of Delaware; Vitor P. Lopes, Instituto Politécnico de Bragança; Leah Robinson, University of Michigan; Ali Brian, University of South Carolina; Luis P. Rodrigues, Escola Superior Desporto e Lazer, Instituto Politécnico de Viana do Castelo

In 2008, a conceptual model explaining the role of motor competence (MC) on children’s physical activity (PA), health-related fitness, weight status and perceived MC was published by Stodden et al. The purpose of this review is to systematically compile mediation, longitudinal and experimental evidence in support of this model. Searches were undertaken for each pathway of interest using six relevant databases. Potential articles were identified through abstract and title checking (N = 585), then screened (n = 152), with 43 articles identified for extraction. Studies needed to: be original, peer-reviewed, include typically developing children and adolescents first assessed between 2 and 18 years and objective assessment of gross MC and at least one other model variable. Strength of evidence was calculated for each pathway in both directions by dividing the proportion of studies indicating a significantly positive pathway in the hypothesized direction by the total amount of studies investigating that pathway. Classifications were: no evidence (0–33 %), indeterminate/inconsistent (34–59 %), or a positive “+” or negative “−” association (≥ 60 %). The latter category was classified as strong evidence (i.e., ++ or −−) when four or more studies found an association. If the total number of studies in a domain of interest were three or less, this was considered insufficient evidence. There was strong evidence in both directions for a negative association between MC and weight status. There was indeterminate evidence between MC and fitness and indeterminate evidence from MC to PA and no evidence for the reverse. There was insufficient evidence for the MC to perceived MC pathway. There was strong positive evidence for the fitness-mediated pathway in both directions. There was indeterminate evidence for the perceived MC-mediated pathway from PA to MC and no evidence for the reverse. To test the whole model, the field needs robust longitudinal studies with multiple time
points, including all variables in the model and accounting for confounding factors. Funding source: N.C.V is supported by the Coordination for the Improvement of Higher Education Personnel – CAPES- Print Brazil. V.P.L is supported by national funding through the Portuguese Foundation for Science and Technology, I.P., under project UID04045/2020 L.P.R is partially supported by the Portuguese Foundation for Science and Technology, I.P. under Project UID/DTP/04045/2019.

Reliability of the PL-C Quest, A Scale Designed to Assess Children's Perceived Physical Literacy
Lisa M. Barnett, Deakin University; Emiliano Mazzoli, Deakin University; Natalie Lander, Deakin University; Jo Salmon, Deakin University

In young children positive physical self-perceptions are important to physical activity, yet comprehensive measurement of perceived physical literacy is lacking. The Physical Literacy in Children Questionnaire (PL-C Quest) was developed by Sport Australia to assess children’s perceived physical literacy. Pictorial items are based on the Australian Physical Literacy Framework and assess 30 elements within four domains (physical – 12 items, psychological – 7 items, social – 4 items and cognitive – 7 items). The PL-C Quest was previously tested with children to ensure the cartoon character appealed and that constructs were understood. The next step is to understand scale measurement properties. Australian parents and children were recruited in 2020 via social media to conduct reliability analyses. Parents completed demographic details and children completed the PL-C Quest online on two occasions. Respondents resided in all seven Australian states and territories. Parents were mostly University educated (n = 52, 86.7%) and spoke English at home (n = 55, 91.7%). Sixty children (51.7% girls, n = 31, 48.3% boys, n = 29) from 6.9 to 12.4 years (Mean = 9.7 years, SD = 1.5) completed the survey twice 15.8 days apart (SD = 3.2). Most children (n = 52, 86.7%) completed the PL-C Quest in less than 20 minutes (Median Test1(T1)=11.5 and Test2(T2)=7.7 minutes). Test-retest values (mixed two way models for consistency) for the complete scale were good (ICC = 0.83) and values for each domain ranged from adequate to good [social: ICC = 0.67, cognitive: ICC= 0.74, psychological: ICC = 0.77 and physical: ICC = 0.80]. Internal consistency (polyachoric alphas) was adequate to good for three domains [cognitive:T1=0.60, T2=0.71; social: T1=0.63, T2=0.70; physical:T1=0.76, T2 =0.83] and lower for the psychological domain (T1=0.53, T2=0.47). Overall, results indicate the PL-C Quest is reliable to assess children’s perceived physical literacy, but further investigation is needed in diverse and larger samples into validity of the questionnaire structure. Funding source: Deakin University.

Gait Dynamic Stability in Children With and Without Down Syndrome When Walking at a Fast Speed and With Ankle Load
Matthew Beerse, University of Dayton; Tasnuva Alam, Georgia State University; Kaylee Larsen, University of Dayton; Jianhua Wu, Georgia State University

The gait pattern of children with Down syndrome (DS) is often characterized as lack of stability due to their shorter step lengths and wider step widths. It is likely that this spatiotemporal pattern accommodates the larger excursions of their center of mass (COM) which has been found in walking and static standing. To assess this compensation, we aimed to determine whether children with DS walked with similar magnitudes of stability (MOS) compared to their typically developing (TD) peers and whether they were able to modify their stability when challenged to walk faster and with ankle load. Twelve children with DS (10M/2F, 8.80 (1.23) years) and 12 age- and sex-matched TD children participated in the study. A custom full-body marker set was attached to each subject and kinematic data were captured using a Vicon motion capture system. Subjects walked at their preferred walking speed and as fast as possible, as well as with and without ankle load equal to 2% of their body mass. Presentation of conditions was randomized across subjects. MOS was calculated as the difference between the projected position of the COM (sum of COM position and velocity normalized by pendulum length) and the base of support. We evaluated MOS at heel-strike and mid-swing, in both the anterior/posterior (AP) and mediolateral (ML) directions. MOS was normalized by body height. A three-way (2 group x 2 speeds x 2 loads) repeated measures ANOVA was performed. Our results showed that children with DS walked with a similar MOS in the AP direction as TD peers and were able to increase MOS while walking at a faster speed. However, in the ML direction, children with DS produced greater MOS than TD peers at heel-strike and mid-swing suggesting a less stable gait pattern. This result might suggest that their compensation of increased step width does not fully accommodate their increased COM movement in the ML direction. Neither ankle load nor fast walking speed influenced this decreased stability, with ankle load possibly further decreasing ML stability in both groups.

SKIPping With PALS: A Hybrid Parent-Led Motor Skill and Physical Activity Intervention for Rural Preschoolers
Ali Brian, University of South Carolina; Sally Miedema, University of South Carolina; Benjamin Miedema, University of South Carolina; Stephen Griffin, University of South Carolina; Alexandra Stribing, University of South Carolina; MacKenzie Walker, University of South Carolina; Chandler Casner, University of South Carolina; Nalda Wainwright, University of Wales Trinity Saint David; Danielle Wadsworth, Auburn University; Jacqueline Goodway, The Ohio State University

The purpose of this study was to explore the effects of a physical activity and motor skill intervention led by parents with their preschool-aged children from rural, socio-economically disadvantaged settings. Preschoolers (N = 104; M age = 48.30 months, SD = 6.90; Boys = 53, Girls = 51) participated in the SKIPping with PALS intervention program (shortened to six months due to COVID-19). The intervention consisted of two parts: 1) parents attending a monthly meeting and 2) parents delivering the program to their children each week with support from a website. Children wore Movband4 wearables for seven days in October (n = 77) and also for six weeks (n = 104, 90, 85, 87, 77, and 56 for each week respectively, 24/7 wear time) in February and March of 2020. Children completed the Test of Gross Motor Development-3 (n = 73) in the fall of 2019 and again in the fall of 2020 (serving as retention data). We were unable to complete an immediate motor skill posttest due to COVID-19. During Feb/March, physical activity behaviors consistently increased each week with a range of 750-2,000 steps per day, per week, with girls showing greater improvements than boys (p <.05, d = .56). Children whose parents attended 4-6 intervention sessions showed significantly greater (p <.001, d = .23) physical activity improvement across six weeks, than those who attended 3 sessions or less. TGMD-3 scores significantly improved from 2019-2020 (p <.001; h² = .33) with no differential effects for attendance or sex (p >.05). Recruiting and keeping parents involved in a year-long program is a challenge, especially in rural and/or social-economically disadvantaged areas. However, when parents attend meetings and utilize access to resources that support motor skill development and physical activity behavior at home, their children can improve their physical activity behaviors and motor skills. Funding source: The Duke Endowment.

Movement Behavior Compositions and Associations With Mental Health Indicators in Young Children With and Without Developmental Coordination Disorder
Denver Brown, McMaster University; Matthew Kwan, Brock University; John Cairney, University of Queensland
To date, little research has investigated the movement behaviors of children with Developmental Coordination Disorder (DCD). Movement behaviors have been found to be important correlates of health for children, and may be particularly important for children with DCD who often experience greater mental health problems beginning later in childhood. The purpose of the current study was to: 1) examine whether differences in movement behavior compositions (i.e., sedentary behavior, light physical activity, moderate-to-vigorous activity) exist between young children with and without DCD; and 2) investigate associations between movement behavior compositions and mental health indicators. This cross-sectional study used the baseline cohort data from the Coordination and Activity Tracking in CHildren (CATCH) study. A total of 514 young children (M_{age}= 4.95 ± 0.59 years; 57% boys) were included in this analysis, of which 236 were classified as at risk for DCD based on scoring ≥16th percentile on the Movement Assessment Battery for Children – Second Edition. Movement behaviors were measured using accelerometers and parents completed the Child Behavior Checklist to assess their child’s mental health. Compositional data analysis techniques were used. After adjusting for potential confounders, the results demonstrated similar movement behavior compositions among children with and without DCD, F(2,504)=1.22, p=0.29. Findings also failed to reveal associations between each movement behavior and mental health problems (depression, anxiety, autism, ADHD, oppositional defiant disorder) for children with and without DCD (all ps > 0.05). Findings are consistent with emerging evidence demonstrating similar patterns of physical activity and sedentary behaviors among young children with and without DCD. Although movement behaviors explained little variance in mental health during this period, future research should investigate when movement behavior compositions diverge, and how these changes may impact the mental health of those with and without DCD later in childhood. Funding source: CIHR.

**Implementation and Qualitative Analysis of a Virtual Adapted Group Fitness Program for Adults With Developmental Disabilities**

**Danielle Carabello, Auburn University; Mary Grayson Nix, Auburn University; Fuller Musselwhite, Auburn University; Ivan Glovotov, Auburn University; Melissa Pangelinan, Auburn University**

The COVID-19 pandemic was a significant barrier to physical activity for individuals with developmental disabilities (Turk et al., 2020). In the midst of COVID-19 in the United States, 89% of individuals lost access to prior recreation services, among other healthcare and behavioral services (e.g., speech therapy physical therapy, academics). While telemedicine was available to provide healthcare services, only 6.5% of recreation services were accessible via video (Jeste et al., 2020). To address this service delivery gap, the present study evaluated the implementation of a virtual adapted group fitness program conducted twice a week for 10 weeks with adults ages 18-65 with developmental disabilities (N = 48). Prior to the start of the program, personal trainers were provided additional training on exercise prescription and behavioral supports for adults with developmental disabilities. Participants were provided two resistance bands and a binder with visual supports and verbal cues for each exercise. Each session consisted of warm-up, upper body exercises, lower body exercises, trunk exercises, and a cool-down led by the personal trainers on Zoom. To examine the efficacy of the virtual format, undergraduate research assistants annotated participant behavior during sessions. Over the 10 weeks, 1929 behavioral annotations were made with respect to the following key behaviors: participant exhibited on-task behavior (N = 334), participant exhibited off-task behavior (N = 143), participant performed lower-intensity modifications (N = 225), participants required assistance to perform the exercise (N = 271), participants performed higher intensity modifications (N = 110), exercises were performed with correct mechanics (N = 611), participants required extrinsic motivation (N = 71), and participants exhibited enjoyment or intrinsic motivation (N = 164). Overall, these observations support that a virtual adapted group fitness program is appropriate and useful to enable adults with developmental disabilities to engage in physical activity and structured exercise.

**Effect of Task Constraints on Children’s Reaching Kinematics Using Virtual Reality**

**Yuping Chen, Georgia State University; Ansley Austin, Georgia State University; Sarah Blanchard, Georgia State University; Kyle Shumeyko, Georgia State University; Miriah Smith, Georgia State University; Tony Trac, Georgia State University; Jin Xu, Georgia Institute of Technology; De’Aira Bryant, Georgia Institute of Technology; Ayanna Howard, Georgia Institute of Technology**

Object size and instructed task goal are well-accepted constraints that influence reaching kinematics in adults. However, it is unclear if these task constraints affect reaching kinematics in children using virtual reality (VR). The purpose of this study is to examine the effects of these task constraints in VR for children aged 6-12 years. Twenty-one healthy children (10f, 11m; avg. 9.19 years) took part in this study and were blinded to its purpose. A VR bubble popping game (SuperPop VR”) was used to analyze all participants’ real-time reaching kinematics (movement time and units, speed, ROM, and straightness). The children performed a total of 24 trials: 3 trials each on their dominant hand and non-dominant hand in four conditions – bubble size (small and large bubble size) and instructed goal (comfortable pace and a fast pace). A repeated ANOVA was run for bubble size and instructed goal. Dominant hand reaches for large bubbles were faster (p<0.01), had straighter trajectories (p<0.05), had greater elbow ROM (p<0.05), and were less jerky (p<0.01). The large bubble condition showed a difference in speed between the two instructed goal conditions; instructions to reach fast yielded a faster speed (p<0.05). The small bubble condition showed no difference in speed between the comfortable and fast pace. In the comfortable condition there was no difference in speed for bubble size. When looking at the fast paced condition, large bubbles were reached for faster (p<0.01). Non-dominant hand reaches for large bubbles were faster (p<0.01), had straighter trajectories (p<0.05), and were less jerky (p<0.01). The elbow ROM for small bubbles was greater for the fast condition than for the comfortable condition (p<0.05). For the large bubble condition, the elbow ROM was greater for the comfortable condition than for the fast condition (p<0.05). In the fast paced condition, the elbow ROM was greater for small bubbles than for large bubbles (p<0.01). Our results indicate that bubble size and task goal do have an influence on children’s reaching kinematics in a virtual reality setting.

**Constant and Dynamic Bimanual Isometric Force Production in Individuals With Parkinson’s Disease**

**Madison M. Davis, Texas A&M University; Yisu Wang, Texas A&M University; Deanna M. Kennedy, Texas A&M University**

Recent research has indicated that individuals with PD may have difficulty inhibiting or compensating for neural crosstalk that is dispatched to homologous muscles in the contralateral limb during asymmetric bimanual coordination tasks. The current experiment was designed to determine the level of interference observed from the forces generated in one effector on the forces exhibited by the contralateral effector during an asymmetric bimanual isometric force production task. Ten participants with PD (mean age = 70.3) and 10 healthy aged-matched control (mean age = 70.8) participants were required to produce a dynamic pattern of force with either the dominant or non-dominant index finger while the contralateral effector produced a constant force. Each trial was 20 s and visual feedback was removed from the effector producing the constant force after 10 s. Mean force and root mean square error (RMSE) of force were used to evaluate accuracy and stability of each effector independently. Time series cross correlations between each effector were calculated to determine the influences of the forces generated in one limb on the forces produced by the contralateral limb. As expected, the
mean force and RMSE was greater for PD than healthy controls. Results also indicated positive time series cross correlations for the control group and the PD group when visual feedback was removed from the unaffected effector. Positive time series cross correlations indicate that as forces increased and decreased in one limb similar increases and decreases occur in the contralateral limb. However, for the PD group, when visual feedback was removed from the affected limb less interference was observed in the contralateral effector. These results suggest that the left and right limbs are tightly coupled in older adults, whereas individuals with PD may be controlling their limbs more independently.

Non-Linear Analysis of Full Day Leg Movement Between Infants With Typical Development and Infants at Risk of Developmental Disabilities

Weiying Deng, University of Southern California; Vivien Marmelat, University of Nebraska at Omaha; Beth Smith, University of Southern California

Recording full day movement behavior using wearable sensors has given researchers the ability to monitor the development of infant motor control in the home environment. Non-linear analysis of infant movement has shown promising results identifying differences between infants with typical development (TD) and infants at risk of developmental disabilities (AR). However, previous literature only explored infant movement variability within a short lab session. We aim to explore infant leg movement’s non-linear variability across a full day in home environment. Data from 11 infants with TD (age: 2-10 months) and 9 infants AR (adjusted age: 2-14 months) were included. Infants wore a sensor on each ankle during the daytime for 5-14 days. We chose the first 2 days’ data that had over 8 hours of awake time and assessed the correlation between left and right legs’ sample entropy (SampEn) value for acceleration and angular velocity within each group using Spearman correlation coefficient. The average of the chosen 2 days’ data was used to compare the SampEn for each variable between the AR and TD groups using Wilcoxon signed rank test. The SampEn were highly correlated between left and right legs within TD group for both acceleration (r = 0.86, p<0.01) and angular velocity (r = 0.99, p<0.01). The AR group only showed significant correlation for acceleration (r = 0.60, p = 0.01), but no significant correlation for acceleration (ρ = 0.06). SampEn for right leg angular velocity was lower (ρ = 0.04) in the AR group (mean = 0.098 ± 0.027) than the TD group (mean = 0.133 ± 0.056). The preliminary non-linear analysis of full day in home data suggests that infants AR may have distinct movement behavior between two legs and lower SampEn (more non-linear analysis of full day in home data suggests that infants AR may have lower SampEn for angular velocity between left and right legs (r = 0.60, ρ = 0.01), but no significant correlation for acceleration (ρ = 0.06). SampEn for right leg angular velocity was lower (ρ = 0.04) in the AR group (mean = 0.098 ± 0.027) than the TD group (mean = 0.133 ± 0.056). The preliminary non-linear analysis of full day in home data suggests that infants AR may have distinct movement behavior between two legs and lower SampEn (more non-repeatability) compared to infants with typical development. This information could be helpful for early diagnosis of developmental disabilities in the future. Funding source: CAL-PT FUND; American Physical Therapy Association Academy of Pediatric Physical Therapy.

Effect of Whole-Body Vibration on Knee Joint Kinematics in Children With Down Syndrome: A Series of Case Studies

Diego Ferreira, Lebanon Valley College; Robert Zeid, Georgia State University; Jianhua Wu, Georgia State University

The Wartenberg pendulum test has been used previously to demonstrate that individuals with Down syndrome (DS) have increased passive stiffness to compensate for their low muscle tone compared to their typically developing counterparts. This increased passive stiffness can lead to decreased joint range of motion and limit motor abilities. Whole-body vibration (WBV) has been used previously to elicit motor benefits and improve muscle performance in various populations, including DS. However, to our knowledge, there has been no study investigating the effect of WBV on passive stiffness in the DS population. Therefore, the purpose of this study was to determine if a single WBV session can decrease passive stiffness in children with DS. Four children (3.1F/1M, 11.08±2.8 years) participated in this study. The WBV protocol included standing on a side alternating WBV platform for 10 bouts of 30 seconds, with 1 minute of rest between bouts. The frequency and amplitude of the vibration was set to 25 Hz and 2 mm, respectively. Subjects completed 5 trials of the pendulum test in a reclined position (a 45-degree angle before and immediately after WBV. A motion capture system was used to collect kinematic data of the knee joint. Calculated variables included: a relaxation index (RI), number of leg swings, peak velocity and acceleration as well as duration of the lower leg during the first flexion excursion. Two children completed only 5 bouts of WBV due to skin sensitivity to the vibration. These two subjects demonstrated visible improvements in the RI score and peak velocity of the lower leg during the first flexion excursion following WBV. The other two subjects completed all 10 bouts. One subject demonstrated a slight improvement in the RI score, but the remaining subject had a decreased RI score and fewer and slower leg swings after vibration. Our preliminary results demonstrate that WBV may have potential to reduce passive stiffness in the DS population. More subjects will be recruited to allow for a comprehensive analysis of the currently observed trends.

Change in Motor and Cognitive Function Following Whole-Body Vibration in Children With Down Syndrome: A Series of Case Studies

Diego Ferreira, Lebanon Valley College; Gena Priest, Georgia State University; Haneol Kim, Georgia State University; Jianhua Wu, Georgia State University

When a child develops, gross motor milestones include sitting, crawling, standing, and eventually walking. When a child has a diagnosis such as Down syndrome (DS) they experience the challenges of low muscle tone which often results in inadequate strength to sit, stand, crawl and walk at similar ages as their peers without DS, and walk, on average, one to two years later than their typical peers. This case study researched whether using a specialized chair would accelerate standing and stepping behavior in a child with Down syndrome over 10 months of both physical therapy and home chair practice. The specially designed chair promoted proper posture and allowed for femur contact, feet flat on the floor, and equal weight-bearing of both hips. The chair was used to systematically practice phases, including pulling up to stand, reaching and grasping while standing, stepping while holding onto a T-bar, and eventually stepping without help. The participant practiced five days a week with their parent, performing 15 reps each day, progressing through the learning of each phase. The physical therapist assessed the child every 3 months using the Gross Motor Functional Measurement (GMFM-88) and the Early Intervention Developmental Profile (EIDP). The scores on the GMFM-88 for our participant increased from 65 to 191 across the intervention period. The participant was observed to progress from sitting (8 months), to standing (15 months), to stepping (16 months), and then walking (16-17 months old). The GMFM-88 score from the pre-test assessment was 65 which fell in the range for mild-moderate impairment. After 7 months of working with the chair and therapist, our participant scored a 170 on the GMFM-88 showing large gains in the sitting and standing categories. The final assessment showed the largest gains in the walking category. These values when compared to existing norms were accelerated for DS and by the end of the intervention were closer to matching their typical peers. A larger study is now being conducted using a variety of children and therapists.
Whole-body vibration (WBV) has been used to elicit health benefits in individuals with Down syndrome (DS). Several studies have demonstrated the benefits of long-term WBV interventions on body composition and one study indicated improvement in motor performance. However, the quality of movement has not been reported nor the potential impact of WBV intervention on cognitive function in individuals with DS. Therefore, the purpose of this study was to evaluate the acute effects of a single WBV session on the motor and cognitive domains in children with DS. Vibration was administered using a side-alternating WBV platform, set to 25 Hz, 2 mm. Subjects were asked to stand on the platform for 10 bouts of 30 seconds, with 1 minute of rest between bouts. A stair ascent task and a timed up-and-go (TUG) task were administered for motor assessment and a flanker test was conducted using the NIH Toolbox Cognitive Battery for cognitive assessment before and immediately after WBV. Four children with DS (2M/2F, 11.6±2.6 years) participated in this study. Each child performed 5 trials of each motor task and 20 trials of the flanker test using fish and arrow stimuli. Two of the subjects were only able to tolerate 5 bouts of vibration due to skin sensitivity. For the flanker test, three children demonstrated a ceiling effect for the fish stimuli, but two subjects showed increases in accuracy for both stimuli after vibration. For the stair task, two children demonstrated improvements in motor strategy to complete the stair ascent task such that they did not stop at the bottom of the staircase before ascending it and not rely on their hands to ascend the staircase following vibration. For the TUG test, two children demonstrated a shorter time to complete the test following vibration due primarily to a faster turn-around phase. The preliminary results from this study indicate that WBV has potential to elicit acute benefits to the motor and cognitive domain in children with DS. More subjects will be recruited to determine if these trends will hold.

A Longitudinal Examination of the Accuracy of Perceived Physical Competence in Middle Childhood

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Evidence is emerging that the accuracy of a child’s perceived physical competence (PPC), rather than only their level of PPC, impacts participation in physical activity. Theoretically, middle childhood is a time when PPC become more accurate as children develop the cognitive capacity to interpret new sources of feedback and develop a realistic sense of their physical abilities. The purpose of this longitudinal study was to investigate the extent to which accuracy of PPC changed from grade 2 to grade 5. Participants were n=155 boys and girls (55% female; Mage = 7.7 years, SD = 4.0 months) from 8 participating elementary schools in Victoria, BC, Canada. The TGMD-2 was used to assess motor proficiency and PPC were assessed using the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (grade 2) and the Self-Perception Profile for Children (grades 3, 4, and 5). Accuracy of PPC scores were calculated for each grade by converting FMS raw scores and PPC raw scores into z-scores. Participants with accuracy z-scores in the lower quartile of the z-score frequency distribution were classified as underestimators, those in the middle 50% as average estimators, and those in the upper quartile as overestimators. Repeated measures analyses of variance with sex and grade 2 accuracy group as factors were used to determine changes in accuracy of PPC from grade 2 to grade 5. Examination of the results revealed that the majority of boys and girls had accurate self-appraisals by grade 3, and this remained stable into grades 4 and 5. For overestimators, there was a steady decrease in perceptions and a consistent improvement in motor skills, resulting in more accurate perceptions in the higher grades. The underestimators, who began in grade 2 with the highest skills and lowest perceptions relative to their peers, did not have significant decreases in perceptions or increases in motor skills across the grades as might have been expected. The lack of improvement in motor skills from grade 2 to grade 5 in this group is very concerning. Funding: SSHRC. Funding source: SSHRC.

Affordances in the Home for Young Children With and Without CHARGE Syndrome

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Affordances in the home environment are critical to early motor development. Currently, home environment has not been examined in children with severe disabilities. CHARGE syndrome is a highly variable low incidence, complex disorder. Most individuals with CHARGE syndrome experience some level of hearing loss, vision loss, and balance problems, which leads to various levels of delay in motor development. To date, it is not known if the home environment of young children with CHARGE syndrome contributes to some of their gross motor delays. Thus, the present study used the Affordances in the Home Environment for Motor Development (AHEMD; Rodrigues, 2005) to examine the relationship between home environment and motor milestones in children with and without CHARGE syndrome 18 to 42 months old. Participants included 28 parents of children with CHARGE syndrome and 32 without disabilities. Children with CHARGE syndrome achieved motor milestones significantly later (p < 0.001) and received significantly less childcare (U = 299, p = .05, r = .25) than children without disabilities. For the five factors of the AHEMD, the two samples only differed on outside space (U = 299, p = .05, r = .25), wherein parents of children without disabilities reported better outside space opportunities than parents of children with CHARGE syndrome. For children with CHARGE syndrome, age was positively correlated with variety of stimulation (r = .41, p = .039) and fine motor toys (r = .50, p = .01). Age of walking for children with CHARGE syndrome was positively correlated with outside space (r = .63, p = .038), fine motor toys (r = .70, p = .016), gross motor toys (r = .84, p = .001), and total AHEMD (r = .88, p < .001). There were no significant relationships between the AHEMD and motor milestones in children without disabilities. These findings indicate that early experiences may be more important for motor development in children with CHARGE syndrome, and parents can play a critical role in helping their children with CHARGE syndrome reach their motor milestones.

Stability in the Development of Infant Walking: Locomotor Activity and Walking Skill

Christina Hospodar, New York University; Justine Hoch, New York University; Whitney Cole, New York University; Karen Adolph, New York University

Inter- and intraindividual variability are endemic in infant motor behavior. In the development of walking, infants differ widely in both spontaneous activity and walking skill. During free play in a laboratory playroom, walking infants’ spend largely variable amounts of time in motion, and although more experienced walkers take faster, longer, and narrower steps than novice walkers, infants with the same amount of walking experience display wide variations in walking skill. We investigated longitudinal stability in locomotor activity and walking skill in 25 infants tested at 15 and 19 months of age. We recorded infants’ locomotor activity during 20 minutes of free play in a laboratory playroom and calculated infants’ time in motion. We measured infants’ step length, step width, and speed with a pressure-sensitive mat. Spontaneous locomotor activity varied widely: At 15 months, time in motion ranged from 7% to 54%, and at 19-months, from 22% to 48%. On average, infants spent more time in motion at 19 months (M = 35%) than at 15 months (M = 29%); t(23) = -2.62, p = .015. Time in motion was not correlated with walking experience at either session (p > .11). However, time in motion at 15 months was correlated with time in motion at 19 months, r = .45, p = .02. A linear regression model confirmed that time in motion at 15 months predicted.
time in motion at 19 months, $R^2_{adj} = .16, p = .028$. As expected, step length increased, step width decreased, and speed increased from 15 to 19 months ($p < .001$). Linear regression models, adjusting for months walking and height, revealed that step length at 15 months explained significant variance in step length at 19 months ($R^2_{adj} = .48, p = .006$), and speed at 15-months explained significant variance in speed at 19-months ($R^2_{adj} = .60, p < .001$); earlier step width did not explain later step width. In sum, behavior at 15 months accounted for significant variance in behavior at 19 months for both locomotor activity and walking skill, indicating stability in infants’ motor behavior over development.

Relations Between Infants’ Gait Variability and Fall Frequency

Christina Hospodar, New York University; Danyang Han, New York University; Karen Adolph, New York University

Individuals’ gait variability, the stride-to-stride variations in spatiotemporal parameters of walking, reflects patterns of gait control. In older adults, gait variability predicts falls, suggesting that sub-optimal levels of variation are associated with walking instability. But does gait variability predict falls in infancy, when gait control is still developing? We investigated the relation between gait variability and real-time falls in 64 15-month-old infants. Walking experience ranged from 0.2 to 5.5 months ($M = 3.0$ months). We measured infants’ step length, step width, and speed with a pressure-sensitive mat and calculated the coefficient of variation (CV; standard deviation divided by the mean) for each measure. We recorded infants’ locomotor activity during 10-25 minutes of free play in a laboratory playroom, video-coded infants’ falls, and calculated infants’ fall rate (number of falls divided by the total time in motion, multiplied by 60). Step length CV ranged from 6 to 22% ($M = 11%$), step width CV ranged from 10 to 48% ($M = 22%$), and speed CV ranged from 3 to 28% ($M = 12%$). Infants’ fall rate ranged from 0 to 117 ($M = 21$) falls per hour in motion; 16 infants never fell. We conducted a linear regression model with fall rate as the outcome variable (natural log transformed to account for positive skew), and walking experience, step length CV, step width CV, and speed CV as predictor variables. The model accounted for 18% of the variance in fall rate ($R^2_{adj} = .178, F(4,43) = 3.55, p = .014$). Step length CV significantly predicted fall rate ($b = .005, t(43) = 2.64, p = .011$); for every one-percent increase in step length CV, fall rate increased by 0.5%. Neither walking experience ($p = .131$), step width CV ($p = .761$), nor speed CV ($p = .659$) significantly predicted fall rate. These results suggest that relations between measures of gait variability and falls exist not only for older adults with deteriorating gait control, but also for infants with developing gait control.

Native Language Modulates Crawling and Orienting Behavior in Human Newborns

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Human newborns can discriminate rhythmically different languages and show a preference for their native language. However, the effect of listening to their native language on newborn’s general motor behavior has not been explored. Here we investigate such an effect on newborn crawling, a crucial activity for early mother-infant interaction. Our hypothesis was that native, but not foreign, language would motivate newborns to move more crawling movements and to orient their head and body more often toward the auditory stimulus. Twenty-three 2 day-old French newborns were wrapped prone on a Crawlskate® to facilitate use of their arms and legs to translocate freely on a firm pediatric mattress in any direction. Their crawling was recorded on video and via an infra-red motion capture system in two randomized two-minute conditions in which they listened to a woman speaking French (NATIVE condition) or English (FOREIGN condition) from a left or right speaker. In the NATIVE compared to the FOREIGN condition, the newborns’ crawling was enhanced, with significantly more arm and leg steps, $F(1,22) = 9.3, p = .006$, partial eta squared = 0.30, and significantly more and larger trunk rotations in the cephalo-caudal axis, $t(22) = 2.2$ and 2.5, $p = .038$, Cohen’s $d = 0.44$ and $p = .023$, Cohen’s $d = 0.50$, respectively. Importantly, the pattern of crawling was not a disorganized succession of limb movements, but a quadrupedally organized pattern of locomotion. In addition, newborns oriented their head toward the appropriate loud speaker, $t(20) = 2.4, p = .029$, Cohen’s $d = 0.93$ when hearing the NATIVE but not the FOREIGN language. An unspecified increase in arousal did not explain the findings because we found no differences in crying duration or in movements unrelated to crawling between the two conditions. These findings highlight newborns’ rich repertoire of social abilities and add to a growing body of evidence suggesting newborn crawling is a complex behavior that is open to supra spinal control. Funding source: This work was supported by the grant ANR-11-BSH2-007 01 from the Agence Nationale de la Recherche, grant from Région Ile-de-France and the Fondation de France.

Effects of Physical Activity on Social, Behavioral and Cognitive Skills in Children With Autism Spectrum Disorder

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The aim of this systematic review is to describe six exercise interventions (swimming, cycling, neuromuscular training, yoga, sports, and exergaming) utilized in school-age children ages 5-22 as a treatment for Autism Spectrum Disorder (ASD). A systematic search of peer-reviewed articles was conducted across five databases focusing on physical activity as an intervention for children with ASD. From an initial screening of 387 records, 29 of the studies were included in the review based on predetermined inclusion criteria. Analysis included types of intervention, dependent measures (social and physical effects), research design and intervention duration. All studies found that physical activity as an intervention improved aspect of physical fitness measured via endurance, strength, and balance. Interventions were also shown to improve cognition, social skills (language, eye-contact, engaging with others), and/or behavior in participants with ASD. Physical activity should continue to be studied as an intervention in ASD, and further explore the role of exercise on symptoms of ASD.

Promoting Positive Health Outcomes in an Urban Community-Based Physical Activity Intervention for Preschool Aged Children on the Autism Spectrum

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While there is wide consensus regarding the importance of early intervention for children on the autism spectrum, health is rarely considered within priorities. Factors related to fundamental motor skill (FMS) competence, health-related physical fitness (HRPF), and physical activity (PA) are important for establishing positive developmental trajectories. The purpose of this study was to examine impact of a PA intervention on FMS, HRPF, and PA in children with autism spectrum disorder (ASD). A secondary objective was to examine associations between motor behavior and ASD symptoms, including social affect and restrictive/repetitive behaviors. Twenty-five children with ASD ($M_{age} = 4.67, SD = 0.82; 72\%$ male) participated in the 12-week physical activity intervention, set in an urban community setting. Children were assessed with the Autism Diagnostic Observation Schedule – 2, Test of Gross Motor Development – 3, Brockport Physical Fitness Test, and seven days with an Actigraph.
The primary aim of this study was to reveal the effect of body-oriented training on sensorimotor functions in 7-8 years of age children with CHD. We compared the efficacy of two methods of training (body-oriented training for children vs. conventional motor exercises) in a randomized controlled pilot study. Methods: 16 children with CHD at the age of 7-8 were included and randomly assigned to training conditions according to a 2×2 cross-over design. The body-oriented training included the exercises from yoga. Children participated in 16 weeks of training. A total of 48 sessions lasting 40 minutes were performed. To assess the sensorimotor functions in children we used 4 subtests from Luria’s neuropsychological assessment battery for children (imitating hand positions, manual motor sequences, auditory-motor coordination and drawing the fence) Effects of training were analyzed by means of an ANOVA for repeated measurements. Results: The ANOVA has revealed (p<0.05) that for 3 subtests (imitating hand positions, manual motor sequences and drawing the fence) the body-oriented training was superior to the conventional motor training, with effect sizes in the medium-to-high range (0.43-0.89). Conclusions: The findings from this pilot study suggest that body-oriented training has a positive effect on sensorimotor functions in 7-8 years of age children with CHD. However, it is necessary to do further research into the impact of body-oriented training on children with congenital heart disease.

Long-Term Effect of Body-Oriented Training on Children With Attention Deficit Disorder (ADD)

Sergey Kiselev, Ural Federal University

Introduction: It is known that children with attention deficit disorder (ADD) have deficit in executive abilities. We have revealed that body-oriented training has positive effect on executive abilities in 5-7 years of age children with ADD (Kiselev, 2020). Objectives The goal of this study was to reveal long-term effect of body-oriented therapy on executive abilities in children with ADD. We compared the efficacy of two methods of treatment (body-oriented therapy for children vs. conventional motor exercises) in a randomized controlled pilot study. Methods: 16 children with ADD at the age of 5-7 years were included and randomly assigned to treatment conditions according to a 2×2 cross-over design. The body-oriented therapy included the exercises from yoga and breathing techniques. We assessed the executive abilities in these children six months after the training. To assess the executive functions and attention we used 3 subtests from NEPSY (Auditory Attention and Response Set, Visual Attention, Statute). Effects of treatment were analyzed by means of an ANOVA for repeated measurements. Results: The ANOVA has revealed (p<0.05) that for all subtests (Auditory Attention and Response Set, Visual Attention, Statute) the body-oriented therapy was superior to the conventional motor training, with effect sizes in the medium-to-high range (0.48-0.84). Conclusions: The findings from this pilot study suggest that body-oriented therapy has not only immediate but also long-term positive effect on executive abilities in 5-7 years of age children with ADD. However, it is necessary to do further research into the impact of body-oriented therapies on the prevention and treatment of ADD in children.

Sensory Integration and Postural Control in Childhood

Anastasia Kyvelidou, Creighton University; Maya Almazloum, Creighton University; Dimitrios Katsavelis, Creighton University

The Clinical Test of Sensory Interaction for Balance (CTSIB) is a simple and effective test in adults to identify and assess deficiencies in sensory integration. The test challenges each primary sensory system (somatosensory, visual, and vestibular) to identify which sensory inputs the body relies on to maintain balance. Currently, there is limited information regarding how the CTSIB in combination with force platform technology can help us identify how sensory motor integration develops in children. The purpose of this study was to capture sensory organization age-related changes in sensorimotor functions. It is important to develop the trainings to overcome this deficit in children with CHD. Objectives: The goal of this study was to reveal the effect of body-oriented training on sensory and motor integration. The test challenges each primary sensory system (somatosensory, visual, and vestibular) to identify which sensory inputs the body relies on to maintain balance. Currently, there is limited information regarding how the CTSIB in combination with force platform technology can help us identify how sensory motor integration develops in children.
Object storage is an important skill for infants to master, as it directly relates to many human abilities that develop over time. Object storage skills, such as acquisition and holding toys, were observed in infants over multiple visits. It is hypothesized that object storage and strategies for more advanced toy interaction will increase as the visits progress. Over time, it is expected that skills, such as holds and intermanual transfers, will be completed more frequently and executed with improved control by the infants. Infants were recruited at the emergence of sitting (enrollment age: M=5.6 months, range: 4.0-6.9 months) and assessed longitudinally at a baseline visit, and then 3, 6, and 12 months postbaseline. At each visit, researchers video-recorded an object storage assessment of infants, comprising 4 trials of 4 standard toys (bead, figurine, foam, shape). Each toy was presented to the infant’s midline quickly to encourage simultaneous multi-object interaction. Reliable coders scored 4 object storage actions throughout the entire trial using Datavyu: touching, holding objects, inadvertent toy loss, or directed forms of object storage (placing, intermanual transfer, throwing, placing). Preliminary descriptive analyses (n=13) demonstrate a decline in inadvertent toy losses following a hold from 48.1% at baseline to 19.7% at 12 months postbaseline. Following a hold, directed forms of storage (17.1% to 31.7%) or holding an additional toy (15.7% to 43.8%) increased from baseline to 12 months. Future analyses are expected to reveal that storage strategies will increase in complexity so that more toys can be managed by the infant. This study is important to determine how infants apply different strategies to improve object storage skills. Future implications of this study could investigate how object storage skills relate to early language abilities. [Funding: IES grant (NCT02593825)-SCD; CHOR grant (647408)-SCD,ECM; VCU Postdoc grant-ECM] Funding source: Funding: IES grant (NCT02593825)-SCD; CHOR grant (647408)-SCD,ECM; VCU Postdoc grant-ECM.

Feasibility of Home-Based Tummy Time Practice in Parent-Infant Dyads

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The pediatricians recommend “tummy time” (placing a baby on their stomach while awake) as a physical activity for non-locomotor infants. Growing evidence supports that tummy time should be a form of early physical activity to support gross motor skill achievements and healthy weight gain. However, parents often do not fully understand specific methods for fulfilling tummy time recommendations (dosage, frequency, location, or position of the body), then did not implement tummy time in the early stage of life. The study aimed to determine the realistic dosage of daily tummy time for parents and infants of various ages. A total of 11 infants (7 girls, 4 boys, start age 61.5 days) participated in the intervention. Accumulate 60 minutes of tummy time was requested throughout the day; it did not have to be performed all at once. Infants completed the intervention (achievement of sitting milestone age) at an average of 182.18 days old (151 – 208 days, SD = 19.42 days). The average duration of days (start age – sitting milestone age) was 120.63 days (32 days to 152 days). The infants’ average daily practice was 50.12 minutes (SD = 42.24). During the intervention, the percentage of completed days infants met their required dosage was an average of 46.3% (ranged 6.92% to 96.43%). The percentage of missing days infants did not practice tummy time at all was an average of 18.64% (ranged 0% to 45.75%). The percentage of days that infants did practice tummy time, but were under the required dosage was an average of 23.51% (ranged 0.00% to 81.08%). Our preliminary results indicated that most participants practiced daily tummy time activity with a high adherence rate, and no one withdraws from our protocols. Tactical strategies such as clear goal setting or practice logs were definitely supportive of pursuing daily practice with young infants. Parent(s)-infant dyads imposed to 1-hour activity but failed to meet our proposed dosage. It
was evident that the prescribed dosage of daily practice was a too ambitious goal and maybe far from realistic for non-locomotor infants.

Motor Performance of BOT-2 and MABC-2 by Children With Autism Spectrum Disorder

Ting Liu, Texas State University; Michelle Hamilton, Texas State University

Previous studies have used either BOT-2 (Bruinink-Oseretsky Test of Motor Proficiency-2) or MABC-2 (Movement Assessment Battery for Children-2) to assess motor impairments in children with autism spectrum disorder (ASD). Limited studies have measured motor competence using both assessments to compare the fundamental motor performance in children with ASD. The purpose of this study was to compare the age-related fine and gross motor performance of BOT-2 and MABC-2 by children with ASD. Twenty-nine children with ASD (ages 5-15 years, male = 25, female = 4) performed BOT-2 and MABC-2. Group differences (younger children: 5-10 years; older children: 11-15 years) on BOT-2 and MABC-2 standard scores were analyzed using MANOVA. The single samples t-test was used to examine the motor performance differences between children with ASD and their age matched peers in the normative data. Descriptive data in BOT-2 showed that 89% of the children with ASD were in the ‘below average’ and ‘well-below average’ categories. The majority of children with ASD (86%) in this study were classified in the red zone suggesting significant motor delays in MABC-2. Moreover, children performed significantly better on gross motor skills than fine motor, and older children performed better than younger children in BOT-2. No significant age-related motor delays were found in MABC-2. The findings indicated that children with ASD were delayed in their fine and gross motor skill performance when compared to the norms as measured by BOT-2 and MABC-2. The BOT-2 assessment is more sensitive in detecting age-related motor delays than MABC-2.

Systematic Review of Fisher Price Toys Designed for Children Between 6-18 Months

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The home environment provides opportunities for children to perceive and experience the world. The quality of the home environment, including the presence of gross and fine motor toys, is associated with children’s motor development. Little is known however, about the characteristics of toys marketed for children. Knowledge of toy characteristics such as the presence of lights and sounds, as well as claims toward promoting gross and fine motor skills may be an important first step in generating research questions regarding what makes a toy more likely to promote motor development. Disability representation in toy product descriptions and photos were explored and may shed light about whom toys are designed for and whether they are inclusive of varying abilities. Fisher Price was chosen as the data source for this pilot study because it is one of the most recognizable toy brands in the United States. 458 toys across the 6-12 month (n=217) and 12-18 month (n=241) age ranges were systematically reviewed from Fisher Price’s website. Duplicate toys (n=143), non-toys (i.e., booster seats; n=59), and toys that did not include the Where Development Comes into Play™ designation (n=118) were removed. A final sample of 138 toys were examined and descriptive statistics, including percentages, were calculated to describe the proportion of toys that had the following characteristics: (1) lights (62%), electronic sounds (75%), and mechanical sounds (38%). 44% and 39% of toys were gross and fine motor toys, respectively. In regard to product descriptions, 0% of gross or fine motor toys mentioned disability or included any photos of children with visible disabilities. This study provides a snapshot of toy characteristics marketed for children that generates novel research questions. For example, what is the frequency, duration, and quality of children’s interactions, including the role of parents and peers, with gross and fine motor toys that may contribute to motor development? This study highlights the exclusion of disabilities in the toy market and warrants further investigation.

Significant Improvements in Swim Skills Following 5-Days of Adapted Swim Instruction (ICanSwim)

Emily Mann, Auburn University; Lisa Ruby, ICanSwim; Melissa Pangelinan, Auburn University

Studies have reported improvement in swim skills in individuals with developmental disabilities participating in learn-to-swim programs. However, these studies typically have small samples (3-42), include participants with a limited age range (3-14 years), examine a specific disability (e.g., autism spectrum disorder, cerebral palsy), have differing program dose (4-32 hours), and use different assessments (e.g., Halliwick’s, Red Cross, Skill Check, etc.). Therefore, it is unclear what factors influence the magnitude of swim skills improvements (e.g., age, diagnosis, and the dose of practice). To address this knowledge gap, the current study evaluated the efficacy of a 5-day adapted swim program (ICanSwim) in 179 individuals with developmental disabilities (i.e., ages 3-27 years). During the program, each participant had a buddy and received instruction in groups of 5 participants. The program was run on 5 consecutive days for 75 minutes per day. Repeated-measures ANOVAs were used to examine changes in swim skills from pre- to post-test with respect to age, dose (i.e., time out of the water), and disability (ASD, CP, DS, ID). Overall, significant improvements in swim level (non-swimmer, beginner, intermediate, advanced) occurred over 5 days (main effect of time). Older participants improved their skills to a greater extent than younger participants (main effect of age). Low dose was associated with poorer swim skills, but after accounting for age, this effect was no longer significant (i.e., younger children spent more time out of the water). There were no effects of disability type or any interactions amongst factors observed. These results suggest that older children with disabilities benefit most from the iCanSwim 5-day program. Additional supports may be needed for younger children to reduce time out of the water and address behavioral needs once in the water to improve their outcomes. Future studies are required in order to determine the dose of practice needed for non-swimmers to become “swim safe.”

A Systematic Review of the Relationship Between Physical Activity and Sleep in Children With and Without Developmental Disabilities

Alice Northcutt, Auburn University; Danielle Carabello, Auburn University; Emily Mann, Auburn University; Melissa Pangelinan, Auburn University

Systematic reviews and meta-analyses have been conducted in adults suggesting a positive relationship between physical activity (PA) and sleep. However, it is unclear if children, especially those with developmental disabilities, exhibit the same relationship. The purpose of this systematic review is to address this knowledge gap. The search terms used were (child* OR youth OR teen*) AND (physical activit*) AND (sleep*) and four databases were included (PubMed (MEDLINE), Academic Search Premier, APA PsycArticles, and SPORTDiscus). A total of 350 studies underwent title and abstract review, of which 227 articles met criteria for full text review. A total of 98 articles met criteria
for data extraction and analysis. These articles included children ages 3 months to 18 years old. Fourteen studies included children with developmental disabilities. There were 93 cross-sectional studies and five interventions aimed at improving either physical activity or sleep. Physical activity was measured with accelerometers (N = 44), parent or self-report data (N = 12), surveys (N = 38), and semi-structured interviews with parents (N = 2). Sleep was measured with accelerometers (N = 34), parent or self-report data (N = 24), surveys (N = 33), and semi-structured interviews with parents (N = 1). Preliminary analyses revealed 26 of 98 studies reported a positive relationship between physical activity and sleep, three studies reported a negative relationship, and while 69 studies did not report a relationship. Of the subset of studies that included children with developmental disabilities, five of the 14 reported a positive relationship, two reported a negative relationship, and seven did not report a relationship between PA and sleep. Further analyses are needed to determine the impact of methodological quality (quantitative measurement of PA/sleep vs. self/parent report), participant characteristics (age, disability), and the levels of PA on the relationships between PA and sleep in this population.

Comparison of Supine-to-Stand and Weight-Bearing Lunge Measures in US Army Basic Combat Training Trainees

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Supine-to-Stand (STS) has been used extensively to assess functional strength and motor competence. The Weight-bearing Lunge (WBL) test is a reliable test of ankle dorsiflexion (DF). Decreased ankle mobility is associated with injury risk and may relate movement coordination (i.e., process) and speed (i.e., product). Thus, the purpose of this study is to determine associations between the WBL and STS tests. These data were part of a larger study conducted by the US Army Research Institute of Environmental Medicine (USARIEM). Participants included US Army BCT trainees (N=130; m: n=75, age: 21.1±3.4 years, BMI: 25.6±3.7; f: n=55, age: 21.4±2.4, BMI: 24.3±3.2). Participants completed five trials of STS with ‘maximal effort’. Ankle DF was determined from the WBL test. Product- (time) and process-oriented (upper extremity; UE, lower extremity; LE, and Axial) measures were analyzed from videotaped trials using DartFish. Paired t-tests were used to analyze sex differences. Product-peak time) and process-oriented (sum of UE, LE, Axial modes) measures were z-transformed and Spearman’s Rho correlations were calculated to determine the strength of associations [correlations; low (r=0.10–0.29), moderate (r=0.30–0.49) and high (r≥0.50)]. Product mean; m: 1.69±0.35s, f: 1.93±0.28s. Process mean: 11.6±5.46°. There were no significant differences between sexes. For all participants, correlations between STS process and DF (total r=0.26) were low and product were insignificant (r=0.14). Higher BMI correlated to slower times to standing (r=0.24), lower total process (r=0.44), and less DF (r=.26). Results indicate that the WBL test is not associated with STS performance. Continued investigation into the practical application of the WBL and STS test is warranted. Future aims of this continuing study will evaluate risk of injury based upon WBL and STS product- and process-oriented measures. Disclaimer: The views expressed in this abstract do not reflect the official policy of the Department of Army, Department of Defense, or the US Government. Funding source: n/a.

Postural Control Age and Sex Differences: A Moderation Analysis

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Postural control has been used to assess neuromotor deficits after a suspected injury. However, given what is known about developmental trajectories and their differences between sex, there are likely postural control characteristics that should be considered in this context. To-date, no large-scale studies have examined postural control in light of age and sex, which was the purpose of this study. Data from the BTrackS Balance Test—an objective and reliable way to measure postural control with low-cost force plate technology—were used to examine sex and age differences in a large athlete database. It was hypothesized that female athletes would exhibit better postural control relative to male athletes and that older athletes would exhibit better postural control relative to younger athletes. BTrackS data from a large sample (N=8324; 2892 female, 5432 male, ages 14-22) were included in this study. Postural control was operationalized as the average Center of Pressure (COP) displacement divided by each participant’s body mass index (BMI, kg/m²) to normalize postural control to body size: COP/BMI. Higher values indicated worse postural control relative to body size. A moderation analysis was used to test interaction effects of sex and age on the COP/BMI ratio. Analysis of COP/BMI indicated a significant mean sex difference (Mmale = 0.924, Mfemale = 0.898, p < .001), as well as a quadratic association with age, such that balance scores normalized to BMI were lower for older athletes (β = 0.042, p < .001), but the magnitude of those age differences also decreased as age increased (β = 0.011, p < .001). Further, the interaction of age and sex was significant for both the linear (β = 0.020, p < .001) and quadratic terms (β = -0.006, p < .001), indicating that younger female athletes exhibited better postural control compared to male athletes, but these sex differences abated in older athletes. These findings highlight sex and age differences in postural control with respect to developmental trajectories and should be accounted for in basic and clinical sciences.

Training the Trainer: An Experiential Learning Curriculum to Prepare Fitness Professionals to Work With Individuals With Developmental Disabilities

Melissa Pangelinan, Auburn University; Emily Mann, Auburn University; Danielle Carabelle, Auburn University; Mary Grayson Nix, Auburn University

Individuals with developmental disabilities (DD) experience physical health disparities that put them at increased risk for obesity, cardiometabolic diseases, and reduced quality of life. However, there is a critical lack of certified and trained exercise and fitness professionals available in the community to provide opportunities for adapted exercise (e.g., personal training or adapted group fitness) to improve health outcomes. To address this lack of service providers, a two-semester sequence of coursework and practical experiences were provided to a cohort of undergraduate and graduate students in Exercise Science. During the first semester, eight students completed coursework to obtain personal training certifications through the National Academy of Sports Medicine (certified personal trainer). During the second semester, the students participated in weekly discussions to prepare them for the American College of Sports Medicine Certified Inclusive Fitness Trainer exam. At the same time, students received training and guidance while leading a virtual group fitness program for adults with DD (N = 48) via Zoom. During the 10-week virtual group fitness program, students took turns leading the group fitness program and annotating behavior of the participants through the program. The students assisted in developing modifications of the exercises for participants with difficulties performing the exercises and for those that needed additional
challenge. All of the students reported that the combination of coursework/discussions and practical experiences significantly increased their confidence, knowledge, and skills to provide personal and group fitness programs for individuals with DD. All of the students reported that the skills gained from this program were relevant to their future career goals (i.e., physical therapy, occupational therapy, and fitness professionals). Reducing barriers for student participation via course credit and reduced costs of certifications is needed to expand the program capacity.

### Automated Classification of Manual Exploratory Behaviors Seen During Early Childhood Using Machine Learning

Priya Patel, Michigan State University; Harsh Pandya, Toyota Research Institute; Rajiv Ranganathan, Michigan State University; Mei-Hua Lee, Michigan State University

Manual exploratory behaviors that precede and form the basis of tool use behavior in children are mostly characterized in terms of their frequency and duration of occurrence. However, to fully understand functional and clinical significance of these exploratory behaviors, quantitative movement characterization (velocity profile, smoothness, etc.) is required in addition to qualitative analysis that is typically done using traditional video coding methods. Two challenges in the process of automatically assessing the type and nature of movements during these exploratory behaviors are to (i) reliably classify the type of movement, and (ii) perform this classification throughout a time series without requiring manual curation of the time series data. Here, we propose a classification method that uses machine learning to classify manual exploratory behaviors in a time series data. For this purpose, we measured three commonly seen exploratory behaviors (rotation, fingering and throwing) in 10 college-aged adults using wireless Inertial Measurement Units (IMUs) embedded in different objects. Participants performed these behaviors multiple times in a random order. We calculated different features (mean, standard deviation, interquartile range, etc.) on the linear acceleration and angular velocity data from the IMUs, and used them to train Support Vector Machine (SVM) based classifiers to identify the three behaviors. Our preliminary findings showed that trained classifiers identified these behaviors on a time series data with high accuracy (above 87%) and substantially less processing time. This classification method holds a promise to facilitate automated movement characterization of manual exploratory behaviors, which in turn may contribute to the assessment of developmental disorders such as Autism where children exhibit atypical manual exploratory behaviors.

### Static Balance Differentially Associates With Endurance and Gait Speed Outcomes Across Lifespan Age Bands

Adam Pennell, Pepperdine University; Angela Starrett, University of South Carolina; Ali Brian, University of South Carolina

Balance is complex/multidimensional and may act as a co-requisite or synergist for the promotion of movement behaviors and health outcomes. The role of balance concerning movement and health remains unclear. The purpose of this study was to investigate associations between standing static balance and lower-body movement variables (i.e., endurance, gait speed) across six age bands. This study was a cross-sectional secondary data analysis of NIH Toolbox motor domain data collected during 2011 ($N=4,859$, $M_{age}=21.2 \pm 20.2$ years). Pearson’s correlation coefficients were calculated to investigate for potential associations between balance and movement. Age bands were: early childhood ($n=687$, 3-5 years), middle childhood ($n=1,379$, 6-11 years), adolescence ($n=1,367$, 12-19 years), early adulthood ($n=496$, 20-37 years), middle adulthood ($n=618$, 38-64 years), late adulthood ($n=312$, 65+ years). Standing static balance consisted of four to five standing balance/sway assessments. Item response theory was used to calculate the value of the latent trait (balance), represented by theta. Outcome variables were ‘usual-paced’ and ‘fast-paced’ gait speeds (m/s) from walking a 4-m linear distance (i.e., locomotion; not collected in 3-4-year-olds) as well as distance covered (feet) during a 2-minute walk test (i.e., endurance). Balance related to endurance in early ($r=.11$, $p=.021$) and middle childhood ($r=.20$, $p<.001$) as well as middle ($r=.15$, $p=.003$) and late adulthood ($r=.41$, $p<.001$). Usual-paced gait speed was only significant at later adulthood ($r=.18$, $p=.016$) while fast-paced gait speed was significant at middle ($r=.10$, $p=.032$) and later adulthood ($r=.25$, $p=.002$). Estimated static balance performance has low-to-moderate positive associations with endurance and locomotion tasks across multiple lifespan age bands, specifically earlier and later in life. More work is needed to explore the potential link(s) between balance and movement-related outcomes/behaviors especially during adolescence and early adulthood where balance may be most developed/less variable.

### Differences in Motor Incoordination Among Youth With Autism Spectrum Disorder by Sex and Clinical Obesity

E. Andrew Pitchford, Iowa State University; Leah R. Ketcheson, Wayne State University

Children with Autism Spectrum Disorder (ASD) can exhibit concurrent motor incoordination, but formal diagnosis of Development Coordination Disorder (DCD) remains uncommon. Greater rates of overweight and obesity have been shown in cohorts of children with ASD and DCD; however, it is not clear how obesity affects the motor incoordination associated with DCD among children with ASD. This study utilized the Simons Foundation SPARK cohort (version 3.0) to describe the scope of motor incoordination among children with ASD and examine the inter-relationships between DCD risk, clinical obesity, and sex. A sample of 16,176 children with ASD, between the ages of 5 and 15 years, were included in the secondary data analysis. Parents completed an online version of the DCD Questionnaire (DCD-Q) and reported if the child was diagnosed with clinical obesity. 87% of children with ASD had DCD-Q scores consistent with being at-risk for DCD. Clinical obesity was reported in 301 children (2%). Children with clinical obesity exhibited significantly greater motor incoordination compared to children without obesity ($p<.001$). Male children were also reported to have significantly lower DCD-Q scores (greater incoordination) than females ($p=.024$), in particular for the fine motor and handwriting subscale ($p<.001$). The interaction between obesity and sex was limited only to that fine motor subscale ($p=.025$). These findings reinforce the pervasiveness of motor incoordination among children with ASD and identify subgroups that appear to be at greater risk for DCD. A limitation of this analysis is the reliance upon a parent report of clinical obesity. It is unclear how results would differ with a sample more consistent with the measured obesity rate in children with ASD (estimated at 22%). The very high rates of DCD risk among children with ASD shown in the large, national SPARK cohort provide further justification for the acknowledgement of motor dysfunction as a core deficit of ASD and the inclusion of motor behavior in early intervention for children with ASD.

### Effect of a Socially Assistive Mobile Robot During Children’s Free Play

Joseline Raia Vora, Oregon State University; Samuel W. Logan, Oregon State University; Ameer Helmi, Oregon State University; Christine Zhan, Oregon State University; Eliora Olivares, Oregon State University; Tina Vu, Oregon State University; Ashwin Vinoo, Oregon State University; Gabriela R. Zott, Oregon State University; Marie Wilkey, Oregon State University
Play is critical for children’s physical, cognitive, and social development. Children engage in play to explore the world through developmentally appropriate toys and social interactions with peers and adults. Technology-based toys like robots are especially of interest to children due to their seemingly life-like properties. This pilot study explored the affordances of the play area provided by developmentally appropriate toys and a socially assistive mobile robot (SAR). The objective of this study was to assess children’s interaction with the SAR and the role of the SAR on physical activity during free play. Six children (5 females, Mage = 3.6 ± 1.9 years) attended seven 1-hour-long weekly play sessions (4 baseline and 3 intervention sessions). During baseline sessions, the SAR was powered off but present (stationary) in the play space. During intervention sessions, the SAR was teleoperated to move in the play area offering rewards of lights, sounds and bubbles to children. Thirty-minute videos of play sessions were coded using a momentary time sampling observation system. Mean percentage of time spent engaged in behaviors of interest in baseline and intervention sessions were calculated. A paired-Wilcoxon signed rank test was conducted to assess differences between baseline and intervention sessions. Children interacted significantly greater (~11.5%; Z = -2.52; p = 0.01) with the robot during intervention sessions compared to baseline sessions. Children also spent significantly more time standing (~15%; Z = -2.09; p = 0.04) and a tendency towards less time sitting (~19%; Z = -1.89; p = 0.06) during intervention sessions compared to baseline sessions. Results suggest that affordances provided by a mobile SAR offering rewards elicits interaction from children, encouraging them to spend more time standing in free play. This pilot study lays a foundation for exploring the role SARs in inclusive play environments in real-world settings like day-care centers and preschools.

The Otteroo: A Case Series Exploring its Potential to Support Physical Therapy Intervention in Infants With or at Risk for Developmental Delay

Isabel Reed, Children’s Hospital Los Angeles; Stacy Menz, Starfish Therapies; Beth A. Smith, Children’s Hospital Los Angeles, University of Southern California

The objective of this case series was to examine the potential of the Otteroo as a tool to support physical therapy intervention in infants with or at risk for developmental disability. The Otteroo is a float with potential for use in aquatic therapy sessions or as part of a home exercise program. By tracking the amount of use and caregiver comments on the interaction, we aimed to focus on typical developing infants and toddlers. A total of 41 studies ranged in age from 25 weeks (gestational age) to 36 months. Only 3 studies focused on typical developing infants and toddlers. A total of 55 studies were included (Aca-
sion OR movement-based learning) and four databases were included (Aca-
da-OR movement interventions across populations of infants and
toddlers with and without developmental disabilities to identify effective
terventions that may be broadly applicable. The search terms used were
(infant OR newborn OR toddler) AND (intervention OR treatment OR
program OR therapy) AND (movement OR physical activity OR exercise
OR movement-based learning) and four databases were included (Aca-
demic Search Premier, APA PsycArticles, Pubmed (Medline), and
SPORTDiscuss). A total of 2900 studies underwent title and abstract
review, of which 77 met the criteria for full-text review. A total of 55
articles met criteria for data extraction and data analysis. Participants
ranged in age from 25 weeks (gestational age) to 36 months. Only 3 studies
focused on typical developing infants and toddlers. A total of 41 studies
reported a significant impact of the intervention on motor development.
The two most common interventions were constraint-induced movement
therapy in infants with cerebral palsy (N=11) and treadmill training in
infants and toddlers with down syndrome (N=9). Further analyses are
needed to determine the impact of methodological quality (e.g., study
design), identify the best window (age range) for the acquisition and
improvement of motor abilities, most appropriate settings (e.g., home,
daycare), and the optimal dose for a given intervention. Moreover, future
studies are needed to determine the impact of early common motor
interventions on the infant/toddler development in other domains
(e.g., cognitive, linguistic, and socioemotional).

Meta-analyses and systematic reviews have been conducted investigating
the relationship between early movement and physical activity interven-
tions in specific populations of infants at risk or diagnosed with a
developmental disability. The present systematic review examined the
effects of early movement interventions across populations of infants and
toddlers with and without developmental disabilities to identify effective
interventions that may be broadly applicable. The search terms used were
(infant OR newborn OR toddler) AND (intervention OR treatment OR
program OR therapy) AND (movement OR physical activity OR exercise
OR movement-based learning) and four databases were included (Aca-
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studies are needed to determine the impact of early common motor
interventions on the infant/toddler development in other domains
(e.g., cognitive, linguistic, and socioemotional).

Attitudes Towards Inclusive Physical Education: A Preservice Teacher Perspective

Danielle Salters, University of Windsor; Jennifer Robertson-Wilson, Wilfrid Laurier University; Sara Scharoun Benson, University of Windsor

Physical Education (PE) is a unique learning environment that is often overlooked in research surrounding inclusive education. Teacher attitudes towards inclusive PE are critical to promoting positive learning experiences, as attitudes have been shown to drive intentions which lead to actual behaviors. The present study aimed to explore preservice teacher perspectives towards inclusion based on preservice teacher age, gender, and stream (age of the students) using the Attitudes Towards Inclusive Physical Education (ATIPE) questionnaire (Meier & Ruin, 2019). Participants (N = 167; 71.9% age 18-25, 76% female) were recruited from multiple Universities in southwestern Ontario, and were enrolled in either their first or second year of a preservice teacher training program. Based on the ATIPE questionnaire, attitudes were divided into wide (favourable) and narrow (unfavourable) perspectives towards inclusion. Multiple regression results demonstrated that attitudes towards inclusion were more favourable among males (B = -.245, p = .036, adjusted R² = .020) and preservice teachers who were in a stream oriented towards younger students (ages 4-11; B = -.107, p = .004, adjusted R² = .045), while preservice teacher age was not a significant predictor of attitudes. The findings provide further evidence for the importance of inclusion-based classes and experiences during preservice training programs to foster positive attitudes towards inclusion as teachers move into careers. There remains a need to identify which aspect of the preservice training program may have the largest impact on the development on positive attitudes towards inclusive PE.

A Systematic Review of Motor Interventions in Infants and Toddlers With and Without Developmental Disabilities

Julia Sassi, Auburn University; Davis Dyke, Auburn University; Siena Munz, Auburn University; Melissa Pangelinan, Auburn University

The objective of this case series was to examine the potential of the Otteroo as a tool to support physical therapy intervention in infants with or at risk for developmental disability. The Otteroo is a float with potential for use in aquatic therapy sessions or as part of a home exercise program. By tracking the amount of use and caregiver comments on the interaction, we aimed to focus on typical developing infants and toddlers. A total of 41 studies ranged in age from 25 weeks (gestational age) to 36 months. Only 3 studies focused on typical developing infants and toddlers. A total of 41 studies reported a significant impact of the intervention on motor development. The two most common interventions were constraint-induced movement therapy in infants with cerebral palsy (N=11) and treadmill training in infants and toddlers with down syndrome (N=9). Further analyses are needed to determine the impact of methodological quality (e.g., study design), identify the best window (age range) for the acquisition and improvement of motor abilities, most appropriate settings (e.g., home, daycare), and the optimal dose for a given intervention. Moreover, future studies are needed to determine the impact of early common motor interventions on the infant/toddler development in other domains (e.g., cognitive, linguistic, and socioemotional).
Feasibility and Challenges of Converting an In-Person Study to Virtual During the COVID-19 Pandemic

Katherine Scott-Andrews, University of Michigan; Alison Miller, University of Michigan; Rebecca Hasson, University of Michigan; Thomas Templin, University of Michigan; Leah Robinson, University of Michigan

Due to the global pandemic of COVID-19 and Executive Orders instituted across the United States, the way we live, learn, and conduct research has been significantly altered. The need to pivot to virtual research was essential and instantaneous. We will discuss the feasibility and challenges of converting an in-person study that examined motor competence (MC), physical activity (PA), and perceived motor competence (PMC) to a virtual format with parent-child dyads. Recruitment was conducted through the university research registry, social media, and public listservs. All correspondence with participants were conducted through email and secure platforms. PMC was assessed with the Self-Perception Profile for Adults and Children. MC was assessed through participants’ perceived interest in the study and 76 parent-child dyads (38%) consented and assented. Of these, 15 dyads dropped out (20%) due to lack of response, time, and health issues. It is feasible to conduct virtual research. However, several challenges arose that range from response rates, motor skill measurement, and technological issues. A virtual format may have impeded participants due to access to internet and technology. Future research will need to address these challenges by developing methods that address virtual recruitment, establish validity and reliability for virtual PMC and MC assessments, and ease participants burden with technology. The way we conduct research has changed due to COVID-19 and adapting to virtual methods is both necessary and feasible but modifications must be taken into consideration. Funding source: Rackham Graduate Student Research Grant, University of Michigan.

Object Control Skill Competence Delays and Sex Differences Among Children From Belgium, Brazil, Indonesia, USA and Wales

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Background: There is emerging evidence that children across the globe have developmental delays in object control skill competence (OCSC) with girls lower than boys. Low OCSC is of concern as OC skills are a key underlying mechanism driving physical activity behaviors across adolescence. Limited comparison of data across countries is available and comparative data is warranted. This study examined the influence of sex and country on the OCSC of young children from five countries and the extent to which children were developmentally delayed (DD). Methods: Participants (N=873) included children from Belgium (n=254), Brazil (n=200), Indonesia (n=140), USA (n=186), and Wales (n=94) aged 3-7 yrs. All children were tested on the OC subscale of the TGMD2 with <25% representing DD. Results: The majority (M=78%) of children were DD. A 5 (Country) X 2 (Sex) ANOVA reported significant Sex (p<.001; ES=.29) and Country (p<.001; ES=.29) main effects and a non-significant Gender X Country interaction (p>.05). Collectively, boys (M=22.18%) were significantly better than girls (M=14.96%) at OCSC. Wales (M=2.11%) had the lowest OCSC followed by Indonesia (M=5.66%), USA (M=17.57%), Brazil (M=21.75%) and Belgium (M=30.26%). Post-hoc Tukey tests examined differences between countries and found that children in Indonesia and Wales were significantly (p<.001) worse than children in the USA, Brazil and Belgium. However, children in Belgium were significantly (p<.001) better than all countries. There were no significant differences between the USA and Brazil (p>.05). Evaluation of within country gender differences revealed significant Sex differences for all countries except Wales. This study highlights the priority for evidence-based, early years motor skill intervention programs and the need for countries to develop physical literacy policies, especially for girls.

Impact of Restrictive vs. Non Restrictive Location Duration and Posture on Achievement of Motor Milestones in Infants

Alicia Springfield, California State University - Fullerton; Do Kyeong Lee, California State University – Fullerton

Infants achieve motor milestones, such as walking, at varying ages. However, much uncertainty still exists concerning the level of physical activity (quality or quantity) prior to motor milestone onset. The present study investigated the role of physical spaces on infants’ gross motor skills (crawling, cruising, or walking). Nine infants (6 f /3 m, M=2.38 months) were observed at monthly home visits beginning at 2 months of age and continuing to 12 months; through the achievement of walking skills (10 ft without falling or stopping). As a naturalistic observation study, the researcher recorded the infants’ spontaneous movement for 20-30 minutes without intervention. Infants were observed within restrictive locations (e.g., held) and nonrestrictive locations (e.g., on the floor). Additionally, the infants’ posture was observed within each location. A total of eight postures were sorted into five categories (prone, supine, seated, upright and carried). Data analysis used frame-by-frame video coding, to determine frequency and duration of each location and posture category. The data reflected that infants exhibit increased motor skills as they spend less time in restrictive locations. As the infants’ age increased, an increase in time spent playing on the floor (M=92.80% of time); as well as a decrease in time being held (M=5.37%) were observed. Furthermore, the data showed an increase of time in seated postures between 2 (M=20.38 %) and 11 months (M=60.85%). The emergence of upright postures were exhibited beginning at 5 months (M=6.18%). Yet a decrease within supine (laying face upward) postures were exhibited between 2 (M=24.44%) and 12 months (M=76.31%). Conclusively, the time infants spend in each location may dictate their posture, or ability to be physically active. Future studies may investigate frequency and duration of location, posture, and movement, in relation to motor skill achievement. Through such observations further implications can be used by healthcare professionals and caregivers to develop interventions for healthy motor development. Funding source: N/A.

Investigating the Tripartite Variables and its Relationship With Actual Motor Competence for Those With Visual Impairments

Alexandra Stribing, University of South Carolina; David F. Stodden, University of South Carolina; Lauren J. Lieberman, The College at Brockport; Eva Monsma, University of South Carolina; Ali S. Brian, University of South Carolina

Perceptions of motor competence typically relate with actual motor skill competence for youth with and without visual impairments (VI). Youth with VI often have low perceptions of motor competence; however, given
the unique relationship between parents and youth with VI, it is important to explore how parents’ perceptions, self-perceptions, and metaperceptions (what children think their parents think about their motor competence), predict actual motor competence. Unfortunately, metaperceptions and parents’ perceptions regarding motor competence for youth with VI are relatively unknown. The purpose of this study, a first of its kind, was to examine how parent-, self-, and metaperceptions predict actual motor skill competence above and beyond age, sex, and degree of vision for youth with VI. Participants with VI, ages 9-19 years ($N=91$; $M_{age} = 12.76$ years, $SD = 2.32$ years) completed The Self-Perception Questionnaire, Metaperception Questionnaire, and Test of Gross Motor Development Third Edition (TGMD-3). Participants’ parents ($N=91$; $M_{age} = 42.98$ years, $SD = 8.10$ years) completed the parent questionnaire. Scores included self-perceptions ($M=4.32$, $SD=.57$), parents’ perceptions ($M=3.72$, $SD=.88$), metaperceptions ($M=4.39$, $SD=.61$), and TGMD-3 ($M=58.77$, $SD=23.70$). The hierarchical regression revealed that age, sex, and degree of vision to predict actual motor competence (Model 1) was statistically significant, $R^2=.25$, $F(3,87)=9.47$, $p<.001$; adj$R^2=.22$. The full model of age, sex, degree of vision, self-perceptions, parents’ perceptions, and metaperceptions to predict actual motor competence (Model 2) was statistically significant, $R^2=.50$, $F(6,84)=14.53$, $p<.001$; adj$R^2=.47$. Parent perceptions ($b=.51$, $p<.001$) and degree of vision ($b=.25$, $p=.004$) were significant predictors of actual motor competence. Parents perceptions and the degree of vision may be underlying mechanisms for actual motor competence for youth with VI. Future research should develop interventions targeting parents who have children with a VI in order to support the motor behavior for this specific population. Funding source: NASPSPA Graduate Student Research Grant.

**Differences Between Infant Leg Movement Characteristics in Laboratory and Home Environments**

**Willis Tang, University of Southern California; Weiyang Deng, University of Southern California; Beth Smith, University of Southern California**

Infant behavior is highly variable under factors such as time and environment. A majority of existing studies on infant behavior have been conducted in laboratory (lab) settings, but infant behavior displayed in the lab environment may differ from their performance at home. We aim to identify differences in leg movement characteristics between these environments, hypothesizing that infant behavior during a short lab session will be different from full day, in-home behavior. Eleven infants (7-9 months) participated in the study. During the lab session, infants were seated facing a NAO-socially-assistive-robot with sensors placed on each leg. They participated in a 2-minute baseline period followed by a contingency reinforcement session. Afterwards, infants continued to wear sensors for 2 consecutive days to measure in-home behavior. To quantify leg movement characteristics, left and right leg movement duration (LD and RD respectively), average acceleration (LAA and RAA), and peak acceleration (LPA and RPA) values were calculated. We used the Wilcoxon signed-ranked test to compare in-lab baseline and in-home data, with significant differences found in average LD between in-home and in-lab environments (0.27s and 0.32s, $p=0.0049$). Interquartile range (IQR) and 95% confidence interval (CI) were also calculated for each variable to quantify variability in leg movement characteristics. Several variables for the in-lab session displayed larger IQR values relative to in-home behavior: LD (0.05 to 0.03), LAA (0.80 to 0.25), RAA (0.67 to 0.20), LPA (1.93 to 0.48), and RPA (1.26 to 0.52). 95% CI ranges also showed that all variables had wider ranges for the in-lab session. These preliminary results support the idea that infant behavior may be more variable in an unfamiliar lab environment and different from in-home behavior. A major limitation of this work is that we compared 2 minutes of data (lab) to full day behavior (home). Future studies should examine these potential differences with a larger sample size, equivalent data collection periods, and other body positions. Funding source: National Science Foundation.

**Concurrent Validity of the Movband 4 With the Actigraph GT3X+ in Young Children**

**Sally Taunton Miedema, University of South Carolina; Benjamin Miedema, University of South Carolina; Danielle Wadsworth, Auburn University; Stephen Griffin, University of South Carolina; Alexandra Stribing, University of South Carolina; Ali Brian, University of South Carolina**

Only 31% of children across the US are considered active and healthy based upon participation in daily physical activity (PA) (Lee et al., 2017). Preschool children should participate in PA 25% of the day or 15 minutes per hour (IOM, 2011). The accurate and detailed measurement of PA in children is a crucial prerequisite to exploring its association with hypokinetic diseases across childhood and adulthood (Chen et al., 2005). However, knowledge is limited on PA of young children, particularly during the school day, due to a lack of practicality and cost-effectiveness of accelerometry. Additionally, indirect PA measures to report PA in children are practical and cost-effective but are often inadequate in the accurate measurement of PA (Dominick et al., 2016). While many consumer-grade PA devices are available to measure PA in young children, little research has been conducted to determine the accuracy of consumer-grade devices in comparison to research-grade accelerometry in preschoolers (Troyano et al., 2011). The purpose of this study was to examine the psychometric properties of the Movband 4 (MB4) compared to the Actigraph GT3X+ for measuring PA in young children. Participants included children ($N=56$ (girls $=30$), $M_{age} = 4.55$) from one preschool in the southeastern US. Children wore both the MB4 and GT3X+ on the left wrist for seven consecutive school days to assess daily PA. Results revealed a significant, moderate, positive correlation between steps per day measured by both devices ($r(56) = .33$, $p < .013$). Results also demonstrated a significant increase in step counts measured by the MB4 across time ($t(55) = 4.24$, $p < .001$). Bland-Altman plots indicated agreement with non-proportional bias for step counts ($t(55) = - .85$, $SE = .19$, $p = .402$). Through the confirmation of psychometric properties of the MB4, we can now further examine the frequency and intensity of PA in young children during the school day, to better understand the compliance of schools with PA guidelines and the impact of children’s PA levels in relation to overall health benefits. Funding source: DUKE Endowment.

**Comparison of a Throw-Catch Task and Maximum Throwing Speed in Young Adults**

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The throw-catch (TC) task assesses the capability to continuously throw and catch a ball to and from a wall at a distance 3-times the participants standing height. Increased TC performance requires individuals to throw for greater speed and with an accurate and consistent trajectory in order to minimize “catch to throw” transition time and thus, may be a viable test to concurrently examine both object projection and reception performance. The purpose of the current study is to evaluate the relationship between TC task and maximal throwing speed in young adults. A within-subject research design was implemented using a convenience sample of young adults ($N=319$; $M_{age} = 265$; $M_{age} = 18.8$±1.6 years) from two colleges in the Southeast U.S. Throwing speed was assessed (maximum from five trials using a tennis ball) using a radar gun (Stalker, Inc). The TC task product score was assessed by the maximum number of successful completions of a...
throw and catch from two 30-second trials. Performers were not provided instruction concerning the throwing pattern (e.g., over/underhand) or task strategy (e.g., speed, trajectory of ball, ball bouncing, one- or two-handed catch). Pearson correlations and linear regressions were used to examine associations between TC score and throw speed by gender. Moderate correlations were found between the TC task score and max speed (rtotal=.66; male=.61; female=.58). Linear regressions demonstrated the TC score explained 44% of the variance in max throw speed for the entire sample (F(1, 318)=247.7; p<.001), 37% in men (F(1, 263)=157.3; p<.001) and 32% in women (F(1, 52)=26.4; p<.001). The TC task demonstrated moderate predictive validity with throwing speed (a validated assessment of throwing skill), despite more complex task and environmental constraints. Thus, the TC task may represent an ecologically valid assessment of object control skill via the integration of both throwing and catching and its unique task constraints. Future research should address process-oriented characteristics of both throwing and catching and task strategy.

Comparison of Standing Long Jump Performance in Young Adults With and Without Autism Spectrum Disorder
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Participation in physical activity is a leading indicator of a healthy lifestyle and may lead to positive benefits which include maintaining a healthy weight and improved fitness. Fundamental motor skills form the basis for more complex skills and participation in recreational and sports activities; competence in these skills is a predictor of physical activity levels. Children on the autism spectrum commonly exhibit deficits in balance and motor skills, such as jumping, however it is unclear how these deficits persist or change as individuals enter adulthood. The purpose of this study was to examine one fundamental motor skill, standing long jump, and compare performance between young adults with and without ASD. Twenty participants (22.5±3.3 years), 10 with ASD (2 Female, 8 Male) and 10 without ASD (2 Female, 8 Male). Each participant completed 5 standing long jumps. Trajectories of retroreflective markers attached to the participant were recorded at 250 Hz using a 12 camera 3-D motion capture system. Marker trajectories were filtered at 12 Hz and subsequently used to identify joint center locations and segment orientations. Dependent variables included bilateral differences in peak hip, knee, and ankle joint angles during the countermovement, take-off, and landing phase of the standing long jump. Independent t-tests were used to compare differences between groups. Alpha was set at 0.05. Statistical analyses were conducted in SPSS. A significant difference was observed in the time difference between the initiation of knee extension and initiation of ankle plantarflexion of the non-dominant leg. Take-off angles were also significantly smaller (less vertical) in the group with ASD but similar take-off velocity was displayed in both groups. The group without ASD jumped 21.7 cm further than participants with ASD. All 20 participants were able to successfully complete 5 standing long jumps. Young adults on the autism spectrum performed a less efficient jump compared to peers without autism. Lack of efficiency may impact participation in a physical activity.

The Effect of Gender and Grade Level on Actual and Perceived Motor Competence in Youth
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Perceived motor competence (PMC), an individual’s subjective assessment of their ability to perform gross motor skills, is an important tenet of childhood development. High PMC, even when inaccurate compared to actual motor competence (AMC), lends itself to sustained participation in physically-demanding activities such as sports and games. In general, very young children have high PMC regardless of their AMC, and over developmental time, perceptions of their ability to perform skill become more aligned with their actual skill level. Less is understood regarding how gender and developmental time interact to influence PMC and AMC. The purpose of this study was to determine whether the effect of grade level on PMC and AMC is different for males and females. The Test of Gross Motor Development (3rd Edition) was used to assess AMC on 216 children (52.3% female) aggregated by school grade (K = 41; 1st = 40; 2nd = 50; 3rd = 20; 4th = 35; 5th = 30). The Pictorial Scale of Perceived Movement Skill Competence was used to assess PMC. A two-way MANOVA was run with two independent variables (gender and grade) and two dependent variables (AMC and PMC). There was a statistically significant interaction effect between gender and grade on the combined dependent variables, F(8, 52)=4.797, p = .001, partial η² = .121. There was a statistically significant interaction effect between gender and grade for PMC, F(4, 27)=3.239, p = .01, partial η²=.156 and for AMC, F(4, 27)=5.439, p =.003, partial η²=.180. Simple main effects for gender indicated differences in AMC between boys and girls in all grades except for 4th and 5th; for PMC, significant gender differences in PMC only existed for 4th and 5th graders. Broadly, boys had better AMC than girls in lower grades, but not higher grades. Boys and girls in lower grades (K-3) had similar PMC, while boys in higher grades had more positive perceptions of skill compared to girls. Gender and grade interact to influence the AMC/PMC relationship, and should be considered when developing interventions to promote high PMC in youth.

The Mediating Role of Perceived Motor Competence in the Relationship Between Actual Motor Competence and Physical Activity in Children
Till Utesch, University of Muenster; Moritz Eggelbusch, University of Muenster; Dennis Dreiskraeumper, University of Muenster; Isaac Estevan, University of Valencia; Maike Tietjens, University of Muenster; Farid Bardid, University of Strathclyde

This study aimed to investigate the mediating role of perceived motor competence in the relationship between motor competence and physical activity in children as hypothesized by Stodden and colleagues (2008) in their conceptual model of motor competence. A total of 207 children aged 8-13 years (58.9% girls) took part in the study. Actual and perceived motor competence (i.e., overall competence, and competence in locomotor and object control skills) were measured using the Test of Gross Motor Development, 3rd Edition, and the Perceived Motor Competence questionnaire in Childhood, respectively. Physical activity was assessed using a self-report questionnaire. Mediation analyses revealed that the relationship between actual motor competence and physical activity was mediated by perceived motor competence. Specifically, a significant indirect effect of actual competence on physical activity through perceived competence was observed for overall competence (β = 0.168) and object control skills (β = 0.178). The present study provides evidence towards mechanisms underlying the relationship between motor competence and physical activity as postulated by Stodden et al. (2008). Moreover, findings indicate that perceived motor competence is important for physical activity promotion during childhood. As such, fostering
perceived motor competence should be considered a key outcome in physical education and youth sport programs.

**Validity and Reliability for the Aquatic Readiness Assessment for Brazilian Children**

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The acquisition of water competence has been long recognized as essential to prevent drowning, especially among children. Identifying children’s water competence requires the use of reliable and validated tests with appropriate psychometric properties. The Aquatic Readiness Assessment (ARA) assesses children’s aquatic readiness. This study’s objective was to translate and investigate the content, construct, and criterion validity and the reliability of the ARA for Brazilian children. Participated in the study, 23 professions and 464 children (newborn to 13 years old). We found strong content (94% to 100% judges’ agreement) and criterion validity, internal consistency (α from .96 to .97), and inter-rater (ICC from .81 to .98) and test-retest (ICC from .94 to .98) reliability. Appropriate fit indexes were observed for the model (CFI = .99; TLI = .99; RMSEA = .08, CI 90% = .67 to .10); the model was invariant for boys and girls (CFI = .99; RMSEA = .080; ΔCFI = .009; Δ RMSEA = .015) but not for age groups (CFI = .87, RMSEA = .160). The results support the content validity concerning clarity and pertinence by experts and professionals. The inter-raters were high, and the scale showed temporal stability (test-retest). The fit for the unidimensional model’s indexes appropriately represents the ARA construct. The internal validity results suggested high homogeneity for the items. The ARA scores for developmental criterion validity showed relevant evidence, practical repercussions regarding different groups of children, and appropriate program strategies. Longitudinal and concurrent evidence is still necessary for the ARA, a limitation in the present study, and our recommendation to future studies. Funding: CAPES and CNPq. Funding source: CAPES and CNPq.

**Developmental Coordination Disorder: When Footedness Really Matters**

Ana Vanesa Valero-García, University of Murcia; Ariadna Díaz-Pérez, University of Murcia; Gregorio Vicente-Nicolás, University of Murcia; Marina Olmos-Soria, University of Murcia

Most studies on laterality and developmental disorders have focused on analysing the prevalence of left-handedness (Darvik et al., 2018; Packeiser et al., 2020) and crossed laterality (Ferrero et al., 2017). However, few studies have comprehensively explored the child’s lateralisation process and Developmental Coordination Disorder (DCD). This research aimed to analyse whether children’s motor difficulties are linked to their lateral dominance (homogeneous, crossed, undefined) of hand, eye and foot. The study sample consisted of 70 children aged between 6 and 8 years, who were administered the Harris Test (Harris, 1978) to assess lateral dominance and the Movement Assessment Battery for Children (2nd Edition) for the level of motor competence. Forty per cent of the sample had homogeneous-right laterality, while only 8.6% had homogeneous-left laterality. Forty per cent of the participants have mixed or crossed laterality, and 11.4% do not have completely defined lateral dominance. Children with undefined lateral dominance showed a lower level of motor competence in pointing and catching (p<0.05) and in balance (p<0.05), especially when they lack definition affects foot dominance (p<0.05). These differences show that the process of lateralisation cannot be understood and therefore analysed through hand preference alone, but that both eye and foot are relevant. In this case, the lack of foot dominance definition is directly related to the precision of movements requiring overall body stability, affecting coordination and gross motor skills. Therefore, the results show no difference whether the child is right-handed or left-handed, as what really matters is that the lateralisation process has been consistently completed. Furthermore, the results highlight the importance of footedness in Developmental Coordination Disorder, with important implications for early intervention.

**Examination of Change in Fundamental Motor Skills Targeted in a Mhealth Intervention for Preschool Children**

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Fundamental motor skills (FMS) are considered the foundation for more advanced movement experiences and a necessary component for children’s future physical activity efforts. PLAY is a 12-week intervention that delivers videos, lessons, and activities over a mobile health (mHealth) app to parents to support their preschool children’s FMS development. We previously demonstrated that children randomized to the PLAY app significantly improved their FMS over 12 weeks (T0 to T1) compared to those randomized to a comparator app that promoted unstructured physical activity, and these effects were sustained at week 24 (T2) follow-up (Staiano et al., in review; Webster et al., 2020). This secondary analysis examined, among the 35 children randomized to the FMS condition of the PLAY app (3.8 ± 0.8 years; 43% male), whether the specific FMS targeted in the PLAY app curriculum (i.e. hop, jump, slide, kick, overhand throw, catch) significantly improved from T0 to T1 and to retention (T2) compared to the FMS not targeted (i.e. run, gallop, skip, 1-hand strike, 2-hand strike, dribble, underhand throw). FMS was measured using the Test of Gross Motor Development – 3rd edition (TGMD-3). Mixed effect linear models were used to examine scores at each time point with covariates for gender and treatment. TGMD-3 raw scores significantly improved for the skills included in the app from T0 to T2 (Δ 1.5 ± 0.7; p=0.03) but not from T0 to T1 (Δ 0.7 ± 0.6; p=0.23) or from T1 to T2 (Δ 0.8 ± 0.5; p=0.15). The skills not included in the app did not change between any timepoint. The PLAY app specifically improved children’s skills that were targeted and did not have global effects on skills that were not targeted. The delayed effects may indicate FMS lessons promote successful continued practice in the targeted skills over the course of the 24-week period, resulting in significantly improved skills after the intervention ended. Funding source: National Institutes of Health (R21HD095035, P30DK072476, U54 GM104940).

**Associations Between Body Composition via Bioelectrical Impedance Analysis and Body Mass Index on Fundamental Motor Skill Competence in Children**

E. Kipling Webster, Augusta University; Indica Sur, University of Michigan; Alicia Stevens, Augusta University; Leah E. Robinson, University of Michigan

Body mass index (BMI) is a widely used and cost-effective measurement for body fat, but fails to account for essential components of body composition which may be critical for motor performance. This project examined the associations between body composition as measured by BMI...
and bioelectrical impedance analysis (BIA) on fundamental motor skill competency in children. 244 children participated (6.05±2.01 years, 53.3% male); body composition was measured by BIA (Tanita SC-331S), BMI was calculated using height and weight, and motor skill competence was assessed with the Test of Gross Motor Development – 2nd edition (TGMD-2). Hierarchical multiple regression was used to assess how well the BIA body composition variables, fat free mass (FFM), fat mass (FM), and fat percentage (F%), and BMI could predict TGMD-2 scores, controlling for age. BIA measures accounted for an additional 6.6% (F(3,239)=9.3, p<.001) and 2.7% (F(3, 239)=3.9, p=0.10) of variance in locomotor and ball skill subscales, respectively. For the TGMD-2, BIA measures accounted for an additional 5% (F(3,239)=8.37, p<.001) compared to BMI which accounted for an additional 0.3% (F(1,259)=1.29, p=.258) of variance in TGMD-2 performance. Age was a significant predictor in all the final models (p<.001). In addition, F% (p=0.013) was a significant predictor for locomotor skills and FFM (p=.030) for object control skills, and both F% (p=.046) and FFM (p=.028) were significant in the final TGMD-2 model. Various body composition components were associated with different aspects of fundamental motor skill competency: Excess body fat may be a morphological constraint to proficient motor performance when transporting the body through space, while leaner body types may be more positively engaging in object manipulation opportunities. More work is needed to understand the causality and directionality of this relationship; however, BIA appears to account for more variance in TGMD-2 performance compared to BMI.

Motor Learning and Control Abstracts

Motor Skill, Motor Planning, and Motor Performance in Adults With Severe Mental Illnesses and Obesity

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Adults with severe mental illnesses (SMI) and adults with obesity exhibit a variety of motor skill impairments such as slow gait and poor balance and coordination. These impairments may contribute to difficulties in motor performance that could cause a lack of participation in physical activity. Thus, the aim of this work was to examine the extent of motor skill impairments in adults with SMI and adults with obesity, as well as associated impairments in motor performance and planning while walking. Motor skills and balance were assessed in adults with obesity (n=15), adults with SMI (n=16), and healthy controls (n=15) using the Functional Gait Assessment (FGA) and the Unipedal Stance Test. Coordination was assessed using the Alternate Hand Wall Toss Test and the Edgren Side Step Test. Motor planning and motor performance (i.e., returning to typical walking patterns and accuracy) were assessed through two separate tasks: crossing obstacles of three different heights and walking to the beat of an audio metronome at three different speeds. The SMI group scored lower on the FGA (all ps <0.001), was significantly slower than controls in completing the Edgren Side Step Test (p <0.001), and did not show evidence of motor planning as reflected by longer step lengths when approaching obstacles (all ps <0.001). However, similar to controls, the SMI group returned to their typical gait after attempting to match the beat of the metronome (all ps >0.05). Both the control and obesity groups had more deviations at the slow compared to the normal or fast paced compared to the SMI group. Persons with obesity also had larger metronome deviation scores compared to the SMI and control groups. Our findings indicate that while adults with SMI display deficits in motor skills and motor planning, they demonstrate the ability to return to their typical walking patterns and to accurately meet task constraints. This indicates potential for improving motor performance within this population and that motor performance may not be contingent upon having intact motor skills.

When the Timing is Right: The Link Between Temporal Coupling in Dyadic Interactions and Emotion Recognition

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Affective states can be understood as dynamic interpersonal processes which is developing over time and space. When we observe emotional interactions performed by other individuals, our visual system anticipates how the action will unfold. Thus, it has been proposed that the process of emotion perception is not only a simulative but also a predictive process – a phenomenon described as interpersonal predictive coding. In the present study, we investigated whether the recognition of emotions from dyadic interactions depends on a fixed spatiotemporal coupling of the agents. We employed an emotion recognition task in which we manipulated the actions of two interacting point-light figures by implementing different temporal offsets which delayed the onset of one of the agent’s actions (+ 0ms, + 500ms, +1000ms or + 2000ms). Participants were asked to determine the subjective valence as well as the emotion category (happiness, anger, sadness, affection) of the interaction. Our results demonstrated that the temporal decoupling had a critical effect on both emotion recognition and the subjective impression of valence intensity. We found that both measures decreased with increasing temporal offset. However, these effects were dependent on the emotion that was displayed. While affection and anger sequences were impacted by the temporal manipulation, happiness and sadness were not. Our findings complement and extend previous evidence by showing that the complex, non-coincidental coordination of actions within dyadic interactions results in a meaningful movement pattern and might serve as a fundamental factor in both detecting and understanding complex actions during human interaction.

The Effects of Physical Activity Throughout a 12-Week Balance Training Program in Older Adults With Fall-Risk

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Balance is vital for fall prevention and maintenance of functional independence in older adults. Current balance and fall prevention interventions focus mainly on physical factors (i.e. physical activity), often overlooking cognitive factors impacting balance, such as attentional focus (AF). This study examined the relationship between physical activity completed outside of a 12-week balance program with AF cues on change in postural control, physical function, balance confidence, fear of movement and quality of life. Fifty older adults were assigned to an external focus (EF) (N= 28, 80.57±6.16 yrs) or internal focus (IF) (N= 22, 80.95±6.41 yrs) group and performed clinical fall risk assessments (Functional Gait Assessment [FGA], Berg Balance Score [BBS], Time up and Go [TUG]), measures of static and dynamic postural control, and qualitative assessments (Activities Balance Confidence Scale Short Form [ABC-6], Tampa Scale of Kinesiophobia [TSK], and the 36-Item Short Form Survey [SF-36]) prior to and following the balance training program. Participants completed a 12-week balance training program using wobble boards, twice weekly for 30 mins and completed weekly physical activity logs. Change in outcome measures was calculated as the difference between baseline and post intervention assessments. Moderation analyses were performed via model 1 of the PROCESS macro for SPSS to examine if AF moderates the relationship between exercise performed outside of the intervention and change in fall risk outcomes. Results showed that as total
exercise time increased, SD acceleration and mean velocity of postural control in the medial lateral (ML) direction increased for IF. As moderate intensity exercise increased, mean velocity and mean acceleration in the ML direction increased for IF. As light exercise increased, TSK scores decreased and SF-36 (General Health and Social Functioning) increased for IF. These data suggest that physical activity outside of a balance training intervention may offset some of the known detrimental effects of an IF during balance training.

Individual Differences of Variance Restructuring When Acquiring a Kettlebell Swing Motor Task in Young Adults
Matthew Beerse, University of Dayton; Kimberly E. Bigelow, University of Dayton; Joaquin A. Barrios, University of Dayton

Initial acquisition of a motor skill might demand exploration of possible degrees of freedom (dof) followed by exploitation of preferred task solutions. The control strategy for this exploration followed by exploitation is unknown. Two major control strategies are plausible, covariation across dof (CoV) or reducing variation of the dof to which the task goal is most sensitive (InV). Both control strategies have been found in young adults dependent upon task constraints. This study aimed to characterize the control strategy employed to structure the variance of body segments (dof) based on their influence on the vertical COM position (task goal) during the acquisition of a kettlebell swing. Twelve young adults (7F/5M, 22.62 (2.04) years) participated. Subjects watched a video that modeled and provided instructions, but received no verbal cues or feedback. We evaluated two conditions: no practice (NP), 3 sets of 20 kettlebell swings, and short-term practice (SP), 3 sets of 20 kettlebell swings following 4 practice days of 5 sets of 20 kettlebell swings. A Vicon motion capture system collected kinematic data. A modified uncontrolled manifold analysis partitioned segment angle variance across cycles as either affecting the vertical COM position or not. Then individual variance was removed to evaluate the degree of CoV and the remaining variance was considered InV. Our results suggest there was not a single strategy employed when acquiring the kettlebell swing. The majority (8/12) demonstrated an InV strategy for both NP and SP, others a CoV strategy (2/12) for both NP and SP, and some shifted from CoV to InV (2/12) from NP to SP. The majority of subjects implementing an InV strategy might suggest a tendency to focus on the dof (i.e. body segment) that has the greatest impact on the task goal and reduce its variance. More work is necessary to qualify if one strategy is more representative of skilled performance and whether practice design could be tailored to these individual differences. Funding source: University of Dayton Research Institute Seed Grant.

Categorizing and Distinguishing Perceptual-Cognitive Skills in Interceptive Sport Athletes
Zachary Besler, University of British Columbia; Miriam Spering, University of British Columbia; Pearson A. Wyder-Hodge, University of British Columbia; Shawn Hetherington, Douglas College; Joseph Baker, York University; Nicola Hodges, University of British Columbia

Recent advancements in technology allow accessible assessments of an athlete’s ability to process information and make decisions, what have been termed perceptual-cognitive (PC) skills. However, there is ambiguity, uncertainty and a lack of organization concerning the type of skills which distinguish elite athletes from their less-elite counterparts. To determine the importance of various PC skills for different athlete groups, operational definitions of these skills are needed, along with defined measurement standards and protocols. The present study classified skills into four broad categories: fundamental visual skills; low-level visual skills; high-level visual/attentional skills; and cognitive skills. After determining the types of skills encompassed within these categories, including domain specific skills and more domain general skills, the study comprehensively reviewed studies containing elite and less elite or novice group comparisons. This first phase focused on interceptive skill athletes, such as those involved in baseball or tennis, where PC skills play a critical role. There was considerable discrepancy in research evidence differentiating between athletes based on fundamental and low-level visual skills, such as dynamic visual acuity and colour/contrast sensitivity. High-level visual/attentional skills; including attention location, typically assessed through eye gaze measures, have consistently demonstrated expert-novice response pattern differences and superior expert performance. Most cognitive skills (anticipation, memory & knowledge, and decision-making) have overwhelming evidence supporting expert-novice differences in sport-specific tasks, yet research evidence regarding general executive function differences mostly fail to distinguish across skill groups, although the evidence is relatively mixed. This review aims to identify gaps and controversies in PC skill research and ultimately orient practitioners and researchers towards distinguishable skills and methods to assess and train. Funding source: NSERC (Hodges, Spering) and Own The Podium (Hodges).

Measures of Gait Variability Are Not Sensitive to Aging
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Gait variability is suggested to be associated with the age-related decline in locomotor ability and increased fall risk in older adults. Differences in gait variability between the old and young have been quantified using linear and nonlinear techniques, promoting their use for identifying poor locomotor patterns. However, little is known about how measures of gait variability change across the lifespan. The purpose of this work was to investigate age-related changes in linear and nonlinear measures of gait variability. Thirty-two adults (23-71 years) walked for 6 minutes at their preferred speed during which stride time, stride length, knee angle, and pelvis motion were recorded. Linear gait variability analysis included standard deviation and coefficient of variation of stride time and stride length. Nonlinear analyses included sample entropy and detrended fluctuation analysis of stride time, stride length, and correlation dimension and local dynamic stability of pelvis motion and knee angle. Of the variability measures, linear regression analyses showed age to be significantly predictive of only coefficient of variation of stride length ($r^2=.09$) and sample entropy of stride time ($r^2=.12$). Age was best predicting preferred gait speed ($r^2=.21$). Additional linear regression analyses used gait speed as a predictor variable for measures of gait variability, revealing gait speed to better predict and predict more measures of gait variability. Gait speed was significantly predictive of coefficient of variation of stride length ($r^2=.32$), sample entropy of stride time ($r^2=.50$), correlation dimension of the pelvis motion ($r^2=.24$) and knee angle ($r^2=.32$), and local dynamic stability of pelvis motion ($r^2=.08$). Thus, while there is a decline in walking speed across the adult lifespan, measures of variability are not especially sensitive to age itself. Future work should consider adjusting for differences in gait speed across ages to understand the changes in locomotor variability that are due to factors other than gait speed.

In Search of Motor Memory Consolidation Processes Underlying Wakeful Post-Training Interventions: A Review
James Brown, University of South Australia; Maarten A. Immink, Flinders University; Alex Chatburn, University of South Australia; David L. Wright, Texas A&M University

Following training, novel motor memory is initially fragile before consolidation processes render the memory stabilized into long-term memory. Of
the two types of time-dependent consolidation processes that occur following training, those associated with sleep have attracted the most attention at the cost of consideration for processes that occur in the post-training wakeful period. Notably, a range of interventions have been shown to provide wakeful motor memory including exercise, cognitive task performance and mindfulness meditation for which several questions remain unaddressed. For example, it is not known whether wakeful consolidation interventions are unique or share common features in how they support memory consolidation. To gain some perspective on this issue, we reviewed wakeful interventions for motor memory consolidation. While a range of means have been proposed to explain consolidation from wakeful interventions including exercise-specific increases in physiological arousal and neurotrophic factors levels and mediation-related increases in striatal dopamine, our review revealed overlapping descriptions of consolidation mechanisms associated with attention. As goal-oriented tasks, wakeful interventions share the requirement of increased attention control to maintain task performance. This suggests that states of increased attention control following training might be important for learning outcomes. Distinct from the role of attention during skill training, consolidation would not require attention control to be skill-specific. There is some discrepancy with this view as it has been shown that states of reduced attention demand, including that associated with mind-wandering or default mode states, following training might better serve memory consolidation. This review has highlighted that while attention control might represent a unifying set of processes by which wakeful interventions provide memory consolidation, these processes remain poorly described and lack empirical evaluation.

Kinematic Predictors of Standing Long Jump Distance in Novice Performers

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The standing long jump (SLJ) is often used to assess physical fitness and athletic abilities in various age groups. Several studies have suggested that SLJ performance is determined by a variety of kinematic factors and is positively influenced by use of external focus (EF) cueing compared to internal focus (IF) cueing. Fewer studies, however, have looked at the effects of cueing on the underlying factors that may lead to improved jump performance. The aim of this study was to examine the effects of cueing on projection angle (PA) at take-off and peak lower extremity (LE) joint angles in the CM phase as they relate to SLJ distance in novice performers. Thirty-one participants with no formal training in the SLJ performed seven jumps in a randomized order (no cue=1, IF=3, and EF=3). Jump distance was measured in centimeters (cm). Internal LE joint angles were measured using 3D motion capture, PA was calculated as the angle between the shank and horizontal, immediately after take-off. Statistical analysis included one-way repeated measures ANOVAs and forward linear regressions. P-values<0.05 were considered significant. As expected, the EF cue led to significantly greater jump distance compared to the IF and no cue conditions. The EF cue also significantly led to a more optimal PA (45.5±6°), which predicted about 17-22% of jump distance in the IF and no cue conditions. IF and EF cues significantly reduced peak ankle dorsiflexion (DF) and knee flexion angles compared to no cue. Peak ankle DF had a significant, negative, moderate relationship with jump distance and was identified as a significant predictor of jump distance in all jump conditions (R2=28-33%). These results suggest that cueing, EF cues in particular, leads to better SLJ performance due in part to a more optimal PA at take-off and reduced peak ankle DF and knee flexion in the countermovement phase. However, a significant percentage of jump distance has yet to be accounted for when considering other kinematic factors (e.g. joint velocity), kinetic factors, and/or muscular contributions to the SLJ.

The Effect of Implicit Learning on Motor Performance Under Psychological Pressure: A Meta-Analysis

Daniel Cabral, Auburn University; Alan Wilson, Auburn University; Matthew Miller, Auburn University

Reinvestment theory predicts that motor skills learned implicitly should be less susceptible to deterioration under psychological pressure (i.e., choking) than skills learned more explicitly. In this meta-analysis, we investigated that prediction. A systematic search was conducted for articles that had participants learn a motor skill implicitly relative to a comparison group and had both groups perform the skill under low- and high-pressure conditions. Ten studies with a median of 9 participants/group met the inclusion criteria. Results revealed that participants who learned a motor skill implicitly performed better under a high-pressure condition than a low-pressure condition (Hedges’ gav = -1.06, 95% lower CI = -1.75, upper CI = -0.37), whereas participants in the comparison group performed similarly between conditions (Hedges’ gav = 0.18, 95% lower CI = -0.25, upper CI = 0.62). For the implicit learning group, funnel plot visual inspection showed an asymmetrical distribution and a significant negative relationship between effect size and precision was found. In conclusion, results confirm reinvestment theory’s prediction that implicit motor learning benefits performance under pressure, but the benefit is due to implicit learning improving performance under pressure rather than preventing choking. Furthermore, this effect might be distorted by bias and driven by underpowered studies.


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In the near future, elder adults aged >65 will make up more than 50% of the population in developed countries. It is therefore increasingly important that elder adults maintain the ability to retain and relearn motor functions as this can facilitate an active quality of life for increased health and wellbeing. Current health systems typically rely on a ‘one-size-fits all’ for motor learning due to limited resources despite wide-ranging differences in physiology, cognitive and motor capacities in the ageing population. We hypothesize that, compared to generic programs, increased benefits are possible when implementing an individualized learning approach, which we call Individualized COgnitive and Motor learning for the Elderly (ICOME). Firstly, to unpack motor sequence learning and related phenomenon such as motor chunks and concatenation, we outline how ICOME is grounded in prominent theoretical sequence learning models like the Cognitive framework for Sequential Motor Behavior (Verwey et al., 2015). Cognitive control is an important consideration that generic programs often fail to consider, which we think meditation as a cognitive practice can offer additional enhancement benefits. To monitor changes in cognitive control, we review the use of event-related synchronization/desynchronization (ERS/ERS), a form of frequency decomposition in electroencephalography during motor sequence learning. We specifically target changes in Alpha bandwidth (µ/ µu) of 8 – 13 Hz and Beta bandwidth of 15 – 30 Hz in the ERS/ERS, that are most relevant for changes in cortical activity over the motor cortices during sequence execution. Lastly, we unify the topics with modelling predictions across behavioral and cortical measures to test the effectiveness of the ICOME approach. For example, we predict that using the ICOME approach will result in greater reductions of Beta ERD (pre and post movement) across learning modelled against reaction time reductions, compared to using a generic motor learning approach. Funding source: This
The Effect of Resistance Training on the Muscle Strength of Rural Elderly  
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Chung-Kai Wang, National Chung Cheng University  

According to the “Sports Status Survey” of Taiwan’s Ministry of Education over the years, most elderly people lack resistance exercises. The elderly with good muscle fitness can strengthen life adaptation and reduce the chance of falls or sarcopenia, thereby reducing the risk of illness, disability, and death. Our team previously reported that a combination of aerobic exercise and yoga could not improve the elderly’s muscle strength. Thus, this study aimed to investigate the effect of a 12-week resistance training program on muscle fitness of rural elderly. The participants were retired farmers, and the program consisted of a 120-minute systemic resistance training class once a week for 12 consecutive weeks. The exercise intensity was maintained above moderate on the Rate of Perceived Exertion Scale. The senior fitness tests, 30-second chair stand test (CST) and 30-second arm curl test (ACT), were applied to evaluate the pre and post-training program’s effectiveness. The data were analyzed by GraphPad Prism v9.0 software and presented as mean±standard error of the mean. The data were analyzed by the two-tailed paired t-test (P≤0.05 is considered significant). Participants were 14 retired farmers from a rural community with an average age of 77.86 (70-88 years old; 71% female). The classes were carried out during their weekly gathering time. Before and after the program, the averaged CST were 12.0±0.44 and 15.9±1.33 stands, and the averaged ACT were 17.6±1.05 and 19.6±1.11 curls, respectively. The training significantly improved the muscle fitness (P=0.001 and 0.022, respectively). Therefore, a 120-minute systemic resistance training class once a week for 12 weeks can improve the elderly’s muscle fitness. In the future, it will be interesting to investigate if this short-term training’s effectiveness was due to neural adaptation. Funding source: N/A.

The Influence of Gravity on In-Phase Coordination  
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With the possibility of commercial space flight and humans going to the Moon in the near future and eventually Mars, it is imperative to understand the influence of gravity on human performance during space exploration. The current investigation was designed to determine the influence of gravity on bimanual coordination. A tilt table was used to simulate gravity on Earth (90° head-up tilt (HUT)), Mars (22.3° HUT), the Moon (9.5° HUT), and microgravity (-6° head-down tilt (HDT)) environments. Right limb dominant participants (N=12) were required to produce a rhythmic 1:1 in-phase coordination pattern by producing a pattern of force with their left and right arms simultaneously. Lissajous information was provided to guide performance. Participants performed 14 practice trials at 90° HUT (Earth). Following a 30 minute rest period participants performed 2 test trials for each gravity environment (Earth, Mars, Moon, microgravity) in a counterbalanced order. Each trial was 30 s. The results indicated that participants were able to effectively perform the task in all four environments and no differences between conditions were observed for measures associated with the timing of the task (inter-peak interval, STD of the inter-peak interval). Interestingly, however, differences were observed for measures associated with force production (mean force, STD of force).

Results indicated that mean force production for the left limb was significantly greater for Earth than for the other 3 gravitational environments. Results also indicated force variability was greater for the left limb for Earth than in the microgravity environment. These results suggest that gravity influences our ability to produce and coordinate forces between the limbs and further research should explore the constraints associated with bimanual coordination in various gravitational environments.

Beyond the Biomechanics: How Knee Factors, Physical Activity, Depressed Mood, and Health Modulate the Relationship Between Obesity and Altered Gait  
Phillip Desrochers, Boston University; Maria Ayoub, Boston University; Simone Gill, Boston University  

Obesity alters gait as indicated by shorter, wider steps and decreased gait velocity. However, many individuals with obesity have co-existing conditions that could modulate the relationship between obesity and altered gait. We investigated how knee pain (KP), knee buckling (KB), depressed mood (DM), physical activity (PA), and physical health (PH) modulate the effect of obese BMI on spatiotemporal gait parameters. Forty-one individuals with obesity (40 women, Median Age=48, IQR: 38-51) performed a gait task on a pressure sensitive walkway (GaitRite, CIR Systems Inc., Franklin, NJ) which measured spatiotemporal gait parameters. Participants walked unobstructed down the walkway and crossed an 8 cm obstacle for five trials each. The obstacle magnified altered gait parameters by imposing an external constraint. Participants rated KP using the visual analog scale and reported instances of KB within three months. DM was reported via the Center for Epidemiologic Studies Depression scale, PA was evaluated with the Physical Activity Scale for the Elderly, and PH was evaluated using the SF-12 Health questionnaire. For each independent variable (IV), dependent variable (DV), and mediator/moderator set, we regressed three spatiotemporal DVs (gait velocity, step length, and step width) onto two IVs (BMI and waist circumference), with KP and KB as mediators and DM, PA, and PH as moderators. We found that DM moderated the relationship between obese BMI and step length (β=0.04, p≤0.05), waist circumference and step length (β=0.04, p≤0.05), and waist circumference and gait velocity (β=0.04, p≤0.05) in the baseline condition only. PH also showed a marginal moderation of the relationship between obese BMI and step width (β=0.06, p=0.09) in the obstacle condition only. These results suggest that DM may act to modulate gait in people with obesity, but that participants retain the ability to respond to external constraints. Further, poorer PH may magnify the effects of obesity on gait, such that participants who have obesity and worse PH take wider steps when navigating an obstacle.

Coordination Variability Analyses of Discrete Motor Actions: How Many Trials are Enough?  
Scott Ducharme, California State University, Long Beach; James Becker, Montana State University; Will Wu, California State University, Long Beach  

For the past several decades, variability analyses of the coordinative relationship between body segments and joints (i.e., coordination variability [CV]) have provided meaningful insight into the behavioral mechanisms and strategies of the motor control system. However, these analyses are almost always performed on continuous tasks, such as walking or running, and these types of tasks typically require numerous trials to assess. The purpose of this study was to determine the minimal number of trials needed to quantify CV in a discrete task; herein the standing long jump (SLJ). Twelve healthy college aged individuals (age 21.4 ± 1.1 yr; height 1.71 ± 0.19 m; mass 71.9 ± 11.9 kg) performed 10 SLJ trials separated by 2-min rests. Instructions were to ‘jump as far as you can’.
Retroreflective markers were placed on bony landmarks and used to create sagittal plane ankle, knee, and hip joint angles. The SLJ action was divided into the descending (from start of downward motion to peak knee flexion) and takeoff (from peak knee flexion to toe off) phases. Knee-hip (KH) and knee-ankle (KA) coordination was defined as the coupling angle between joints using a modified vector coding technique. CV was defined first as the standard deviation across each percentage (0-100%) of a given phase, and then as the average across the phase. We performed a sensitivity analysis, whereby the CV magnitude across the first 2 trials was divided by the CV magnitude across all 10 trials. This process was repeated for the first 3, 4, 5...9 trials. The results revealed that 3 trials were needed to account for ≥80% of the total CV magnitude for the KH and KA in both the descending and takeoff phases (range = [79.9, 88.8%]). At least 90% of the total CV was achieved in 5 trials for the KH downward (91.25%) and takeoff (94.64%) phases and the KA takeoff phase (93.53%), while a 6th trial was required to attain ≥90% in the KA descending phase (90.34%). These findings provide preliminary guidelines for determining experimental design when quantifying CV in the SLJ motor task in the sagittal plane. Funding source: NA.

Massed or Distributed Practice? Examining What Improves Learning of Complex Motor Skills
Leandro Dutra, Universidade Federal de Minas Gerais; Gylton Da Matta, Colorado State University; Cicero Costa, Instituto Federal de Educação, Ciência e Tecnologia do Ceará; Herbert Ugrinowitsch, Universidade Federal de Minas Gerais

Although the distribution of practice represents a traditional research topic in motor learning, there is a compelling need to investigate its effects on complex motor skills since different inter-trials intervals have been used, and different results have been reported. This study aimed to investigate the distribution of practice through different inter-trials intervals on learning a complex motor skill. Subjects (N = 36, Mage = 13.8 ± 1.0 years) participated in this study performing the volleyball overhand serve (complex skill). Three experimental groups were carried out: massed practice (1sec-inter-trials interval-G1) and 15 sec distributed practice and 40 sec distributed practice (inter-trials intervals of 15 sec and 40 sec-G15 and G40, respectively). All groups performed 12 trials in the pre-test, 200 trials in the acquisition divided in three days, and 12 trials in the retention test after one week. Comparing the three groups’ performance accuracy and consistency on pre-test and retention tests was run through two-way ANOVA (3 Groups x 2 Blocks). The results showed that the three groups increased performance accuracy from pre-test to retention, but G1 was more accurate than G15 and G40 on the retention test (p < 0.008, CE = 0.498, 3.851). Likewise, the three groups increased performance consistency, but G1 was more consistent than G15 and G40 on the retention test (p < 0.003, CE = -2.917, -0.508). Moreover, the G1 showed larger magnitudes of effect sizes for accuracy and consistency measures, notably concerning G15. In general, findings demonstrated better learning for shorter inter-trials intervals than longer inter-trial intervals. Massed practice leads to better retention of learning towards volleyball serving compared to distributed practice. These findings seem relevant insights for pre-service teachers to optimize their teaching effectiveness through massed practice. More research is needed with other complex skills to embrace a broader generalization of learning effectiveness through short inter-trials intervals. Funding: CAPES, Brazil. Funding source: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES, Brazil).

Analyzing the Variability of Relative Timing in Volleyball Spike
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The Motor Control area has investigated the outcome and movement organization variability. The variability movement organization may change during the execution, suggesting that the neuromotor system’s organizational properties may also change. In complex interceptive timing actions, the variability can be quantified through the coefficient of variation of the relative timing, i.e., the proportion of time for each component of a motor skill in relation to the total movement time. The volleyball spike has five components: 1) approach, 2) takeoff, 3) arm loading phase with backswing of the attack arm, 4) arm acceleration phase with the forward motion for ball contact, and 5) landing. However, only the approach, arm backswing, and forward can vary for timing adjustments. The purpose of this study was to identify which component has the most variable relative timing, which will indicate an association with the adjustments of the spike’s coincident timing. This study was carried out at the Nebraska Athletic Performance Laboratory (NAPL) at the University of Nebraska (UNL). The sample consisted of seven American college volleyball athletes (Mage = 20.57 ± 1.27 years) from an NCAA Division I college team. The participants performed a sequence of 10 spikes with an experienced setter, and we selected five successful attempts for analysis. Static markers, reflective to infrared light, were placed at specific anatomical landmarks for analysis. The motion trajectories were captured using 12-cameras Qualisys Pro Reflex with a speed of 300 Hz using the Qualisys Track Manager software. The results of the average coefficient of variation (CV) of the relative timing of the attempts were represented for the three components: approach (CV= 6.50%), backswing (CV= 21.66%), and forward swing (CV= 10.41%). The findings through one-way ANOVA indicated higher variability on backswing than on approach and forward swing. In conclusion, backswing is the relevant component associated with adjustment of the coincident timing during the volleyball spike. Funding: NAPL, UNL and CAPES, Brazil. Funding source: Nebraska Athletic Performance Laboratory (NAPL), University of Nebraska (UNL).

Meta-Analysis of Enhanced Expectancies in Motor Learning
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The present meta-analysis aimed at investigating the effect of enhanced expectancies on motor learning by quantifying the size of the effect across studies that manipulated positive feedback, social-comparative feedback, perceived task difficulty, conceptions of ability, self-modeling, and extrinsic rewards. After systematically searching the databases PsychINFO, Web of Science and PubMed, 48 studies met the inclusion criteria and were included in the quantitative analysis. A total of 54 effect sizes were calculated based on behavioral performance differences between enhanced expectancies and neutral/diminished expectancies groups at delayed retention tests (≥24h). Results of the random-effects model showed that the best estimated effect of enhanced expectancies on motor learning is a Hedges’ g of 0.51 (95% CI[0.35, 0.68]). Individually, positive feedback (g = 0.69, 95% CI [0.35, 1.02]), social-comparative feedback (g = 0.62, 95% CI [0.31, 0.92]) and perceived task difficulty (g = 0.49, 95% CI [0.17, 0.80]) manipulations were also shown to have a moderate effect on motor learning, whereas a limited number of studies using the other manipulations precluded reliable estimates of their effects. A second moderator analysis revealed that contrasting enhanced
expectancies against neutral or diminished expectancies. The findings did not result in evidence of different effects. Overall, not only do these findings support the predictions made by the OPTIMAL theory of motor learning (Wulf & Lewthwaite, 2016), but they also provide an effect size estimation that can be used by motor learning researchers to design more powerful studies.

**Gender Stereotype Effects on Performance and Learning of a Gymnastic Skill in Boys**

*Rubia García, Federal University of Pelotas; Suzete Chiviacowsky, Federal University of Pelotas; Erick Fernandes, Federal University of Pelotas; Priscila Cardozo, Federal University of Pelotas*

Recent research with adults has demonstrated that gender, age, and weight stereotypes can impact not only immediate performance, but also the learning of motor skills in general. The objective of the present study was to investigate whether gender stereotypes influence performance and learning of a gymnastic skill involving balance in a standing position — the arabesque — in 10-year-old boys. The participants were divided into three groups. After a pre-test and before practice they were informed that, in general, boys tend to show worse results compared to girls (stereotype threat condition, ST), that girls tend to show worse results compared to boys (stereotype lift condition, SL), or they did not receive stereotype related information (control). One day later, retention and transfer tests were performed. The results showed significant differences between the groups in practice, retention, and transfer — with superior time in balance for the SL group compared to the ST and control groups. These findings confirm previous stereotype results that showed higher performance in male adult participants provided with information questioning the ability or value of members of an external group (stereotype lift) and provide the first evidence that motor performance and learning in boys are affected by gender stereotypes. Future studies could investigate the potential underlying mechanisms of such effects as children’s perceptions of competence or their enhanced expectancies for performance.

**The Effect of COVID-19 on National Hockey League Shooting Accuracy**

*Olivia Garrett, University of Tennessee, Knoxville; Andrew Strick, University of Tennessee, Knoxville; Logan Markwell, University of Tennessee, Knoxville; Jared Porter, University of Tennessee, Knoxville*

The COVID-19 lockdown has changed many aspects of our daily lives and society. Additionally, all sports in the United States of America developed safety protocols to protect athletes and team personnel. The National Hockey League (NHL) adopted new guidelines in order to adapt to the risks imposed by the pandemic. The NHL 2019-2020 regular season was interrupted in March 2020 and was reconvened for the Stanley Cup playoffs in August 2020. The NHL created two “hubs” — cities with 12 teams in each “hub”, where the players quarantined, and fans were prohibited from attendance. The NHL differed from other professional sports leagues by adopting two separate hubs instead of one bubble. During this time, some reports indicated increases in shooting accuracy at record breaking levels. Therefore, the purpose of this study was to examine the difference in shooting accuracy between the games played before and after the COVID-19 lockdown. The analysis showed a significant decrease in shooting accuracy post COVID-19 in comparison to the pre COVID-19 season. In the pre COVID-19 season, goals made over total shot attempts were 9.5%, compared to the post COVID-19 season which had an 8.7% in goals made over shot attempts. While previous reports suggested that shooting accuracy improved in certain sports following the COVID-19 lockdown, our results demonstrate that there was a decline in NHL shooting accuracy during the games played within the “hubs.” One possible reasoning behind this could be that the goalies in the NHL were less distracted without fans being present in the arena. This may have led to an enhanced ability to focus and increased shot blocking abilities, which could be indirectly observed in the decrease in shooting accuracy during the post COVID-19 season.

**Transfer Performance From a Circular to a Non-Circular Chainring**

*Thomas Haab, Saarland University; Peter Leinen, Saarland University; Stefan Panzer, Saarland University*

Questions regarding motor transfer arise when mechanical properties of equipment changed because of sports technical innovative developments. Athletes must transfer a task permanently, purposefully taking account of the changed mechanical properties. This kind of transfer has received only moderate attention. The present study examined a change from a circular (C) to a non-circular (NC) chainring on a cycling-ergometer and scrutinized if the transfer performance is permanently present. The participant’s task was to learn a cadence at exactly 70 rounds per minute (50 % individual watt maximum). Participants were blindfolded to avoid visual control so that movement patterns were represented only via proprioceptive feedback. The participants (N = 36) were randomly assigned to one experimental group (EG: n = 12) and two control groups for each chainring (CG-C: n = 12 and CG-NC: n = 12). EG came in the laboratory on three consecutive days and CCGs on two different days. Acquisition phase was on Day 1 (EG, CG-C) and Day 2 (EG, CG-NC). Day 3 required two tests where all participants cycled with both chainrings in counterbalanced order. Dependent variable was the total variability error (E) of the cadence. To reduce variability due to crank rotation fluctuation at the beginning of pedaling, error calculation started without the first ten crank rotations. Positive transfer from the change of the C to the NC chainring was expected. However, a loss of retention performance for the NC chainring at EG performers was hypothesized as a result of proactive interference. Results reveal that all groups increased their performance during acquisition phase. Transfer performance from C to NC in the EG was positive (29 %). A 3 (Group) x 2 (Test) ANOVA with repeated measure on the last factor indicated no performance differences on
Day 3 between the groups ($F(2,33) = 1.40, p > .05$) and across tests ($F(1,33) = 2.02, p > .05$). These results indicated that previous practice on the original equipment induces positive transfer and no loss in retention.

**Perception of Self-Motion via Haptic Flow**

*Steven Harrison, University of Connecticut*

The visual, vestibular, and haptic perceptual systems are each able to detect self-motion during locomotion. Such information can be integrated during locomotion in order to perceive traversed distances. This process is referred to as odometry. Visual odometry relies on information in optic flow patterns. Analogously, haptic odometry can be said to rely on information in haptic flow patterns. Information about self-motion in haptic flow is associated with the movements of the legs and associated tissue deformation patterns detectable by the haptic perceptual system. Two theories regarding the information about self-motion in haptic flow patterns have been proposed. These theories are gait symmetry theory and the spatial reference frames theory. These theories have been used to explain why different gait patterns produce distinct measurements of distance traveled, such that when gait is changed across the outbound and inbound phases of a homing task, significant signed errors are sometimes observed. The predictions of the gait symmetry theory are derived from a model of the group symmetry structure of muscle recruitment patterns during legged locomotion. This theory predicts that the haptic perceptual system detects higher order variables defined over patterns of tissue deformation. In spatial reference frame theory, the haptic perceptual system is believed to detect higher order variables associated with limb kinematics. In this theory, differences in how distance is perceptually measured across gaits is believed to result from distinct reference frames (i.e. either proprioceptive or exteroceptive) that are assumed to embed the measurements. In a series of recent studies, we have obtained evidence that is contrary to the key predictions of the gait symmetry theory, and that is consistent spatial reference frame theory. We have also found support for a surprising prediction of the spatial reference frame theory, namely that haptic perception of self-motion, and visual perception of another person’s motion should possess the same error structure.

**Attentional Focus in Trained Cyclists and Runners During Different Training Intensities**

*Lauren Q. Higgins, University of North Carolina at Greensboro; Masa-hiro Yamada, University of North Carolina at Greensboro; Louisa D. Raisbeck, University of North Carolina at Greensboro*

Field-based research of attentional focus (AF) in endurance athletes is limited with respect to the effect of training intensity on athletes’ thoughts and focus. Using a newer conceptual framework of AF in endurance athletes, our goal was to examine associations between endurance sport (e.g. cycling and running) and AF during different training intensities. Participants (N=37 Cyclists, 45.08±13.06 yrs and N=35 Runners, 38.58±11.95 yrs) completed an online survey with open-ended questions about their training and racing history, and what they most often think about or focus on during training sessions of varying intensities (e.g. endurance, tempo work, intervals, and max effort). Two raters independently coded responses into the 7 categories of the conceptual model: internal sensory monitoring (ISM), active self-regulation (ASR), external outward monitoring (EOM), active distraction (AD), and involuntary distraction (ID), internal focus (IF), and external focus (EF). Coded responses were reviewed and an agreement was made for discrepancies. Chi-square tests of independence were conducted between AF categories and sport for each training intensity. Compared to runners, cyclists reported significantly greater EOM during endurance ($X^2(1)=9.44, p=.002$), tempo ($X^2(1)=4.77, p=.029$), and interval ($X^2(1)=3.89, p=.049$) sessions. No other significant differences were observed in AF between sports; however, ASR was reported most often by both sports. Thus, ASR was further characterized into 4 categories: holistic execution, technique, strategy, and motivation. Cyclists reported significantly more focus on holistic execution (e.g. going fast, relaxing) during endurance ($X^2(1)=6.93, p=.008$), tempo ($X^2(1)=5.79, p=.016$), and max effort sessions ($X^2(1)=5.29, p=.021$), with runners reporting more focus on technique during endurance ($X^2(1)=6.50, p=.011$), interval ($X^2(1)=4.12, p=.042$), and max effort sessions ($X^2(1)=18.12, p<.001$). These data suggest that regardless of training intensity, cyclists tend to focus on EOM and holistic execution, while runners tend to focus on technique.

**Virtual Lab Toolbox: Infrastructure and Reliability of Translating In-Lab Motor Tasks to an Online, Unsupervised Version**

*Andrew Hooyman, Arizona State University; Sydney Schaefer, Arizona State University*

The capability to continue human movement research during an unprecedented era of limited face-to-face contact is imperative. Fortunately, converting some established lab-based human movement paradigms to an online space is possible at minimal cost using common internet tools and open-source software (i.e., a virtual lab). However, navigating technical limitations within this space and determining the reliability is critical. The purpose of this abstract is to 1) outline the infrastructure needed to translate an experimental motor paradigm from a typical face-to-face laboratory setting into a secure online space, and 2) demonstrate the reliability of motor data collected online. Motor tasks that require button presses only are ideal for translation to an online space using a free software known as Unity. We have found that Unity, a gaming software, is capable of reliably collecting and storing continuous cursor position and acceleration data at 100 Hz. To deploy online, the motor task was converted into a Unity game and hosted on an online server as a web graphic library (WebGL). Currently, prices for secure server and domain name space cost approximately 500 US dollars for a 4-year commitment. This comes with 3 GB of storage space within a relational database that is capable of storing all standard forms of data, i.e. numeric, integer and character as both short and very long vectors. Unity WebGL objects can be directed to have their data projected and stored within the relational database. Then, to determine the reliability of this approach, we played a previously-developed motor learning video game requiring sequential key presses (SuperG) and the data were stored directly to the computer hard drive and the online relational database simultaneously to compare the two data storage methods directly. The data stored online was 99.8% identical to that of the data stored locally, thereby demonstrating that the proposed methods are reliable and affordable for online, unsupervised collection of (certain types) of human movement data.
of QE, is to assess which event-related neural processes align temporally with QE. To achieve this, we first limited the analysis to self-initiated tasks and established the movement preparation, programming QE and online QE durations from published papers to identify an average timeline reference. Next, we incorporated temporal markers associated with several movement-related cortical potentials, examined event-related synchronization/desynchronization, and reviewed timelines for EEG rhythms associated with attention, inhibition, goal-directed control, and the binding of inputs from diverse networks. Finally, we aligned the time course of neural events in specific brain areas from published papers related to movement planning and execution, attention, and postural control, working from EMG muscle responses back to the presentation of the stimulus. Here, we also focused on the temporal variability of processes, knowing that those underlying QE would need to account for significant variability across tasks and participants. After completing this process, we reassessed the feasibility of the aforementioned theories. We present the results of this analysis, with focus on proposed models and a neural dynamics approach. We present support for a postural-kinematic hypothesis, delimit the likely contributors to a motor planning theory, and propose that QE can also be explained through an accumulator model.

Attentional Focus Effects on Joint Covariation in a Reaching Task
Charlend Howard, Louisiana State University; Nikita Kuznetsov, Louisiana State University

Adopting an external focus of attention (EF) is generally beneficial over internal focus (IF) for performing motor skills. Previous studies primarily examined focus of attention (FOA) effects on performance outcomes (error and accuracy), with relatively less emphasis on movement coordination. Given that human movements are kinematically and kinetically abundant (Gelfand & Latash, 1998), FOA instructions may change how motor abundance is utilized by the CNS. This study applied the uncontrolled manifold analysis (UCM) to address this question in a reaching task. Healthy young adults (N = 19; 21 ± 1 yr; 5 men, 14 women) performed planar reaching movements to a target while grasping a wooden dowel with their right hand without online visual feedback at preferred movement pace under three different FOA instructions: no-focus (NF), EF, and IF. Joint angles of the clavicle-scapula, shoulder, elbow, and wrist were recorded, and their covariation for controlling dowel endpoint was analyzed via the UCM. As expected, EF led to more accurate aiming performance than IF. Consistent with this result, the UCM analysis showed that EF led to lower goal-relevant variance among the joints (VORT) than IF during all phases of the reach. However, EF also decreased goal-irrelevant variance (VUCM) compared to IF. The index of stability of joint coordination with respect to endpoint position (ΔAV) was not different between the EF and IF. These results provide further evidence that FOA instructions affect the kinematics of skill execution. We suggest that the benefit of EF may be conceptualized within the exploration-exploitation tradeoff and that each instruction may provide unique benefits to task performance: IF encourages exploration of joint covariation patterns at the cost of accuracy, while EF encourages performance outcome optimization at the cost of reducing the space of joint covariation. Funding source: N/A.

Characteristics of Sub-Movement in Space-Time Constraints
Tsung-Yu Hsieh, Fu Jen Catholic University; Mathews M. Pacheco, University of São Paulo

Discrete movements are ubiquitous in life and theories in motor control have been trying to accommodate and explain these movement properties. These movements can be, through kinematic (velocity and acceleration) profiles, decomposed in sub-movements. Sub-movements characteristics and their prevalence are said to reflect different strategies and mechanisms in motor control. Thus, it is expected that task constraints will modify the types and prevalence of sub-movements. Here, we systematically examined the effects of an aiming-time-minimization task with eight movement amplitudes (5-40 cm), and two different target sizes (1 and 2 cm) on the movement kinematics and characteristics of sub-movements. Twenty participants performed 40 trials for each task-condition combination. The ANOVA revealed the expected effect on movement time and end-point variability given movement amplitudes and target widths. In terms of sub-movements, we found a trade-off between movements composed of a single sub-movement and overshooting sub-movements. Target width was the most influential variable in modulating sub-movement characteristics and prevalence. The findings suggest that sub-movements are adapted in terms of the precision demands of the task (target width), rather than movement amplitudes. Funding source: MOST 108-2410-H-030-060; MOST 109-2410-H-030-062.

The Effect of Attentional Focus and Task Difficulty on Movement Variability in a Balancing Task: An Uncontrolled Manifold Approach
Chen-Ju Hung, Texas Woman’s University; Kevin Becker, Texas Woman’s University

The benefit of an external focus for motor performance has been consistently reported in the literature (Wulf, 2013). Recently, Hung and Becker (2020) tested whether the external focus benefit may stem from improved functional movement variability. They used an uncontrolled manifold (UCM) approach in a study where participants balanced on inflatable balance discs while using an internal focus (IF) and external focus (EF). Results showed no differences between conditions in postural sway nor in movement variability assessed by UCM. The authors speculated that low task difficulty diluted attentional focus effects resulting in no differences. The purpose of the present study was to extend this work by using two levels of task difficulty in a similar design. Young healthy adults (N = 36) balanced on inflatable discs while standing (low difficulty) and squatting (high difficulty). For each level of difficulty, they completed three baseline trials, three EF trials (focus on minimizing movement of the disc), and three IF trials (focus on minimizing movement of the feet). All trials were 10 seconds in duration. The order of task difficulty was counterbalanced and the focus condition order was randomized. Kinematic and COP data were captured by 9 Vicon infrared cameras (250 Hz) and 2 AMTI force plates. Separate factorial MANOVAs assessed differences due to focus and difficulty for postural sway (SD of COP in anterior/posterior and medial/lateral directions, SD_{COPx} & SD_{COPy}) and movement variability as assessed by UCM (V}_{UCM} and V}_{ORT}). Sidak post-hoc tests were used for pairwise comparisons. Results showed there was reduction of postural sway in the anterior/posterior direction (SD_{COPy}) in EF compared to IF and baseline (p = .024, p < .001, respectively). UCM measures showed no differences between an EF and IF, but there was a reduction of V}_{UCM} in the EF condition compared to baseline (p = .009). While behavioral benefits of an EF are consistent with previous research, the hypothesis that an EF promotes greater functional variability was not supported.

Failure to Demonstrate an ‘Expecting to Teach’ Benefit: A Replication and Extension Experiment
Julia Hussien, University of Ottawa; Brad McKay, University of Ottawa; Michael Carter, McMaster University; Zachary Yantha, University of Ottawa; Hugh Brooks, University of Ottawa; Jordin Hassin, University of Ottawa; Malick Turenne, University of Ottawa; Diane Ste-Marie, University of Ottawa

The expecting to teach phenomenon was first reported in the motor learning literature by Daou and colleagues and suggested learners benefit from...
practicing with the understanding they will later need to teach the skill. While expecting to teach has been shown to enhance motor learning, the mechanisms linked with this benefit are yet to be determined. Also considered here were recent recommendations for conducting high-powered, pre-registered replications in the motor learning field. As such, this study sought to replicate the expecting to teach effect and to extend those findings by exploring participants’ thought processes. Participants (N=76) were randomly assigned to one of two groups in which they were told that they were learning a golf putt in order to 1) be tested on the skill or 2) to teach the skill to another individual. On Day 1, participants completed pre-test putts, a pre-acquisition intrinsic motivation inventory (IMI), study of an instructional booklet, 50 practice putts and a post-acquisition IMI. During practice, participants were also afforded opportunities to continue studying the booklet and to complete additional putts. Participants returned 24-hours later to complete a retention test, a transfer, and a free recall test, as well as a post-study survey to reveal thoughts they engaged in after practice but before (or during) the retention test. Similar to Daou et al., no significant differences were found with study time, number of acquisition putts, or motivation. Golf-putting performance during retention and transfer, however, unlike Daou et al., resulted in no differences for radial error \( (g = -.14, 95\% \text{ CI } [-.56, -.28]) \) or bivariate variable error \( (g = .07, 95\% \text{ CI } [-.37, .52]) \) between the two groups and no differences for the free recall test emerged. These results are inconsistent with large expecting to teach benefits, but does not rule out modest effects. Although unable to fully replicate the findings of an expecting to teach benefit, the post-survey results did suggest differences in the thought processes engaged in between the two groups.

Mind the Sequence: Long-Term Mindfulness Meditation Training Enhances Motor Sequence Performance and Representation in Older Adults

Maarten A. Immink, Flinders University; Russell W. Chan, University of Twente

Mindfulness meditation techniques have been shown to enhance attention, working memory and learning. As such, regular mindfulness training might be effective in reducing motor sequence learning deficits observed in older adults. Learning in the serial reaction time (SRT) task was compared between 15 older adults (6 females, \( M_{\text{age}} = 59.8 \pm 4.7 \) years) with a mean of 2,862 hours (± 3,460.6, range 442.5 – 13,167 hours) of mindfulness meditation experience and 13 healthy control older adults (7 females, \( M_{\text{age}} = 60.1 \pm 54.7 \) years). Meditators \( (M = 42.4 \pm 4.6) \) scored significantly higher on the Freiburg Mindfulness Inventory than controls \( (M = 32.8 \pm 7.2, p < .001) \). Across 20 blocks of the SRT with an embedded 12-item, second-order conditional sequence, meditators \( (M = 480.5 \pm 103.8 \) ms) performed with significantly shorter reaction time than controls \( (M = 632.4 \pm 204.2 \) ms, \( p < .001 \) ). A significant block main effect \( (p < .001) \) and non-significant group x block interaction \( (p = .17) \) indicated that both groups demonstrated equivalent rates of improvement. However, meditators \( (M = 118.0 \pm 92.0 \) ms) demonstrated significantly higher transfer costs than non-meditators \( (M = 19.2 \pm 146.5 \) ms, \( p < .05 \) ) in a final, novel sequence SRT block. Furthermore, meditators performed significantly higher in recall of the 12-item practiced sequence \( (47.2\% \pm 11.6 \text{ vs } 29.5\% \pm 12.6, p < .001) \). Higher transfer costs and sequence recall in meditators indicates that a greater extent of motor sequence learning contributed to SRT improvements in this group. In contrast, the control group’s improvements were based on general practice effects. With respect to motor sequence behavior, these results highlight two important benefits of mindfulness training in older adults. Mindfulness training might reduce response latencies by enhancing selective attention and response inhibition processes. Motor sequence learning in older adults could as well benefit from mindfulness training through enhanced working memory function resulting in better capacity for development of sequential representations.

Attention, Working Memory and Cognitive Flexibility Determinants of Visual-Motor Performance

Maarten A. Immink, Flinders University; Alex Chatburn, University of South Australia; James Baumeister, University of South Australia; Mathias Schlesewsky, University of South Australia; Ina Bornkessel-Schlesewsky, University of South Australia

Determining the critical cognitive factors contributing to task performance is essential for formulating personnel or athlete selection testing protocols and to develop task-relevant cognitive training interventions. As attention, working memory capacity (WMC) and cognitive flexibility, the capacity for set switching and stimulus adaptation, are frequently represented in cognitive testing and training approaches, the present work aimed to identify their contributions to visual-motor performance in terms of perceptual sensitivity (d-prime), aiming and selection latency and cognitive demands, based on a secondary auditory probe reaction time task. Participants \( (N = 45, 23 \text{ females}, M_{\text{age}} = 22.7 \pm 3.8 \) years) completed the Attention Network Test (ANT), Digit-Span Test (DST) and the Remote Associates Test (RAT) prior to performing an immersive virtual reality marksmanship task involving aiming and selection of visual target stimuli while avoiding selection of non-targets. Based on linear regression, d-prime increased with DST scores \( (\beta = 0.015, \text{ CI: 0.0020, 0.029, } p = 0.03) \) while selection latency decreased as DST \( (\beta = -1.59, \text{ CI: -2.67, -0.50, } p = 0.005) \) and RAT \( (\beta = -1.92, \text{ CI: -1.13, -0.34, } p = 0.006) \) scores increased. Probe reaction time decreased as DST scores increased \( (\beta = -1.23, \text{ CI: -2.80, -0.072, } p = 0.04) \) and increased with poorer ANT executive network performance \( (\beta = 0.39, \text{ CI: 0.022, 0.772, } p = 0.04) \). These results highlight the importance of WMC across perceptual and motor dimensions of visual-motor task performance consistent with the view that WMC is a general attribute of performance. The inverse association between response latency and RAT scores illustrates the relevance of cognitive flexibility for processing speed and orienting towards target information in the presence of distractions. While probe reaction time was intended to index cognitive demands, the associations with WMC and the ANT executive network suggest that probe reaction time more likely reflected an ability to detect and respond to two sources of information simultaneously. Funding source: Human Performance Research Network, Department of Defence, Australian Government.

Laterality, Cognitive Processing, and Reactive Agility

Jeffrey Ives, Ithaca College; Justine Carlson, Ithaca College; Waverly Datner, Ithaca College; Jung Chen Kuo, Ithaca College; Griffin Meyers, Ithaca College; Rebecca Perini, Ithaca College

Locomotor reactive agility (RA) is the ability to rapidly stop, start, and change direction in response to stimuli. The ecological nature of the stimuli is a determinant of RA speed, but there is little information about how stimuli are processed in RA performance. The purpose of the current project was to examine how left and right side brain processing may influence left and right side RA speed. To stimulate left and right side brain processing, a RA task was devised using left and right stimulus lights to elicit the “Simon Effect”. The Simon Effect is elicited when spatial non-congruity (e.g., right side stimulus signals movement to the left) slows down processing compared to spatial congruity. College-aged male and female subjects \( (N = 19) \) were tested over three days for left and right side laterality in handedness and footedness using Waterloo questionnaires, eyendness, and unilateral and bilateral lower limb power and balance. Subjects were tested for agility speed in a stimulus congruent and stimulus non-congruent RA task, and in a similar pre-planned agility (PPA) task. Stimuli in the RA tasks were presented in the left or right eye field of view. ANOVA results showed significantly (58\%, \( p < .001 \)) faster movements for PPA \( (M = 0.704 \text{ s, SD = 0.125}) \) versus RA \( (1.112 \pm 0.100 \) s). PPA had
significantly (4.5%, \( p = 0.015 \)) faster movements to the right side (0.688 ± 0.129 s) versus the left (0.719 ± 0.125 s). However, there were non-significant differences between right (1.110 ± 0.106 s) and left (1.122 ± 0.107 s) RA speed, suggesting that cognitive processing mediated left to right movement differences. Congruent RA movements (1.051 ± 0.100 s) were significantly (12.3%, \( p < .001 \)) faster than non-congruent RA movements (1.180 ± 0.113 s). Neither eye nor foot dominance, nor lower limb measures of power or balance, influenced the results. Overall, these data indicate that stimulus spatial incongruity can play a role in locomotor reactive agility, and further, that movement laterality differences may be compensated for by cognitive processing.

**Arm and Leg Laterality and the Simon Effect**

Jeffrey Ives, Ithaca College; Arianne Baum, Ithaca College; Matthew Flood, Ithaca College; Hope Hiza, Ithaca College; Ryan McNamara, Ithaca College; Jillian Schmidt, Ithaca College

Human laterality in left versus right side performance can impact motor performance from text scrolling to agility. Laterality also exists in brain processing of visual information. How visual information affects limb laterality performance is not well understood, particularly in footedness. Footedness is more variable than handedness because footedness can be categorized into mobility or stability preferences. The aim of this study was to examine if visual information processing speed is influenced by laterality, and if this influence is different between stability and mobility limb preferences. To examine these questions a visuo-motor response time (RPT) task for arm and leg movements was employed using a “Simon Effect” protocol. The Simon Effect is elicited when stimulus spatial non-congruity (e.g., right side stimulus signals movement to the left) slows down processing compared to spatial congruity. To assess mobility and stability components the RPT task positioned subjects such that in some conditions the limbs supported and stabilized the body (standing for legs, inclined push-up position for arms), and in some conditions the body was supported without the limbs (seated). Subjects (\( N = 16 \), \( M_{age} = 21.3 \) yrs) were tested over three days in the RPT task and for laterality in handedness, footedness, and eyedness. All subjects were right-handed and 10 of 16 were right-eyed. ANOVA results showed that as expected the arms were faster than legs, unsupported faster than supported, and congruent faster than non-congruent. However, the right limbs (arms and legs) were significantly (\( p < .001 \)) faster (\( M = 1184 \) ms, \( SD \pm 71 \) ms) than the left limbs (1199 ± 73 ms) under congruent movements, but the left limbs (1244 ± 90 ms) were faster than the right limbs (1251 ± 86 ms) in non-congruent movements, suggesting processing through the right visual field to be faster than through the left visual field. Handedness, eyedness, and footedness in stability or mobility did not influence these results, suggesting that limb preference may have little to do with simple speeded tasks.

**Expectation for Success and Autonomy Support Facilitate Motor Skill Learning in Children**

Takehiro Ivatsuki, The Pennsylvania State University, Altoona College; Seyyed Mohammadreza Mousavi, University of Isfahan

Expectations for success and autonomy support have been shown to facilitate motor learning and enhance motor performance. The purpose of the study was to examine whether we replicated 1) enhanced expectations and autonomy support intervention enhanced motor skill learning in children, and 2) identified the underlining psychological mechanism. Forty-eight girls performed soccer ball kicks with their dominant leg to a squared area target. Participants were randomly assigned to one of the four groups: enhanced expectancies and autonomy support (EE/AS), enhanced expectancies (EE), autonomy support (AS), or control (CON) groups. Participants learning the skill were or were not provided enhanced expectation instructions by making the task success easier and provided an opportunity to choose one of the three colored balls (yellow, blue, red) during their practice. Two days later, they performed retention and transfer tests. Results indicated that the EE/AS group had the highest scores, with main effects of autonomy support being significant (\( p < .05 \)) and enhanced expectancies being only marginally significant (\( p = .069 \)) for the retention and transfer tests. The kicking accuracy scores of the EE and AS groups were higher than those in the CON group. Therefore, having expectation for success and being autonomous were important ingredients for facilitating motor skill learning in children. Psychological mechanisms – confidence and perceived choice – were also discussed.

**A Systematic Review Examining the Influence of Exercise on Falls in Individuals With Dementia**

Deborah Jehu, University of British Columbia; Jennifer Davis, University of British Columbia-Okanagan Campus; Jessica Gill, Carleton University; Teresa Liu-Ambrose, University of British Columbia

Exercise prevents falls in cognitively intact older adults; however, this relationship is less clear in individuals with dementia. Hence, we conducted a systematic review of randomized controlled trials (RCTs) examining the effectiveness of exercise in reducing the rate of falls among older adults with mild to moderate dementia. We included peer-reviewed RCTs evaluating any mode of exercise on falls among older adults with dementia (e.g., medical diagnosis, Mini-Mental State Examination ≤ 23 points, Mini-Addenbrooke’s Cognitive Examination score of ≤ 25 points), and excluded studies if they did not solely involve individuals with dementia. We searched AgeLine (1978-Present), the Cochrane Dementia and Cognitive Improvement Group’s Specialized Register, and grey literature on August 19, 2020. We removed duplicates; screened titles, abstracts, and full-texts; and evaluated the risk of bias using the Cochrane Risk of Bias Tool. Thirteen studies were included (age: 80.7 ± 7.0 years; female: 58.1%; intervention duration range: 12-52 weeks; adherence: 73.0 ± 15.4%; attrition: 21.1 ± 12.6%). The fall rate ranges were 1.1-5.0 and 0.6-5.1 falls/year for the intervention and control groups, respectively (exposure time: 12-52 weeks). Only 1 (7.7%) study was powered for falls and found no effect. All studies had risk of bias because they were: 1) not powered for falls (12 studies, 92.3%); 2) the assessments became unblinded to intervention allocation (5 studies, 38.5%); and 3) falls were subject to recall bias (8 studies, 61.5%). Higher quality research is needed to ascertain the efficacy of exercise to reduce falls in older adults with dementia. Funding source: Dr. Liu-Ambrose is a Canada Research Chair (Tier 2) in Physical Activity, Mobility, and Cognitive Neuroscience, at the University of British Columbia. Dr. Davis is a career scholar funded by the Michael Smith Foundation for Health Research. Dr. Jehu is a funded postdoctoral fellow through the Michael Smith Foundation for Health Research. The funders played no role in the design, conduct, or reporting of this study.

**Cooperation, But Not Competition, Enhances Motor Learning**

Angélica Kaefer, Federal University of Pelotas; Suzete Chiviacowsky, Federal University of Pelotas

Relatedness represents the need to experience satisfaction from interpersonal acceptance and closeness with others and is considered a basic human psychological need. To date, studies testing the effects of supporting learners’ needs in motor learning have manipulated relatedness via instructions from the experimenter as well as observed practice and learning at an individual level (e.g., Gonzalez & Chiviacowsky, 2018).
A different form of influencing the perceived relatedness of learners is through cooperative and competitive learning. In different domains, contexts involving cooperative effort strategies and goals are observed to result in greater positive interpersonal relationship and higher goal achievement in relation to individual efforts or competitive conditions. In this experiment, the effects on motor learning of structuring practice in cooperative and competitive ways was tested. Adolescents participants practiced a task in pairs involving hitting a ball with a racket towards a target, and were assigned to three experimental groups. In the cooperation group, the participants practiced in a cooperative condition. In the competition group, the participants practiced in a competitive condition. Participants in a control group were not induced towards cooperative or competitive contexts of practice. The next day participants of all groups individually performed retention and transfer tests. Questionnaires measured the participants’ motivational and affective levels. The results show that cooperation increases intrinsic motivation, positive affect, self-efficacy, task performance, and learning relative to practice with competitive or control conditions. Perceived relatedness was decreased in the competitive group. The findings add to a growing body of evidence showing the importance of social relatedness in motor performance and learning and highlight the need to further explore its effects on different populations, tasks, and contexts. Funding source: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

Relatedness Support Enhances Motivation, Positive Affect, and Motor Learning in Adolescents
Angélica Kaefer, Federal University of Pelotas; Suzete Chiviakowsky, Federal University of Pelotas

Social relatedness is a basic psychological need to experience satisfaction of interpersonal acceptance and closeness with others. In this experiment, the effects of social relatedness on the learning of a task (hitting a ball with a racket toward a target) were tested in adolescents. Participants were assigned to three experimental groups. After a pre-test and before practice, participants in the relatedness support (RS) condition received instructions emphasizing recognition, importance, and interest in the participant’s experience. Participants in the relatedness frustration (RF) condition received instructions emphasizing disinterest in the participant as a person. Control (CON) participants did not receive specific relatedness instructions. One day later, they performed retention and transfer tests. Questionnaires measured participants’ motivational and affective levels. The results showed that supporting the relatedness need enhances motivation, positive effect, and task learning in adolescents. The findings are the first to show that social relatedness affects adolescent’s motor learning and reveal underlying mechanisms implicated in such effects. Funding source: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

Bilateral Skill Symmetry in Gaelic Football: Perspectives From Performance Analysis, Players and Coaches
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Bilateral skill symmetry refers to a player’s capacity to perform equally well with both their dominant and non-dominant limbs. The sport of Gaelic football is ideal for the study of bilateral skill symmetry due to players having the potential to perform multiple skills with either hand or foot. An initial investigation utilized performance analysis software to evaluate all 12 games played by a high performance adult Gaelic football team during the 2018/19 season. Four games played by a team of a lower standard were used for comparison. Players on both teams (n=57) completed a questionnaire predicting their frequency of dominant side behavior and their percentage success using either limb for a range of skills. Both teams were heavily dependent on their dominant side (>90% dominant for all skills), with no differences between teams (all p’s > 0.05). With the exception of shooting, percentage success in skill execution was high for both teams, and did not differ across limbs. Players from both teams consistently under-estimated their dominant side bias. A second investigation interviewed 14 players and 5 coaches who had been involved at the highest level of adult Gaelic football. Hierarchical content analysis produced three themes: the importance of being bilaterally skilled (e.g., influence on selection), how to develop bilateral skills (e.g., supportive team environments), and challenges to developing bilateral skills (e.g., reverting to type under pressure). Advantages of bilateral skill symmetry were identified for both the individual and the team. The contrast between the quantitative analysis of game play and the qualitative analysis of coach and player perspectives indicates a gap in knowledge between current practice and evidence-based approaches to skill development. These results should stimulate reflection on current practice regarding bilateral skill development on the part of administrators, coaches, researchers, and players at all levels of the game.

Balanced Improved Following Both Acute Assisted Cycle Therapy (ACT) and Resistance Training in Adults With Down Syndrome
Danielle Keim, Arizona State University; Shannon Ringenbach, Arizona State University; Nathaniel Arnold, Arizona State University; Daniel Peterson, Arizona State University; Kabyun Nam, Arizona State University

People with Down syndrome (DS) have a decreased ability to balance, a slower gait pattern, difficulty adapting to new environments, and a lack of improvement in these areas with growth and development when compared to their neurotypical peers. Thus, different interventions to improve balance and gait are necessary. The purpose of this study was to determine the immediate effects of resistance training (RT) and Assisted Cycle Therapy (ACT) on adults with DS’ balance ability and gait speed. It was hypothesized that acute RT sessions would improve adults with DS’ balance more than ACT or no training (NT). Thirteen adults (19 – 38 years, 5 female) completed three, 35 min interventions separated by at least 48 hours. 1) ACT: pedals of a stationary bicycle moved approx. 35% faster than preferred cycling rate by a motor 2) RT: 2 sets of 8-12 repetitions of 75% of participant’s 1RM on stack-weight Machines of leg press, chest press, seated row, leg curl, shoulder press, and latissimus pulldown 3) NT: played board games Balance and gait speed were measured by a Clinical Test of Sensory Interaction on Balance (CTSB) (i.e., eyes open firm surface, eyes closed firm surface, eyes open foam surface, eyes closed foam surface) on a Btracks board and by a Timed Up and Go (TUG) test prior to and after each intervention. Paired sample t-tests were conducted pre and post within each intervention. The results showed statistically significant improvements in total path length from pre to post in the RT intervention with the eyes closed foam surface task as well as with Anterior-Posterior excursion in the ACT intervention. One explanation for improvements from pre to post in the eyes closed foam balance task is that strength gain occurred following resistance training among participants with Down syndrome, which also resulted in improved balance. Another interpretation is that social interaction with the researchers could have been beneficial for motor improvements. Further research should investigate balance after different chronic exercise interventions. Funding source: Barrett Honors College Thesis funding, Arizona State University.
The Influence of Integrated Feedback Information on Bimanual Force Control in Individuals With Parkinson’s Disease

Deanna M. Kennedy, Texas A&M University; Madison M. Davis, Texas A&M University; Yiyu Wang, Texas A&M University; Osmar Pinto Neto, Anhembi Morumbi University

A number of recent investigations have demonstrated the robust nature of integrated feedback in facilitating complex bimanual performance in healthy adults. The current investigation was designed to determine the extent to which individuals with Parkinson’s disease (PD) are capable of using integrated feedback information to coordinate bimanual force patterns and to determine if PD exhibit increased interference between the limbs as compared to aged-matched healthy adults. Ten participants with PD (mean age =72.1 yrs.) and 10 older adults (mean age = 71.9 yrs.) were required to rhythmically produce patterns of isometric forces by abducting their left and right index fingers. Lissajous displays were provided with a goal template and a cursor indicating the forces produced with both effectors. The cursor moved from left to right as force was produced with the right index finger and from bottom to top as force was produced by the left index finger. The template illustrated the specific pattern of force requirements needed to produce the goal coordination pattern (1:1, 1:2). Participants performed 13 practice trials and 2 test trials per coordination pattern at 10% max voluntary contraction (MVC). On the test trial, muscle activity from the first dorsal interosseous (FDI) were recorded using sEMG. The results indicated very effective temporal performance of the bimanual coordination patterns for both PD and aged matched controls, with PD performing the task as effectively as the control participants. Despite the effective timing performance, the analysis of the force and force-velocity profiles identified distortions in force for both groups. The distortions for older adults were associated with production of force in the contralateral limb while no such associations could be identified for PD. Further, the distortions in force production were greater (reduced harmonicity) and more disruptive (phase angle plots) in PD than the healthy controls. Funding source: T3 grant, Texas A&M University.

What We Imagine We Learn From Watching Others: The Illusion of Skill Acquisition Through Observation is Mitigated by Imagined Practice

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Although motor learning can occur from observing others perform a motor skill (action observation; AO), observers’ confidence in their own ability to perform the skill can be falsely increased compared to their actual skill level. This illusion of motor competence may be due to the lack of sensory feedback provided by observation, which would help to inform individuals of their veridical motor capabilities. Unlike observation, motor imagery (MI), the mental rehearsal of a motor skill, is thought to be better linked to anticipatory, feedforward processes and kinesthetic perceptions. MI may thus provide the observer with movement-related diagnostic information, leading to greater accuracy in assessing ability. In the current study, we evaluated the effects of MI when paired with AO in informing motor capabilities. Through an online platform, naïve to juggling healthy participants were randomized into two groups. The AO group (n = 15) observed 20 trials of one-handed, 2-ball juggling and was asked to rate their confidence (0-100%) that they could perform the same skill after each observation. The AO+MI group (n = 13) watched the same videos but they were also asked to perform MI following observation, before reporting confidence. As predicted, overall confidence was higher for the AO (M= 73.3%, SD=20.1), than for the AO+MI group (M=64.4%, SD=31.6). Confidence increased with repeated observation for both groups, with a positive change from trial 1 to trial 20 (ΔAO=15.5%, SD=16;4; ΔAO+MI=11.2%, SD=8.7). Area under the curve (AUC) analyses, comparing the “size” of increase across trials for individuals, showed greater AUC for the AO versus AO+MI group (Cohen’s dAO − dAO+MI = 0.33). In summary, the addition of MI mitigated the inflation of overall confidence supporting the conclusion that MI allows access to sensory information which is not necessarily provided by AO alone. This access provides a learner with “better” diagnostic information about capability, but actual testing of juggling is needed to confirm this conclusion and inform both application and theory. Funding source: NSERC.

Neural Correlates of Augmented Feedback Processing are Associated to Short-Term Behavioral Changes and Automaticity in Motor Learning

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To examine the neural processing of valence-dependent augmented feedback and respective associations with short-term (i.e., trial-to-trial changes) and long-term (i.e., retention and automatization) behavioral changes, 38 students learned an arm-movement sequence in 5 practice sessions (total of 960 practice trials). A performance-adaptive bandwidth for movement accuracy led to equal frequencies of augmented feedback with negative and positive valence. Event-related potentials reflecting reinforcement learning (feedback-related negativity; FRN) and supervised learning (late fronto-central positivity; LFCP) were recorded time-locked to feedback onset in the first and last practice session. Automaticity was measured according to a dual-task-paradigm before and after the practice phase. Coherences between feedback processing, short-term behavioral changes, and different dimensions of long-term learning (i.e., accuracy, consistency, and automaticity) were examined. Higher FRN-amplitudes after negative feedback were followed by higher goal-independent changes of behavior (p = .035, d = 0.29), whereas more positive amplitudes of the LFCP after negative feedback were followed by higher goal-independent changes of behavior (p = .001, d = 0.59). As assumed, the FRN seems to reflect reinforcement learning following a trial-and-error strategy, while the LFCP reflects supervised learning, using detailed error information (i.e., error direction and magnitude) to optimize motor performance. Long-term learning was not predicted by the ERP components, while the reduction of dual-task costs (i.e., automatization) was significantly correlated with LFCP-amplitudes after positive feedback (p = .022, r = .371) and by tendency also with LFCP-amplitudes after negative feedback (p = .051, r = .319) in the early practice phase. Contrary to our hypothesis, more pronounced processing of error information in the early practice phase, which was also available in trials with positive feedback valence, seems to facilitate motor automatization.

Feasibility of the Mini-BESTest for Evaluating Balance in Adults With Developmental Disabilities

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The Mini-BESTest includes four subsections ( anticipatory, reactive postural control, sensory orientation and dynamic gait) developed from modified elements of well-established balance tests. It is ideal for testing motor performance because the test considers sensory contributions to balance control and has a short administration time (~15mins). The Mini-
BESTest has been validated for use with Stroke and Cerebral Palsy. However, there is a diverse range of developmental disabilities for whom balance is a goal in education and ongoing rehabilitation. Hence, this study’s objective was to determine the feasibility of administering the Mini-BESTest for balance, mobility, and movement performance in people with developmental disabilities such as down syndrome (DS) and autism spectrum disorder (ASD). Four volunteers from an adapted dance program participated in this study (three with DS, one with ASD). Trained researchers administered the test and ensured participants understood the tasks and felt safe. The dependent variable was the performance rating in each subsection and the total score of the Mini-BESTest. All participants completed the balance assessment successfully, with scores ranging from 14 to 26 points. Although meaningful scores were acquired, it was apparent from field observations that the standardized written instructions were complex, resulting in participants having difficulty understanding the task, thus negatively influencing performance. The scoring criteria within the Mini-BESTest was also limiting as it did not accurately capture the range of behaviors observed. Like modifications to other standardized measures, participants improved their performance with concurrent physical demonstrations of the instructions and external focus of attention cues. We propose that with modifications to the Mini-BESTest instructions and an expansion of the scoring criteria, the test could be a valuable outcome for evaluating novel instructional techniques used to access motor performance in people living with physical and/or intellectual disabilities like DS and ASD. Funding source: University of Manitoba.

The Feasibility of a Tablet Based Fitts’ Task for Assessing Upper-Limb Performance of Adult Dancers With Developmental Disability
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This case series explored the movement performance of three adults with developmental disability who participate in an existing adapted dance program. The program uses rhythmic movement and dance techniques to train balance, coordination, kinesthetic awareness, strength and flexibility (for mobility). In addition to the Mini-BESTest, a reciprocal Fitts’ task was chosen to assess movement performance because it is a performance-based outcome that relies less on subjective assessment and the interpretation of instructions. The purpose of this case series was: i) to assess the feasibility of using a tablet computer to present the Fitts’ task, and ii) to consider whether or not the addition of sound at target acquisition enhances performance in people living with physical and/or intellectual disabilities like DS and ASD. Funding source: University of Manitoba.

Attentional Focus Cueing: The Impact on Timing and Amplitude of Peak Gluteal Activity and Standing Long Jump Distance in Novice Performers
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A common exercise used to evaluate and measure athletic performance is the standing long jump (SLJ). Performance outcomes can be influenced by the type of verbal instruction given to the performer, by either directing the performer’s attention to their body movements or movement effects or internal focus (IF) and external focus of attention (EF) cues respectively. Additionally, the gluteus maximus (GM) is a powerful hip muscle often associated with jumping activities. However, previous research has not explored how cueing might affect GM activity in an SLJ. The present study examined the effect of IF/EF cueing on SLJ performance and the amplitude and timing of peak GM activity. Relationships between jump distance and GM strength were also investigated. Thirty-one healthy participants were recruited (15 males and 16 females). Each subject performed seven SLJs: one with no cue, three with an IF cue, and three with an EF cue. IF and EF conditions were randomized. Jump distance was recorded in centimeters. Peak GM activity was recorded using surface electromyography (EMG). Muscle activity was normalized by a subject’s maximal voluntary contraction. An alpha level of p=0.05 was used to determine significance. A one-way repeated measures ANOVA showed that subjects could jump significantly further with an EF cue (191.4±44.6cm) compared to an IF cue (184.3±45.5cm, p=0.003) and no cue (179.5±47.8cm, p<0.001). There was no significant effect on the amplitude (F(2, 60)=0.76, p=0.472) or timing of peak GM activity (F(2, 60)=1.514, p=0.230). However, Pearson’s correlations showed there were significant, positive, moderate relationships (no cue r=0.426; IF r=0.491; EF r=0.449) between GM strength and jump distances for each cueing condition. These results indicate that type of attentional focus cue may play an important role in improving jump performance, but the underlying causes of improved performance cannot be linked with peak GM activity amplitude or timing. However, it could be suggested that strengthening the GM could help increase jump distance in novice performers.

Effects of Social Comparative Feedback on Motor Sequence Learning and the Kinematic Variables of Performance
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Positive social comparative feedback during motor skill practice leads to better retention of the motor skill. However, prior research focused on the learning of upper extremity motor skills with gross movement requirements (i.e. general accuracy) rather than sequential movements with precise spatial and temporal demands. The purpose of this study was to examine the effects of positive feedback on the learning of a motor task with spatial and temporal demands (a joystick-based motor sequence task). Forty-eight non-disabled adults (mean age 25.4; 33 females) completed the motor task for two sessions, 24 hours apart. Participants were randomized to one of three groups based on feedback provided during practice (Day 1): control (CO; received feedback that they completed the block of practice), response time only (RT only; received feedback on their response time to complete a block of practice), or positive feedback (RT+POS; received feedback that their response time was better than the average of others, i.e. positive social comparative feedback). Performance measures included response time (overall performance), path distance (distance traveled by the hand, spatial measure of movement) and...
peak velocity (movement speed) for one 8-target sequence. We found a main effect of group (p=0.002) and block (p<0.001) for response time; the CO group and RT+POS group showed faster response times than the RT only group across blocks. Differences in the kinematic variables between groups suggest different approaches were taken to improve performance. The CO group had shorter hand paths than the RT+POS group (p=0.037). In contrast, the RT+POS group showed faster peak velocities than the CO (p=0.009) or RT only group (p<0.001). In conclusion, providing response time feedback without context may be detrimental for motor skill learning versus no performance feedback or performance feedback with context. Our results suggest that providing positive feedback might promote higher movement speed over straight hand paths to improve performance over practice. Funding source: American Heart Association; Office of the Vice President of Research – University of South Carolina.

**How Does an External Focus of Attention Affect Sports Performance? A Comprehensive Evaluation by Meta-Analysis**

**Danyang Li, Beijing Sport University; Liwei Zhang, Beijing Sport University; Xin Yue, Beijing Sport University**

The effects of an external relative to an internal focus of attention on sports performance are well established. However, there is a lack of systematic evaluation identifying the magnitude of this available evidence. This meta-analysis aimed to examine the effect of an external focus of attention, as well as potential moderators, on sports performance. A systematic search of relevant literature in both English and Chinese databases (PubMed, Embase, Cochrane, Web of Science, CNKI, WanFang, and CQVIP) was conducted. Only randomized controlled trials (RCT) were included. The analyses of the overall effect, heterogeneity, potential moderators, and publication bias were assessed by using Meta-Essentials software. The methodological quality of the included RCT was assessed by using Cochrane’s tool for evaluating the risk of bias. A total of 115 studies provided 138 comparisons with 3473 participants. Random-effect meta-analysis showed a significant small-to-medium effect of external focus on sports performance ($d = 0.46, 95\% CI [0.38, 0.54], F^2 = 63.94\%$) compared with internal focus. Subgroup analyses showed that performance effects were moderated by the gender of participants (male > female), the type of tasks (movement effective task > movement efficient task), and the design of experiments (parallel RCT > crossover RCT), whereas the healthy status of participants, the expertise level of subjects, or the source laboratory of studies does not play a significant role. Overall, these findings provide preliminary support for the constrained action hypothesis, demonstrating the use of external focus across a range of physical activities to enhance sports performance. The results presented here call for the broad implementation of external focus to improve sports performance. Funding source: National Key Technology R&D Program of China (2019YFF0301600).

**Comparative Study on Functional Fitness and Physical Activity of Elderly Females With and Without Fall History**

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Background: Fall is a serious threat to elderly’ safety and health, especially for the females. The progressive decrease of Functional Fitness (FF) and lack of Physical Activity (PA) are well documented as two important factors related to physical disability and resultant fall risk in older adults. However, the fall risk related factors in FF are still unclear for lack of researches on specific group of older adults, and how PA associated FF and fall risk are yet to be known. Purpose: The purpose of this study was to determine the main risk factors in FF predisposing elderly females to fall and investigate its association with Physical Activity (PA). Methods: 209 community dwelling elderly females aged 65-84 yrs were classified into the groups of fallers and non-fallers according to falling history. FF was assessed according to the guidelines of Senior Fitness Test (SFT) battery (Rikli, 2013), which includes six components of upper & lower strength, upper & lower flexibility, balance/agility and aerobic endurance; in addition, movement time were measured with a responsive movement to a visual stimulation. The volume of physical activity was measured with the short form of Physical Activity Scale for the Elderly (PASE). Statistically, effect of falling history on FF and PA were conducted with MANCOVA with age as covariable on SPSS 20.0. Results: Compared to non-fallers, the elderly fallers showed lower performance in the measurements of their lower strength, lower flexibility and balance/agility, as well as less volume in PA; and upper & lower strength, lower flexibility and balance/agility have close correlation with the volume of PA. Conclusion: Fallers experienced greater functional decline in strength and flexibility of lower extremities as well as deterioration in balance/agility, which are serious risk factors contributed to falls in elderly females, under which physical inactivity is an important predisposing factor making elderly females susceptible to risk of falling. Funding source: This research is funded by National philosophy and Social Sciences Foundation of China (grant number: 19BYY045).

**Older Adults Could Generate Anticipatory Postural Adjustments Relying on an Auditory Cue Only**

**Huaying Liang, Marshall University; Tippawan Kaewmanee, University of Illinois at Chicago; Alexander Aruin, University of Illinois at Chicago**

Many falls in older adults happen because they could not respond appropriately to a postural perturbation from an external source such as a hit or a bump. Maintaining balance in response to a postural perturbation involves two components: anticipatory postural adjustments (APAs) and compensatory postural adjustments (CPAs). APAs are associated with the activation and inhibition of the trunk and leg muscles and a shift of the center-of-pressure position prior to a perturbation. The generation of APAs primarily relies on the availability and accuracy of visual information. In this study, we aimed to investigate whether older adults could generate APAs in response to an external perturbation relying on an auditory cue only. Ten older adults (5M/5F, mean age 70.2±5.2 years) were instructed to stand straight on a force plate and be prepared for a pendulum hitting the front of their shoulders bilaterally. They received this external perturbation while vision was available (BLV, 5 trials) and while vision was blocked (BLNV, 5 trials). Then they received 10 training blocks (Tr1 to Tr10, 5 trials in each block) when vision was blocked but an auditory cue signaling the moment of the pendulum hit. EMG activity was recorded from eight postural muscles bilaterally. EMG integrals were calculated to evaluate the magnitude of muscle activities during the APA (-250 to +49ms) and CPA (+50 to +349ms) phases with respect to the moment of the pendulum hitting the front of their shoulders bilaterally. They received this external perturbation while vision was available (BLV, 5 trials) and while vision was blocked (BLNV, 5 trials). Then they received 10 training blocks (Tr1 to Tr10, 5 trials in each block) when vision was blocked but an auditory cue signaling the moment of the pendulum hit was provided. EMG activity was recorded from eight postural muscles bilaterally. EMG integrals were calculated to evaluate the magnitude of muscle activities during the APA (-250 to +49ms) and CPA (+50 to +349ms) phases with respect to the moment of the pendulum hit. Series of one-way repeated measures ANOVAs were conducted. Results show that when vision was blocked (BLNV), older adults displayed smaller APA integrals and required larger CPA integrals of tibialis anterior and rectus femoris compared to BLV and they improved APAs after training (conditions Tr3 through Tr10) (all p<0.05). These results suggest that after short training, older adults could learn to generate APAs effectively for an otherwise unpredictable postural perturbation relying only on an auditory cue. Generating APAs also resulted in reduced CPAs after the physical impact of the perturbation.

**Investigating the Impact of Physical Exercise on Motor Proficiency and Sleep Quality in Children With ADHD: A Case Study**

**Hok Ling Venus Liu, The Education University of Hong Kong**
Physical exercise is widely shown beneficial on motor proficiency and sleep in children with Attention Deficit Hyperactivity Disorder (ADHD). However, limited research is done to investigate its impact on sleep quality and motor proficiency in children with ADHD. The purpose of the present study is therefore to fill this research gap. In the present case study, we recruited three students (age ranged from 10 to 11) diagnosed with ADHD by education psychologists. They underwent a 12-week physical exercise intervention (60 minutes per session, 2 sessions per week). Pre- and post-intervention assessment were conducted one week before and immediately after the intervention. Test of Gross Motor Development (TGMD-2) and sleep log were used to measure motor proficiency and sleep quality respectively. Results revealed that physical exercise significantly improved motor proficiency and sleep quality in children with ADHD. A large-scale randomized control trial study is warranted to further investigate the impact of exercise on motor proficiency and sleep quality in the population.

Developing Expert Gaze Pattern in Laparoscopic Surgery Requires More Than Behavioral Training

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Laparoscopic surgery experts not only perform better but also gaze more efficiently than those with less experience. Given that laparoscopic surgery trainees are mostly provided with behavioral training opportunities in existing educational programs, it is meaningful to understand whether expert gaze patterns in laparoscopic surgery can be developed through high-volume behavioral training. Three surgeons were assessed in a testing visit and five novices were trained and assessed (at pre-, mid-, and post-training points) in a 5-visit protocol on the Fundamentals of Laparoscopic Surgery peg transfer task. The task was adjusted to have a fixed action sequence to allow recordings of dwell durations based on pre-defined areas of interest (AOIs). Novices’ individualized learning curves were analyzed using a non-linear model, and group-level differences were tested using analysis of variance on both behavioral performance and dwell duration measures. Trained novices were shown to reach more than 98% (M = 98.62%, SD = 1.06%) of their behavioral learning plateaus, leading to equivalent behavioral performance to that of surgeons. Despite this equivalence in behavioral performance, surgeons continued to show significantly shorter dwell durations at visual targets of current actions than trained novices (ps < .03, Cohen’s d > 2). This study demonstrates that, whereas novices can train to match surgeons on behavioral performance, their gaze pattern is still less efficient than that of surgeons, motivating surgical training programs to involve eye-tracking technology in its design and evaluation. Funding source: US Army Research Office.

Hysteresis is Mediated by Task Difficulty in Performing the Roller Ball Task

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The experiment was set-up to provide a test for the presence of hysteresis in performing the roller ball task as a function of task difficulty as a control parameter. We examined the asymmetry of the critical transition ball speed according to its directional change: namely, low to high ball speed and conversely high to low ball speed in the presentation order of practice conditions. Twenty-one young adult participants performed the ascending and descending ball speed parameter conditions (10 to 30 rps in intervals of 2 rps) on 2 consecutive days as the pre- and post-test with 5 trials on each speed condition. Participants then practiced 50 trials a day at the individually determined speed conditions of the rollerball task for 10 to 29 days. The task goal was to maintain or increase the ball speed at the end of the 10 s trial. The success rate of each speed condition and the slope of the ball speed profile of the 10 s trial were used to assess performance. The transition speed conditions were identified when a speed condition contained both success and failure trials. The SD of the pre-transition, transition, and post-transition conditions of the post-test were examined with one-way repeated measure ANOVA. The lowest initial speed that had 100% and 0% success rate in the post-test were compared between the ascending and descending sequences using paired t tests to test the bi-stability and hysteresis effect. The results showed a significant higher SD of the slopes (1.20 rps²) in the transition phase than the pre-transition phase (0.509 rps²) and the post-transition phase (0.508 rps²), p < .001. For the hysteresis effect, the lowest initial speed for 100% success rate did not reach the significant level, t(19)=1.67, p= .05 but the lowest average initial speed for 0% success rate of descending sequence was significantly lower than that of ascending sequence, t(16)=2.38, p = .15. The empirical findings of the current study provide a basis for future modeling of the dual control parameter dynamics in perceptual-motor skill acquisition. Funding source: Ministry of Science and Technology of Taiwan MOST 107-2410-H-003 -116-MY2.

Performance of Older Adults Within an Immersive Overground Virtual Reality Obstacle Course

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Fall prevention programs aim to reduce risk of falling in older adults, but can be costly and may need physical resources. Virtual Reality (VR) training can be cost- and resource-efficient, however previous research has been limited to VR training on a treadmill, constraining natural movement. Immersive VR allows for overground movement in all 3 directions with safe and natural negotiation of virtual obstacles. However, it is unknown how older adults may perform within an overground VR obstacle course. The purpose of this study was to compare the performance of younger and older adults in an overground VR obstacle course environment. It was hypothesized that older adults would exhibit a slower completion time and learning rate (change in completion time between stages) compared to younger adults. Healthy older (OA; N=8, 67.0±4.4 yrs) and younger (YA; N=13, 22.1±2.5 yrs) adults completed 15 trials of a VR obstacle course split into 3 training stages: Early (1st 5), Mid (2nd 5), and Late (last 5). The course contained a variety of obstacles to target or avoid in all 3 directions. The VR course was presented in a head mounted display with virtual feet projected in VR via foot trackers for real-time foot positioning. Time to complete the course (TC) in seconds was measured. A Group(2) by Stage(3) ANOVA was calculated (η²=.05). There was a significant main effect of Stage [F(1.125, 21.375)=15.73, p<.0001]. Follow-ups showed TC significantly decreased from Early (23.7±5.8s) to Mid (20.7±4.2s; p=.003), Mid to Late (20.0±4.1s; p=.038), and Early to Late stages (p =.002) with no significant group effect or interaction (p >.05). On average, OA showed slower TC at Early, Mid, and Late stages (26.3±4.4, 23.0±2.1, 21.6±1.28s) compared to YA (22.1±6.1, 19.3±4.6, 19.0±4.9s). Our results suggest learning occurred within a novel overground VR obstacle course as time to complete the course decreased as both groups progressed through the subsequent stages. Though OA were generally slower to complete the course, our results indicate comparable learning rates between OA and YA. Funding source: NASPSPA Graduate Student Research Grant.
Temporal Discrimination in Simulated Natural and Built Environments

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It is well known that a person’s environment can influence psychological constructs such as mood and impulsivity (Bedrosian & Nelson, 2013; Berry et al., 2015) along with physical actions such as reaction time, movement planning and behavior (e.g., Engell, Lórák, & Sigmundsson, 2020). It is anecdotally known that the environment in which a person acts can influence his or her perception of the duration of time – the experience of time flying when you’re having fun. More specifically, the environment in which a person acts influences the threshold at which a durations are perceived as either short or long (Ortega et al., 2009). The aim of this study was to determine whether or not the basic ability of temporal discrimination was facilitated by some projected scenes over others. Participants were tested on a Perceptual Estimation through Sequential Testing (PEST) task. Either built or natural images were displayed in a sound-proof room via a projector directly in front of participants. One group of subjects (n=28) viewed a scene, heard auditory tones, and made judgements as to whether the 2nd tone was longer or shorter than the first. A second group of subjects (n=25) had either built or natural scenes flashed on the screen in front of them and had to make judgements about whether the second flashed scene was displayed for longer or shorter than the first. The reference duration was 800 ms. The displayed environments did not have an influence on perceptual estimation of auditory tones as shown by a non-significant effect of the scene displayed ($F(2, 54) = .15$, $p = .86$, $\eta^2_p = .0056$). Likewise displayed images of built vs. natural scenes did not influence perception of the duration of those scenes as shown by a non-significant effect of the scene ($F(4, 96) = 1.78$, $p = .14$, $\eta^2_p = .07$). The small effect size of the auditory discrimination task indicates that a projected scene does not influence temporal discrimination. The moderate effect size of the visual temporal discrimination tasks indicates we may find significance with more subjects.

Taking the Hard Way Out: Explicit Action-Costs Lead to Perceptual Bias Towards the Costly Decision

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Many of the decisions humans make are enacted by the action system. For example, humans use reach-to-grasp movements when choosing between and obtaining fruits of varying quality. Recent work suggests that the predicted characteristics of each action alternative may influence the decision itself – there may be a bias away from making perceptual decisions associated with high action-costs when participants are unaware of the action-cost differences. The present experiment examined if perceptual decisions were influenced by action-costs that were made explicit to participants. Pseudo-random dot motion stimuli were presented in which most dots moved in random directions and varying percentages of remaining dots moved coherently left- or rightward. Participants indicated if they perceived left- or rightward coherent motion by reaching to left- or rightward targets, respectively. A resistance band was affixed to participants’ wrists and anchored either left or right of the home position. When anchored rightward, reaching leftward required more force as this stretched the band (and vice versa). Right- and leftward decisions were enacted with high action-costs in separate conditions, Cost-Right and Cost-Left. Results indicated that a lower percentage of leftward motion coherence was needed to make leftward decisions enacted with high compared to low action-costs. Leftward motion was also reported more often in the Cost-Left compared to Cost-Right condition. Therefore, choices were biased towards decisions with high action-costs. We hypothesize that explicit cost information (knowing that reaching in one direction required more force than the other) led participants to pre-plan the costly action to overcome potential kinetic differences between responses. This pre-planning may have influenced choice behavior via motor-visual priming. Overall, the novel findings may evince that implicit and explicit action-cost manipulations influence decision-making behavior via partially distinct mechanisms and support action-centric models of decision-making. Funding source: Natural Sciences and Engineering Council of Canada.

Measuring Whole-Body Postural Control With a Virtual Reality Head-Mounted Display

Jonathan Marchetto, Temple University; Gregory Teodoro, Temple University; William Geoffrey Wright, Temple University

Emerging evidence suggests that virtual reality (VR) head-mounted displays (HMDs) can accurately measure whole-body posture without the need for additional posturography equipment (Marchetto & Wright 2019). However, more research is needed to establish validity of HMDs across devices, testing conditions, and populations. Therefore, the purpose of this study was to assess the ability of the HTC Vive HMD to measure whole-body changes in postural sway during an upright balance task. Participants (n=24) performed a previously validated balance protocol which varied the visual input presented in VR and somatosensory feedback provided by the support surface across 8 testing conditions (Wright et al., 2017). Center of pressure (COP) was recorded from a Wii Balance Board force plate (WBB) while linear and rotational head position were simultaneously tracked with the HTC Vive’s infrared cameras and internal gyroscopes. Pearson’s correlations found very strong relationships between COP velocity and linear head velocity (r = 0.94), as well as COP sway area and linear head sway (r = 0.91) across conditions. COP velocity and head rotational velocity were also found to be strongly correlated across conditions (r = 0.88), but COP sway area and head rotation were only weakly related (r = 0.33) and may vary by condition. These findings lend further support to the utility of HMDs to accurately measure whole-body posture without the need for additional posturography equipment such as a force plate. This may provide a promising avenue for improving the cost, portability, and availability of fall risk assessments and balance treatment options to a wide range of clinical populations with impaired postural control.

The Persistence of Inappropriate Outcome Variables in Motor Learning Experiments: A Follow-Up to Fischman (2015)

Julianna Marfisi, McMaster University; Laura St. Germain, McMaster University; Michael J. Carter, McMaster University

In many motor learning experiments, participants are asked to learn a skill where the outcome of a performance can vary in both the x and y directions, such as golf-putting. Typically, a target consisting of concentric rings with a bullseye in the center is placed on the floor. Each ring is assigned a point value that decreases with each ring further from the bullseye. Any outcome landing in a specific ring receives the same score; findings lend...
practice a 2-dimensional motor task. Our search returned a total of 2213 articles. Following the removal of duplicate entries, the remaining articles were coded for inclusion or exclusion by two researchers independently. This process resulted in 86 articles that met our inclusion criteria. Of these articles, we found that less than half of them used an appropriate 2-dimensional measure, with radial error being the most common. Thus, in the majority of articles researchers opted to use an inappropriate 1-dimensional measure for their selected 2-dimensional motor task, with the concentric ring point system being the most common. While our investigation revealed that some researchers have followed the advice of Fischman, an alarming majority continue to use inappropriate measures. This is problematic as valid outcome measures are necessary for theory development and evidence-based recommendations in practical settings.

**Neural Processing of Augmented Feedback is Valence-Dependent and Changes After Extensive Practice of a New Motor Task**

**Linda Margraf, Paderborn University; Daniel Krause, Paderborn University; Matthias Weigelt, Paderborn University**

Several event-related potentials are associated with valence-dependent processing of augmented feedback in motor learning tasks. But it is not yet clear if and how these processes change with extensive practice. In the present study, 38 students (Mage = 20.9 ± 1.7 years) practiced a sequential arm-movement task with 192 trials in each of five practice sessions with subsequent feedback presentation providing quantitative error information (960 trials in total). EEG was recorded time-locked to feedback onset in the first and last practice session. An adaptive bandwidth for movement accuracy led to equal amounts of positive and negative feedback. The ERPs of interest were quantified for prediction errors in reinforcement learning, was more negative for negative feedback (p < .001; η² = .45). This negativity increased after extensive practice (p = .045; d = 0.41), which might be interpreted as increased difficulties to predict the smaller errors in the later practice phase. The late fronto-central positivity (LFCP; Fz; 450-550 ms), associated with supervised learning, was more positive for negative feedback (p < .001; η² = .31) in the first and last practice session. Accordingly, complex feedback processing, integrating the current and the desired outcome, seemed to be operative in both practice phases. The P300 displayed a higher amplitude for positive feedback (p < .001; η² = .41), which is interpreted as the higher significance of positive feedback for the updating of internal models in this setting. A valence-independent increase of the P300-amplitudes (p = .019; η² = .14) might reflect an improved ability to update the internal representation of the task. These results demonstrate that there are practice-related changes of valence-dependent feedback processing in motor learning.

**The Effects of COVID-19 on NBA Free Throw Shooting Accuracy as a Product of Attention Regulation and Practice Specificity**

**Logan Markwell, University of Tennessee Knoxville; Andrew Strick, University of Tennessee Knoxville; Jared Porter, University of Tennessee Knoxville**

The COVID-19 pandemic impacted sports, along with nearly all other facets of life worldwide. The National Basketball Association (NBA) quickly adopted a unique method to finish the 2019-2020 regular season and playoffs. Hosting the entire league for months in quarantine, the NBA finished their games without fans inside the “NBA bubble”. During this time, increases in shooting accuracy were reported, suggesting that free throws and field goals were made at record breaking levels compared to prior seasons. One previously published article suggested that the average free throw percentage has been 75% for nearly five decades. The present study scientifically examined differences in free throw shooting accuracy before and after the COVID-19 lockdown. Archival data were retrieved and analysed to evaluate potential differences in free throw shooting accuracy. Pre and post COVID-19 free throw shooting accuracy were examined in multiple analyses. Our examination revealed free throw percentages were significantly greater following the COVID-19 lockdown compared to the 2018 and 2019 seasons. Specifically, our analysis showed that prior to the COVID-19 lockdown, the average successful free throw percentage in the NBA was approximately 76%. The free throw shooting percentage increased to 79% directly following the COVID-19 lockdown. We propose that not having fans present as rowdy spectators, changes in the environmental characteristics and possibly lower arousal levels as a product of playing inside fan-less arenas following the COVID-19 lockdown were likely contributors to the improved free throw phenomenon reported in this study.

**Altering Focus of Attention Effects Isometric Muscular Endurance and Heart Rate During Fitness Testing**

**Logan Markwell, University of Tennessee Knoxville; Russell Nolan, Southern Illinois University Carbondale; Blake Brown, Southern Illinois University Carbondale; Hubert Makaruk, The Józef Piłsudski University of Physical Education in Warsaw; Jared Porter, University of Tennessee Knoxville**

Subtle changes in instruction that direct attention internally or externally can lead to a significant change in performance, potentially hindering the validity of a fitness test. While motor performance has been found to improve when instructions promote an external focus of attention, less is known about the instructional effects on the physiological responses and performance during an isometric endurance test. Two experiments were conducted to better understand how focus of attention effects submaximal endurance fitness tests. Experiment 1 tested the hypothesis that directing attention externally would lead to superior performance of a submaximal endurance test compared to an internal focus of attention. Participants (N=23) performed a wall sit test following instructions that directed their attention externally or internally. Results showed that instruction promoting an external attentional focus led to significantly higher endurance hold times compared to those promoting an internal focus. The purpose of experiment 2 was to test the effects of attentional focus on performance and heart rate during an endurance test. Participants (N=44) performed a wall sit test in one of three counterbalanced attentional focus conditions: external, internal, control. Results showed that endurance hold times were significantly greater during the external condition compared to the internal condition and marginally different compared to the control condition. Additionally, the results revealed that participant’s heart rate during the internal condition was significantly higher compared to the external and control conditions. The results of these two experiments indicate that instruction directing attention internally and externally lead to significantly different physiological responses and endurance performance outcomes. Additionally, these experiments suggest that instruction directing attention externally results in superior performance compared to an internal focus during a submaximal endurance fitness test.

**Non-Invasive Brain Stimulation Enhances Training Accuracy and Reduces Training Variability of a Rhythmic Bimanual Motor Skill**

**Austin T. McCulloch, Texas A&M University; John J. Buchanan, Texas A&M University; David L. Wright, Texas A&M University**
The purpose of this study was to determine if non-invasive brain stimulation (tDCS), applied either before or during training, influences the training of a rhythmic bimanual task. tDCS was applied to the primary motor cortex (C4 & C3). Previous research using tDCS and bimanual tasks have revealed mixed results on the impact of training for both pre-training and concurrent stimulation. In this experiment, participants (N = 64, M_age = 21.3 yrs) learned a novel rhythmic bimanual task. Two groups received active stimulation either during training (Dur-stim) or pretraining (Pre-stim). The two placebo groups received sham stimulation either during training (Dur-sham) or pretraining (Pre-sham). The active stimulation groups received 2 mA of current for 20 mins whereas the sham stimulation groups received a placebo stimulation. The task required participants to abduct-adduct their arms on the horizontal plane while grasping two vertical handles fixed to a railing system perpendicular to their body. A visual display of a circle template representing the coordination pattern of 90° continuous relative phase and a dot representing the motion of the two handles were presented on a monitor. Training with the 90° pattern occurred over a 20 minute session. An ANOVA revealed an interaction between stimulation (Active, Sham) and timing (Pre-training, Concurrent) for two variables. Post hoc analysis of the continuous relative phase standard deviation revealed the Pre-stim group was less variable compared to Pre-sham and Dur-stim (p < .048). Post hoc analysis of the accuracy variable, which calculated time spent within a ± 22.5° bandwidth around 90°, revealed the Pre-stim and Dur-sham groups were more accurate than Pre-sham (p < .047) which spent less time within the bandwidth. Thus, stimulation to M1 prior to training a novel rhythmic bimanual coordination task can reduce variability and improve accuracy during the training session. This suggests priming the motor cortex prior to training could be beneficial for similar training protocols.

Meta-Analysis of Reduced Feedback Frequency and Motor Learning: Missing Data and a Lack of Support for Reduced Feedback Benefits

Brad McKay, University of Ottawa; Julia Hussain, University of Ottawa; Mary-Anne Vinh, University of Ottawa; Alexandre Mir-Orefice, University of Ottawa; Hugh Brooks, University of Ottawa; Diane M. Ste-Marie, University of Ottawa

Motor learning researchers have encouraged practitioners to limit the frequency they provide feedback in order to avoid over-reliance on augmented information. The aim of this meta-analysis was to investigate the impact of providing a reduced frequency of augmented, terminal feedback on the learning and performance of motor skills to determine if such encouragement is justified. A pre-registered search, extraction, coding, and analysis plan was followed. PubMed and PsycINFO database searches were conducted using the query “feedback” AND “motor learning.” Articles that met the inclusion criteria from the first search were then probed using forward and backward tracing to identify other articles to include. Sixty articles were identified for inclusion in the meta-analysis. Effect sizes were calculated from statistics reported in the articles and, when insufficient information was present, authors were contacted. Despite this effort, a large quantity (~63%) of the primary data of interest was missing due to either incomplete reporting in the article or original datasets no longer available. A naïve random effects model (NREM) of the available data (k = 21) yielded an effect size of g = .29 (p = .15) at delayed retention and substantial heterogeneity in effects. Moderator analyses suggested three studies were contributing significantly to the overall heterogeneity. A second NREM, excluding the three studies, resulted in an estimate of g = .26 (p = .08). Selective publication of results based on statistical significance (p < .05) was probed using the Vevea-Hedges weight-function model (WFM) and accounted for a significant proportion of the remaining heterogeneity. The WFM estimated the average effect of reduced relative feedback frequency as small and not statistically significant (g = .001, 95% CI: -.32 – .32). Given this current dataset, the direction of feedback frequency effects on motor learning is unclear. As such, concrete recommendations to practitioners, such as coaches, teachers, and therapists, with respect to feedback frequency appear warranted.

A Systematic Review of Cortical Activity and Gait Variability During Walking Tasks

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Walking is a complex task and adaptation is needed to traverse everyday environments. However, cognition and the ability to adapt declines with age and disease. A decrease in cognition, specifically executive function, is linked to increased fall risk. Recent technological advances have allowed for the use of electroencephalography (EEG) and functional near infrared spectroscopy (fNIRS) to record cortical activity during walking, while concurrently assessing gait. The literature lacks a systematic review on the relationship between gait variability and cortical activity during walking tasks, which may help clinicians and future research. This review examined the most current literature on cortical activity during walking using EEG and fNIRS in adult populations and how it affects gait variability. Keyword searches were conducted using PubMed, psychINFO, and Scopus, resulting in 560 articles. Articles were included if they focused on brain activity during walking, walking assisted, gait assessment, and a gait variability measurement, leading to 20 studies included in this review. We focused on the populations being studied in this context, the modality in which cortical activity was measured, and the manner in which gait variability was quantified. Healthy adults were included in 15 studies, followed by those with mild mobility deficits (n=2), stroke (n=1), Parkinson’s disease (n=1), and gait ataxia (n=1). Cortical activity was assessed using fNIRS in 15 studies and EEG in 5 studies. Gait variability was quantified using standard deviation in 10 studies and coefficient of variation in 9 studies. The most common finding was increased gait variability and increased prefrontal activity with dual task walking (n=7 studies). Notably absent was the adoption of fractal analyses to assess variability in cortical activity or gait performance. Future studies should explore more consistent procedures to examine variability of gait and its relation to cortical activity during walking tasks, as well as adopt fractal analyses to quantify variability in this context.

A Comparison of Balance Error Scoring System Measures Between College Athletes and Non-Athletes

Ben Meyer, Shippensburg University

The purpose of this project was to compare balance performance between athletes and non-athletes in standing balance tasks. Previous work (e.g., Hryson, 2011) has assessed the relationship between balance ability and athletic performance. Comparisons of balance ability of athletes between sports and at different levels of competition within a sport have been made; the present study aims to extend this research to include non-athletes in the comparisons. Sixteen males and fifteen females (77 +/- 17 kg, 1.72 +/- 0.10 m, 22 +/- 2 years) performed a Balance Error Scoring System (BESS) test. The test required participants to stand in several configurations (single leg (SL), double leg (DL), tandem stance (TS)) for 20 seconds while maintaining upright balance on a static platform. For each stance configuration, tests were performed on both firm and foam surfaces. A Biodex Balance System SD (Biodex Medical Systems, Shirley, NY) was used to measure the overall sway index (SI) for each test. A composite value (the average of all tested configurations) was also computed for each participant. The sway index values were not significantly different (p > .05) between athletes and non-athletes on a firm surface: DL 0.64 vs 0.77; SL 1.60 vs 1.83; TS 1.12 vs 1.10.
On a foam surface, the differences between athletes and non-athletes were not significant: DL 1.11 vs 1.12; SL 2.45 vs 2.30; TS 1.62 vs 1.61. The composite value for athletes (1.62) was not significantly different than the value for non-athletes (1.52). The results of this study add to the existing literature on balance performance in athletic and non-athletic populations. The single-leg, firm surface sway index values from the present study (~1.7) are larger than those found by Lin et al. (2016) for baseball pitchers and javelin throwers (~0.7). Future research should utilize multiple dynamic platform settings in order to assess performance in a variety of challenging conditions.

Variability in Motor Control: Multilevel Modeling Reveals Meaningful Differences in Force Output

Kristina Neely, Auburn University; Zhaotong Zhang, Auburn University; William Murrah, Auburn University

Previous work in motor control has used traditional statistical methods (e.g., ANOVA), which often make unrealistic assumptions, such as identical variance across groups. Further, many of us collect rich time-series data over multiple trials, which are often averaged and reduced to one point in time. The current work compared the results of an ANOVA-approach, in which we averaged peak force (PF) across trials, versus multilevel modeling (MLM), in which we included all trials in the model, to evaluate differences in PF in adults with and without Attention-deficit/hyperactivity disorder (ADHD). Participants were 150 adults, 72 with confirmed ADHD. Participants completed 30-s hold and 2-s pulse tasks. PF was right-skewed, violating assumptions of linear models. Additionally, variance was not equivalent between groups. This is important because MLM provides a means to model heterogeneity of variance whereas ANOVA assumes identical variances across groups. Both models yielded similar results for mean PF across task and group, such that adults with ADHD (M = 17.2 N, SE = 0.14) generated higher PF than adults without ADHD (M = 16.7 N, SE = 0.13), irrespective of task. While the ANOVA model assumed that the groups were from populations with the same variance, MLM showed that the variance in PF for adults with ADHD was 30% higher than for adults without ADHD, in both the 30-s and 2-s tasks (χ²(1) = 210.11, p < .001). Exploration of the distribution of PF and the MLM residuals suggests that the observed mean difference may be due to a combination of a floor effect in PF and greater variability in the ADHD group. These results suggest that the restrictive assumptions and aggregation of trials may mask important information. Instead of manipulating complex data to fit simple models, we need to model the complexity of motor output. Not only does MLM allow relaxing unrealistic assumptions, such as equal group variances, but it also provides opportunities to model variability. This is particularly important in the study of clinical populations with variability in behavior. Funding source: This work was supported, in part, by a Young Investigator Award (#25004) from the Brain & Behavior Research Foundation to KAN. This work was supported, in part, by grant UL1 TR002014 and KL2 TR002015 from the National Center for Advancing Translational Sciences (NIH NCATS).

Inter-Individual Differences in the Capability to Reduce Dual-Task Interference in Sequence Learning

Stefan Panzer, Saarland University; Christina Pfeifer, Saarland University; Julia Harenz, Saarland University; Otmar Bock, Deutsche Sporthochschule Köln; Charles H. Shea, Texas A&M University

Dual-task performance can be increased by practice. However, previous findings indicated substantial individual differences in dual-task performance following extensive practice. Recent behavioral research provided evidence that a large portion of the variance in cognitive control and attentional processes is associated with executive functions. The main purpose of the present experiment was, therefore, to scrutinize the roots of the inter-individual differences by examining the role of executive functions in dual-task performance following moderate and extensive practice. Participants (N = 19) acquired a 16-element dynamic movement sequence task by elbow extension and flexion movements under dual-task training. During sequence execution, individuals were required to concurrently perform a simple reaction time (RT) task, in which they had to depress a button in response to two auditory stimuli; one stimulus was presented in the middle and the other at the end of the sequence task. Individuals were randomly assigned to one of two groups, a 1-Day practice group (n = 11) and a 4-Days practice group (n = 8). Learning was evaluated in a retention test following 24 hrs of acquisition. After the retention test, participants were required to perform executive function tests (to assess inhibition: Stroop test, Simon test; to check the updating working memory: Keeptrack test). The results indicated that all groups increased their performance across 1-Day and 4-Days of practice. The retention results showed that dual-task performance of the 4-Days practice group was superior compared to participants of the 1-Day practice group. For the concurrent RT task, RT decreased across all acquisition sessions. Regardless of the amount of practice, all correlation coefficients between sequence retention performance and the executive function tests were low to moderate, and not significant. These findings indicate that an inhibition and the updating of the working memory contributed little to inter-individual differences in dual-task performance of a dynamic movement sequence task. Funding source: German Research Foundation (grant number: PA 774 13-2; SPP 1772).

An Exploration of Referee Behaviors Before and During COVID-19 in North American Professional Sports Leagues

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It became clear in the early 2020 that sports would be greatly impacted by the worldwide spread of the COVID-19 virus. An examination of major professional sports in the United States revealed that the behaviors of athletes in some sports (e.g., basketball, soccer, hockey) were different following the COVID-19 lockdown compared to the same behaviors in prior “normal” years. In addition to athlete behaviors, we also examined how the performance of officials for professional sports may have been impacted by a lack of spectators during COVID-19. All of the leagues (i.e., NBA, WNBA, MLS, NHL) included in our analysis were played in the absence of any fans following the restart of competitive play after COVID-19 lockdown restrictions were eased in summer 2020. Previous research has suggested that the presence of spectators can influence officiating behaviors and that these are likely to benefit a home team (Dohmen, 2008), while recent research conducted with professional soccer in Europe indicated a reduction in referee bias and home field advantage during spectator-free matches during the COVID-19 pandemic (Sors, Grassi, Agostini, & Murgia, 2020). The current study focused specifically on number of penalties called with no spectators present compared to the previous year with spectators. Analyses revealed that referees in the NHL awarded more penalty time following the restart of the hockey season following the COVID-19 lockdown, while there were no significant differences in penalties/fouls called in the MLS, WNBA/NBA, respectively. Specifically, our analysis discovered that when controlled for the same number of days and games played, the amount of penalty time during the post-COVID season was significantly greater than the pre-COVID season. These results will be discussed within the context of existing literature on officiating bias and spectator influence in order to better understand the unique influence that spectators may have on officials’ behaviors and how this knowledge could lead to improved decision making in game situations.
Understanding the Influence of Neck Muscle Vibration and Background Information During Upper Limb Pointing

Goran Perkic, University of Toronto; Damian M. Manzone, University of Toronto; Luc Tremblay, University of Toronto

When making reaching movements towards a target, we utilize sensory information that arises from our body and the environment. Regarding sensory information arising from the body, muscle receptors (i.e., proprioceptors) provide information pertaining to our position in space (Proske & Gandevia, 2012). Pertinent to the current study, manipulating proprioceptive cues in the neck using tendon vibration alters endpoint accuracy when aiming to a target (Roll et al., 1991). On the other hand, the presence or absence of environmental cues such as objects or items in the vicinity of the target (e.g., dots between home and target positions) influences endpoint accuracy during pointing (Coello & Magne, 2000). The purpose of the current study was to investigate the contributions of neck proprioception and visual background cues on the control of upper-limb movements. Seventeen participants (9 male; $M_{age}=24.4 \pm 3.6$ y) performed targeted pointing movements on an aiming board. Participants performed movements with posterior neck muscle vibration and/or with a white dot grid background. The main variables of interest were endpoint position and endpoint accuracy. We hypothesized that posterior neck muscle vibration would elicit shorter movement amplitudes and the presence of a background would elicit greater endpoint accuracy. A 2 Vibration (vibration, no vibration) x 2 Background (background, no background) repeated-measures ANOVA was conducted. The presence of neck vibration led to significantly shorter movement amplitudes compared to no vibration ($F(1,16)=7.33, p<0.017; h_{p}^2=0.314$) and the presence of a background led to significantly increased endpoint accuracy compared to the absence of a background ($F(1,16)=29.86, p<0.001; h_{p}^2=0.651$). However, for both endpoint position and accuracy, no significant interaction between vibration and background was found ($F(3,38.85)$. Overall, this suggests that afferent information from the body (i.e., neck proprioception) and the environment (i.e., background contextual cues) both independently influence upper-limb movements. Funding source: NSERC.

Choosing to Exclude or Excluding on Purpose: Testing Uncertainty-Based Practice Scheduling for Learning Adapted Reaching Movements

Carrie M. Peters, University of British Columbia; Thomas M. Coppola, University of British Columbia; Beverley C. Larssen, University of British Columbia; Nicola J. Hodges, University of British Columbia

Optimal practice schedules have been investigated for their role in human and machine learning. Huang and colleagues (2008) proposed that learners should seek to reduce the uncertainty of a practice outcome, by avoiding well-learned components characterized by low error. However, practicing well-learned components might improve a learners’ self-validation ability and allow them to tailor their schedule to their needs for competency and learning. In this experiment we tested the effectiveness of an uncertainty-based practice schedule in a multi-target adaptation paradigm, where individuals reached to 4 targets of varying difficulty. To manipulate uncertainty, we excluded targets from practice once participants attained a criterion error score (mean <5°) from the last 5 trials to the same target. Participants either chose how to practice (self) or practiced under an imposed random order, with or without exclusion. The two self-groups were also compared to two yoked groups (6 groups; n=10/gp). There was a 240 trial acquisition phase, followed by a 24 hour retention test. There was no evidence that forcing individuals to adopt uncertainty-based practice, where successful targets were excluded from practice, aided learning. Neither did we see benefits from having self-control over the order of practice. In contrast to predictions, it was the no-exclusion groups that were more accurate in retention compared to the exclusion groups. During acquisition the self-controlled groups adopted uncertainty-based practice, spending more time at difficult targets and less time at easier targets, but this did not aid learning (compared to random groups where equal time was spent at each target). In conclusion, we did not support the efficacy of uncertainty-based practice for learning novel skills. There were benefits from keeping easier/low error skills in practice for later retention which could be in part related to the increased switching between skills or perhaps through increased engagement and motivation to learn. Funding source: Funding for this project was provided by the Natural Sciences and Engineering Research Council of Canada (Discovery grant awarded to NJH).

The Role of Executive Functions: Single-Task vs. Dual-Task Training in Learning a Simple Movement Sequence

Christina Pfeifer, Saarland University; Charles H. Shea, Texas A&M University; Omar Bock, German Sport University Cologne; Mathias Haeger, German Sport University Cologne; Stefan Panzer, Saarland University

Recent behavioral research provided evidence that some portion of the variance in cognitive control and dual-task performance is associated with executive functions (EF). However, the extent of EF in movement sequence learning following single-task and dual-task practice is still unresolved. Therefore, the main purpose of the present experiment was to investigate the role of EF for dual-task performance following single- and dual-task practice. Participants (n=58) were randomly assigned to one of two groups, a single-task practice group (n=29) and a dual-task practice group (n=29). The simple sequence task was a 2000 ms spatial-temporal pattern of elbow extension/flexion movements. Following the acquisition session on Day 1, participants returned on Day 2 for two tests: a dual-task (Test-DT) and a single-task (Test-ST). The dual-task was a simple reaction time task with a manual response to one auditory stimulus during movement execution. On Day 3, participants performed a test battery of EFs (to evaluate inhibition: Stroop test, Simon test; updating: Keep Track test). The results of the sequence task indicated that both groups increased their performance throughout the acquisition session. Both groups performed Test-ST superior compared to Test-DT. Furthermore, results show significant negative correlations between inhibition and dual-task performance following single-task practice. Stroop: r=-.503; Simon: r=-.496. The negative sign represents better dual-task performance. However, there were no significant correlations between inhibition and dual-task performance following dual-task practice, Stroop: r=-.115; Simon: r=-.193. No significant correlations were found between updating and dual-task performance regardless of whether the sequence task was acquired under dual- or single-task practice. Fisher’s z-transformed correlation coefficients indicated that the correlations descended from the same population. These findings indicate that inhibition and updating contribute little to dual-task sequence performance following single- or dual-task practice. Funding source: PA 774/13-1; SPP 1772.

Aiding Performance and Injury Reduction: Examining Knee Separation Distance in a Dynamic Task

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The motivational and attentional factors included in OPTIMAL Theory (OT) have been empirically shown to enhance motor control and learning (Wulf, 2016). Our prior work supported OT when learning to optimize hip-knee alignment (injury risk variable) in a static task of a box squat. This
Mind Control: Using Focus of Attention and Imagery to Remotely Pilot a Drone

Jared Porter, University of Tennessee; Xiaopeng Zhao, University of Tennessee

It has been well established in the field of motor behavior that imagery can be utilized to facilitate motor learning and performance. Moreover, several decades of research have consistently demonstrated that altering the conscious allocation of attention has a meaningful impact on motor behavior. The purpose of the present study was to investigate how the use of imagery through the efficacy of an internal focus of attention could be used to control an unmanned aerial system (i.e. drone). College aged, presumably healthy participants (N=20) were fitted with an EEG system for the study. Participants were instructed to imagine simultaneously flexing their hands or simultaneously relaxing their hands. The EEG system measured the electrical activity of the frontal lobe region associated with the hands as participants engaged in the imagery motor activity. A computer program relayed the assessed EEG activity to a drone in close proximity to the participant. Specifically, software was developed to raise the drone vertically as the participant imagined flexing their hands. Conversely, the program lowered the drone as the participant relaxed their hands. This allowed the participant to pilot the drone by simply altering their focus of attention through imagery (i.e., flexing or relaxing the hands). It is important to note that participants did not physically move their hands during the course of the study; they only imagined the bimanual motor task. It is our goal to further develop this technology to help patient populations suffering from physical debilitating injury (e.g., stroke, TBI) or disease (e.g., Parkinson’s, ALS). Furthermore, there are many applications of this technology to populations suffering from spinal cord injury. Future work is needed to understand how adopting an external focus of attention through imagery impacts the operational control of a remotely piloted vehicle.

The Effects of Direction and Incline on Treadmill Walking in Typically Developing Children

Gena Priest, Georgia State University; Diego Ferreira, Lebanon Valley College; Jianhua Wu, Georgia State University

Treadmill (TM) walking is a common rehabilitation technique used for children with disabilities. TM protocols frequently modulate walking conditions such as direction and grade for better training outcomes. Both backward and incline walking have distinctive gait patterns in adults. However, there is minimal literature describing how typically developing (TD) children adapt to these conditions; let alone children with disabilities. It is, therefore, important to understand how TD children adapt to these conditions before introducing them as part of a TM protocol for children with disabilities. In this study we recruited 19 TD children (10M/9F) aged 5-12 years. Subjects completed bouts of 2 minutes of TM walking for each condition. TM conditions included forward and backward walking at each of 3 inclines (0%, 5%, and 10% grades). Kinematic data were collected using a motion capture system. Dependent variables included spatiotemporal parameters such as step length, step width and foot clearance and joint kinematic variables such as the range of motion (ROM) of the hip, knee, and ankle. Two-way (2 direction x 3 incline) ANOVA with repeated measures were conducted on all variables. Results showed that there was an incline by direction interaction for foot clearance in mid-swing. Greater levels of incline resulted in increased foot clearance in both directions; it was greater during backward walking on a level surface, but greater during forward walking on an incline. Also, backward walking at all grades resulted in a shorter step length, greater step width, and decreased ROM of the hip, knee, and ankle. Our results suggest that TD children adapt to backward walking similarly to adults. However, while adults adapt to increased inclines by decreasing knee ROM and step length and increasing peak hip, knee and ankle flexion angles, these changes were not seen in TD children. This may suggest that TD children’s ability to adapt effectively to incline walking remains immature in preadolescence. Alternately, the presumed novelty of the task may have been a factor.

The Association Between Facing Experience and Focus of Attention in Triathletes

Louisa Raisbeck, University of North Carolina Greensboro; Lauren Higgins, University of North Carolina Greensboro; Masahiro Yamada, University of North Carolina Greensboro

Field based research examining attentional focus (AF) in endurance athletes suggests athletes’ foci are more complex than the dichotomy of internal focus (IF) and external focus (EF) often examined in laboratory research. A newer working model has been proposed that includes five AF categories: internal sensory monitoring (ISM), active self-regulation (ASR), external outward monitoring (EOM), active distraction (AD), and involuntary distraction (ID). However, slight research exists regarding the application of this model. We applied this model in addition to the categories of IF and EF to examine associations between racing experience and AF during each triathlon race discipline (e.g. swimming, biking, and running). Participants (N=19) completed an online survey with open-ended questions about their training and racing history, and what they most often focus on or think about while racing each discipline. Two raters independently coded responses. Coded responses were then reviewed and an agreement was made for discrepancies. Participants were dichotomized to groups based on racing experience, less than 5 years (N=11, 42.35 ± 12.84 yrs) and greater than 5 years (N=8, 50.22 ± 5.58 yrs). Chi-square tests of independence were conducted between AF categories (e.g. EF, IF, ISM, ASR, EOM, AD, ID) and racing experience group for each discipline. No significant differences were observed in AF between groups for each racing disciplines, but ASR was reported most often by both groups. Based on our observations, we further characterized ASR into 4 categories: holistic execution, technique, strategy, and motivation. Statistically significant associations were found between groups and holistic execution during biking ($X^2(1)=6.115, \ p=.013$) and running ($X^2(1)=6.967, \ p=.008$) and motivational thoughts during running.
expensive laboratory equipment. Our previous work developed an Android detection typically depends on subjective clinical tests or non-portable and that the concussed participants would exhibit neuromotor de

utility has not been fully examined to-date, which was the purpose of this

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Robins, Temple University; Daniel E. Kim, Naval Hospital Camp Pendle-
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learning to examine how these predictions relate to the notions of
sample sizes for increasing robustness, and (iv) longer time scales of
prediction was largely constrained to a single session of
timescale of prediction was vs. behavioral) but also the actual predictors used within each type. Similarly, for the predicted variables, there was variation in whether the prediction was related to the specific variables and level of correlation between predictors and outcomes. Overall, our results show a large variation in the literature in how these predictions were made. For the predictor variables, there was variation in terms of the type of predictor (neural vs. behavioral) but also the actual predictors used within each type.

Analysis of the methodological choices indicated that: (i) a majority of the tasks fell into one of three categories – visuomotor tracking, adaptation, or sequence learning, (ii) sample sizes used in these studies (typically between 20-40) were relatively small for correlational analyses even though they were larger than typical motor learning studies and (iii) the timescale of prediction was largely constrained to a single session of learning. Our results suggest that future work should involve the use of (i) methods to constrain researcher degrees of freedom in the selection of predictor and predicted variables, (ii) a wider range of tasks beyond sequence learning, tracking and adaptation to test generality, (iii) higher sample sizes for increasing robustness, and (iv) longer time scales of learning to examine how these predictions relate to the notions of specificity of learning. Funding source: NSF 1823889.

Neuromotor Changes After a Concussion are Detected With a Custom Smartphone App

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Neuromotor deficits after sustaining a concussion are common, but their detection typically depends on subjective clinical tests or non-portable and expensive laboratory equipment. Our previous work developed an Android smartphone app that uses the phone’s sensors to measure performance during a dynamic balance test, providing an objective, portable, and cost-efficient way to measure neuromotor control. However, the app’s clinical utility has not been fully examined to-date, which was the purpose of this study. We compared a cohort of concussed vs. non-concussed participants when performing a dynamic balance test, which was a 70-second stepping-in-place task with the smartphone attached to the thigh. We hypothesized that the concussed participants would exhibit neuromotor deficits indexed by greater variability in their movement during the task. Standard deviation

of the maximum velocity (SD MAX VEL) of the thigh during the stepping-in-place task (a previously validated dynamic balance test and measure) was used as the dependent variable to index movement variability in this study. Participants (N=205) were recruited from one military site and two civilian sites, and were separated into non-concussed (N=144, 70±13.8 kg, 172.0

±9.7 cm) and concussed (N=61, 75.3±16.2 kg, 171.4±12.3 cm) groups. Stepping-in-place occurred under three conditions: eyes open (EO), eyes closed (EC), and side-to-side head shaking (HS). ANOVAs showed a significant difference between groups, F(1,197)=15.02, p<.001, η²=.071, and conditions, F(1,197)=2.7, p=.013, η²=.031. Follow-up analyses showed higher SD MAX VEL (m/s) for the concussed group (M = 13.77, SE = 0.347) relative to the non-concussed group (M = 12.17, SE = 0.223), and the EC and HS conditions both discriminated the concussed group from the non-concussed group. These data suggest that our custom smartphone app and dynamic balance test are an objective, portable, and cost-efficient way to assess neuromotor changes after a concussion. Funding source: Department of Defense W81XWH-15-1-0094.

An Investigation of the Cognitive Processes Underlying Soccer Coaches’ Decision-Making During Competition

André Roca, St Mary’s University & Fulham Football Club; Cláudio Gomes, St Mary’s University; Colm P. Murphy, St Mary’s University

The ability of coaches to make effective decisions that can impact positively on a team’s performance during competition is a fundamental skill in coaching, especially in fast, dynamic team sports such as soccer. Yet, there has been little research attention given to exploring the thought processes underpinning coaches’ decision-making during soccer matchplay. We used a think aloud protocol analysis to explore the cognitions of skilled (n = 10) and less-skilled (n = 10) adult soccer coaches while required to watch and coach one of the teams during a sequence of representative videos clips of a soccer match first-half. The clips offered a perspective view from the dugout and were played in chronological order to provide a realistic representation of the match context. At the end of the first-half, coaches were also asked to verbalize their thoughts about what they would say to the team at half-time. During first-half match-play, skilled coaches verbalized a greater percentage of thoughts related to performance and tactical evaluations, and the planning of actions, whereas less-skilled coaches mostly monitored the ongoing game actions or events (all p < .05). Moreover, during half-time skilled soccer coaches generated a greater number of relevant planning strategies that aimed to improve team performance for the second half than less-skilled participants (p < .05). Our findings suggest that skilled soccer coaches’ more advanced memory representations of the game enable them to easily retrieve task-specific information in order to make more relevant evaluations and plan better strategic decisions compared with their less skilled counterparts.

Developmental Activities That Contribute to Creative Decision Making in Skilled Soccer Players

André Roca, St Mary’s University & Fulham Football Club; Paul R. Ford, St Mary’s University

The ability to produce creative decisions during match-play is a key attribute of team sports players (Memmert & Roca, 2019). Yet, very few researchers have studied how this type of creative behavior is acquired and developed in the sporting domain. The aim of this study was to assess the link between sport-specific creative decision making and prior engagement in developmental activities in skilled adult soccer players. Players were classified as either high- or low-creative decision makers based on their performance on an established soccer-specific video-based creativity test. Their decisions on the test were measured using the three observation criteria for creativity of originality, flexibility, and fluency. We used
retrospective recall questionnaires to collect participation history data on their engagement in soccer and other sport development activities. Results showed that the high-creative decision-making group accumulated significantly more hours per year \((M = 345 \text{ h} \cdot \text{year}^{-1})\) in free, unstructured soccer-specific play activity during childhood and early adolescence (6-15 years of age) when compared to those classified as low-creative \((M = 192 \text{ h} \cdot \text{year}^{-1})\). No differences were reported for hours per year in soccer-specific formal practice or competition between the two groups throughout their development. Moreover, hours accumulated in other sports and milestones achieved did not differentiate groups. Our findings suggest that informal unorganized, free play in the primary sport is positively associated with and necessary for the development of superior levels of creative decision making in this sport.

**Attentional Focus Cueing in a Standing Long Jump: Effects on Motor Performance and Lower Extremity Muscle Activity in Novice Performers**

Carolina Rojas, California State University Long Beach; Natalie Cabiles, California State University Long Beach; Will Wu, California State University Long Beach

Research has shown that external focus of attention (EF) generally yields better results in motor performance than internal focus of attention (IF) in a standing long jump (SLJ). However, further investigation of the underlying causes of improved performance with regards to peak activity of the biceps femoris (BF) and rectus femoris (RF) muscles has not been investigated. The purpose of this study was to examine the effects of cueing on SLJ performance and the amplitude and timing of peak activity of the BF and RF muscles. Thirty-one participants (15 males, 16 females) were randomly sampled for this study, each having no formal training in the SLJ. Subjects performed one SLJ with no cueing. Furthermore, correlations suggest that increasing strength in the hamstrings might also lead to better jump performance.

**Recognition of Micro-Relations in the Context of Full Game Patterns in Soccer**

Oliver R. Runswick, King’s College London; Ed Hope, University of Essex; James Feist, University of Chichester; Keval Patel, University of Essex; Jamie S. North, St Mary’s University, Twickenham

Pattern recognition contributes to anticipation in team sports. Patterns of play consist of localized relations between individuals. Research in face recognition has shown that recognition performance for whole faces is reduced when local parts of a face (rather than the whole) are presented initially. From a sports perspective, this suggests that the use of small-sided games (SSG; part of a pattern), may disrupt the ability to recognize patterns of play in a full-sided game (the whole pattern). This study investigated the effects of skill level and amount of information presented in initial viewing on the recognition of sequences of play in soccer. Participants were presented with sequences from soccer matches in point light display format in either ‘whole’ or ‘part’ display mode. ‘Whole’ (W) clips showed a 11v11 soccer match and ‘part’ (P) clips presented sequences showing only two players: either two Centre Forwards (CF) or Peripheral Players (PP). Elite (n = 20), skilled (n = 34), and novice (n = 37) soccer players viewed 18 clips in a viewing phase and, following a break, completed a recognition phase in which they made judgments as to whether each clip was novel or had been presented in the viewing phase. This process was repeated in three counterbalanced conditions: ‘W-P’ (i.e., whole in viewing phase and part in recognition phase), ‘P-W’ and ‘W-W’. There was a main effect of group. Elite players’ \((T1=71.67\pm 10.06\%\) recognition accuracy was higher than skilled \((56.52\pm 12.70\%\) and novice \((53.22\pm 13.20\%\) groups \((p<0.01)\). There was also a main effect of condition. Participants were more accurate in the W-W \((67.09\pm 11.45\%)\) than W-P \((57.42\pm 8.36\%)\), and P-W conditions \((56.90\pm 13.12\%\); \(p<0.01\)\). There was also a main effect of skilled players. Recognition accuracy was higher for part clips featuring CFs \((59.28\pm 13.74\%)\) than those featuring PPs \((55.63\pm 14.53\%\); \(p=0.02\)\). Findings suggest that CFs are important to recognizing patterns of play and 11v11 games during training may be more effective than SSG in supporting pattern recognition.
Performance Estimation and Knowledge of Results Frequency Effects on Learning and Transfer
Mohammad R. Saedpour, Indiana University, Bloomington; Alayna Holbert, Indiana University, Bloomington; John B. Shea, Indiana University, Bloomington

Movement planning is influenced by costs such as performance error and effort. Previous studies showed that knowledge of results (KR) frequency effects learning. The learner can detect the mismatch between predicted and actual outcomes. To determine effects of KR frequency and error estimation on learning, subjects performed 30 practice trials with KR and estimation on every trial (30KR-30EST); KR on every 5 trials and estimation on all trials (5KR-30EST); KR on every trial and no estimation (30KR-0EST); and KR on every five trials and no estimation (5KR-0EST). A retention and transfer test was given after practice trials. Results showed that subjects used KR on the first practice trials to update their movement plan. As soon as error reached 100 ms, subjects did not further update their plan. The 30KR-30EST group reached the 100 ms error point after receiving 4 KR trials. The 5KR-30EST reached the 100 ms error point after 16 trials. Subjects who did not estimate their performance times had difficulty updating their plan. The 30KR-0EST group reached the 100 ms error point after 12 KR trials. The 5KR-0EST group did not reach the 100 ms error point. These findings indicate that learners use KR to update their movement plan until reaching an error threshold (100 ms in the present study). After that, they may not use KR to update their plan. Performance on the retention and transfer tests was more accurate for estimation groups (30KR-30EST, 5KR-30EST) than no estimation groups (30KR-0EST, 5KR-0EST). Moreover, the effect of KR frequency was not significant for the retention and transfer tests. KR by itself is not included in the movement plan for the task. Estimation leads to more critical analysis by the subject of their performance.

The Effects of Imagery With Specific Uses of an Internal and External Focus of Attention
Jack J. Sampson, New Mexico State University; Christopher A. Aiken, New Mexico State University; Phillip G. Post, New Mexico State University; Tatiana Zhuravleva, New Mexico State University; Sean M. Cochran, New Mexico State University

The effects of mental imagery on motor performance is fairly well understood with the typical finding being that it enhances performance (Taktak, 2004). One common manipulation within imagery research is the use of kinesthetics where focus is placed on the feeling of the movements (Fery, 2003). This seems to be at odds with motor learning research that suggests attentional focus needs to be on the effects of the movement and not on the movement itself (Wulf, 2013). The purpose of the present study was to investigate the use of specific attentional focus cues imbedded into an imagery script, facilitating an internal or external focus. 36 individuals participated in the research study and passed the Mental Imagery Questionnaire (MIQ-3). The study consisted of performing two trials of the standing long jump within three different conditions. All individuals completed two control (CTL) trials where they were instructed to jump as far as possible. Participants were then provided an imagery script in which terminology was consistent with an internal (INT) or external (EXT) focus of attention. They were asked to image the skill as the script was read, and then when ready, complete two trials of the long jump. Participants were then given the same imagery script with changes to meet the other attentional focus strategy and completed the last two trials. The order in which the experimental conditions were completed were in a counterbalanced order and the jump distance was recorded (cm) for each trial. Data were analyzed with a repeated measures ANOVA with Sidak post-hoc to compare the various conditions. Results revealed a significant main effect for condition ($F=42.32, p<.001$). The post-hoc revealed that INT and EXT imagery resulted in significantly longer jumps than CTL ($p’s<.001$). No differences in jump performance were observed between INT and EXT imagery ($p>.05$). Results support the use of imagery as an intervention regardless of attentional focus used within the intervention. Additional research is needed to better understand this relationship.

Evidence of Long-Term Visuomotor Control Deficit Following mTBI
Gustavo Sandri Heidner, East Carolina University; Caitlin Schult, East Carolina University; Andrea Robinson, Davidson College; Nicholas Murray, East Carolina University

Mild traumatic brain injuries (mTBI) can result in long-lasting impairment of neural and motor functions. It is still unclear how long the abnormalities in visuomotor control can be detected after the symptoms of acute mTBI. Fifty-four participants ($N=54$), 25 of who have suffered one or more mTBI in the past 12 years, participated in this research. A virtual reality headset with infrared eye-tracking was used to deliver a circular smooth pursuit paradigm and track eye focus individually. Participants performed three 30-s trials each while seating down. Data were visually inspected before analysis. A one-way ANOVA was conducted to investigate the differences between the means of each group (healthy and mTBI). The independent variables were position error, angular error, sample entropy of error (SEE), and sample entropy of angular error (SEA), for both left and right eyes. On average, there were no differences of position error for the left eye between healthy ($M=.69$, $SD=.51$) and mTBI ($M=.63$, $SD=.59$), $p=.646$, or for the right eye between healthy ($M=.67$, $SD=.49$) and mTBI ($M=.60$, $SD=.59$), $p=.646$. Similarly, there no differences of angular error for the left eye between healthy ($M=.11$, $SD=.08$) and mTBI ($M=.10$, $SD=.09$), $p=.643$, or for the right eye between healthy ($M=.11$, $SD=.08$) and mTBI ($M=.10$, $SD=.09$), $p=.643$. For the left eye, there were no differences of SEE between healthy ($M=.16$, $SD=.02$) and mTBI ($M=.15$, $SD=.03$), $p=.205$, or SEA between healthy ($M=.17$, $SD=.02$) and mTBI ($M=.16$, $SD=.03$), $p=.160$. Conversely, for the right eye, there were differences of SEE between healthy ($M=.16$, $SD=.02$) and mTBI ($M=.15$, $SD=.04$), $p=.029$, and SEA between healthy ($M=.17$, $SD=.02$) and mTBI ($M=.15$, $SD=.03$), $p=.038$. Our results suggest that mTBI visuomotor impairments can be long-lasting and sample entropy of mean positional and angular error has the sensitivity to detect these deficits. Furthermore, visuomotor control impairment appears to be lateralized.

Effect of Rocksteady Boxing vs PD SAFEx on Parkinson’s Disease Progression: A Double-Blinded Randomized Controlled Trial
Kishoree Sangarapillai, Wilfrid Laurier University; Benjamin Norman, Wilfrid Laurier University; Quincy Almeida, Wilfrid Laurier University

Animal models suggest high-intensity exercise and sensory integration training may be important adjunct therapies in the management of Parkinson’s disease (PD). However, exercise studies rarely focus on disease progression, including boxing and sensory rehabilitation. This study aimed to investigate the effects of boxing and sensory training on the progression of PD over 10 months. In this 40-week double-blinded randomized crossover trial 64 participants with idiopathic PD were randomized into two groups, the PD SAFEx™ start group (n=32) or the boxing start group (n=32), a non-active group was also present (n=4). Participants completed 10-weeks of exercise (either boxing or PD SAFEx™). Each treatment was followed by a 10-week no exercise period, and then a subsequent crossover to the other intervention, also followed by a final 10-week no exercise period. Motor symptoms were assessed at each 10-week interval using the
Unified Parkinson’s Disease Rating Scale (UPDRS-III). Data was analyzed using SPSS and repeated measures ANOVA was conducted. Overall from week 0 to week 40, a main effect of start group (boxing vs. PD SAFE™) F(1, 63)=4.421, p=0.040 was found, post hoc revealed those that started with PD SAFE™ showed greater improvements compared to those that started with boxing (MD=-5.423, SE=2.579). In comparison, the non-active group which worsened by 3.5 points over the 40 weeks. It was found that those that started with PD SAFE™ experienced a delay in disease progression, while those that started in the boxing group experienced similar progression to the non-active group. Future rehabilitation research should incorporate similar measures to explore whether exercise can delay PD progression, improving the quality of life for those with PD.

Reliability and Validity of Assessments for Vestibular Behavior in Sitting and Standing
Jennifer Sansom, Central Michigan University; Karen Lonond, Ithaca College

Our goal was to examine test-retest reliability and construct validity of two commonly performed clinical assessments for vestibular behavior in young, healthy adults while sitting and standing: Dynamic Visual Acuity (DVA) and Gaze Stabilization Test (GST). We tested 22 healthy participants (12 females), 23.0±1.5 years old during 3 sessions, each separated by 5-7 days. During each testing session, participants performed the DVA, GST, Sensory Organization Test (SOT), and Head-Shake Sensory Organization Test (HSOT) assessments with the Neurocom Balance Manager; DVA and GST were performed in sitting and standing for head rotations around yaw, pitch, roll axes. Test-retest reliability: In sitting, fair relationships were found for DVA and GST for head rotations around 3 axes (ICC(3,1)=0.61-0.71). In standing, fair-good relationships were detected for DVA and GST (ICC(3,1)=0.48-0.88). Construct Validity: Between sitting and standing positions, strong-very strong associations were found for DVA and GST (r=0.61-0.81; p<0.05). Moderate associations were found between the SOT and standing GST head velocities (r=0.44-0.52; p<0.05). Weak associations were detected for sitting DVA and GST with SOT and HSOT. Our results show that DVA and GST in standing had slightly better consistency for results across multiple testing sessions than the typical sitting posture for head rotations around 3 axes. Strong associations were found for construct validity during standing DVA and GST with results from sitting vestibular behavior assessments. However, associations between standing DVA and GST with other clinically based assessments of vestibular behavior for standing postural control (i.e., SOT, HSOT), were weak-moderate, possibly due to contextual differences in the assessments. Thus, clinical testing for vestibular behavior may be effectively performed in standing to track progress across time. However, further research is necessary to understand how vestibular behavior influences postural control in other populations. Funding source: Central Michigan University Faculty Research & Creative Endeavors Grant #48151.

Effect of Non-Contact Boxing Training on the Frequency and Timing of Anticipatory Postural Adjustments in Healthy Adults
Won Teak Shin, Miami University; William Berg, Miami University; Michael Hughes, Miami University

The study determined the effect of non-contact boxing training on the frequency and timing of anticipatory postural adjustments (APA) in healthy adults. We hypothesized that non-contact boxing training would result in more frequent as well as earlier APAs in a rapid bilateral arm raising maneuver. The experiment involved 33 healthy adults between the ages of 18 and 27 years who had no previous boxing experience. The control group consisted of 17 participants (8 men and 9 women), while the boxing group consisted of 16 participants (8 men and 8 women). In pre and post-tests, 12 trials of a rapid bilateral arm raising maneuver was used to elicit APAs. EMG in four postural muscles, the thoracic erector spinae (TES), lumbar erector spinae (LES), semi-tendinosus (ST), and soleus (SO) was recorded to determine APA frequency and onset timing. Participants in the boxing group completed twenty 90-min non-contact boxing training sessions over 8 weeks, whereas the control group kept their physical activity routine consistent during the intervention period. Dependent variables included the percent change in the number of trials of the rapid bilateral arm raising maneuver exhibiting APAs, as well as the percent change in APA onset timing. Two-tailed t-tests were used to analyze the data for a difference in sample means between the groups. On average, the frequency of trials exhibiting APAs in the boxing group increased by 8.5%, while control group APA frequency decreased by 4.8%. However, the LES was the only muscle showing a significant difference in APA frequency. On average, the onset of APAs in the boxing group was 17.5% earlier in the post-test than the pretest, whereas APAs in the control group were 5.9% earlier. However, for each muscle, analyses indicated that the mean percent change in APA onset timing between the control and the boxing groups was not significantly different. It appears that non-contact boxing training is limited in its ability to alter the frequency and timing of APAs in healthy adults.

Optimising Children’s Foundational Movement Skills and Movement Assessment Batteries: The OPTIMAL Theory
Thomas Simpson, Edge Hill University; Paul Ellison, Edge Hill University; Richard Tyler, Edge Hill University; Evelyn Carnegie, Edge Hill University; David Marchant, Edge Hill University

OPTIMAL motor learning theory can enhance children’s foundational movement skills (FMS) [eg. object manipulation, locomotion, and stability skills]. It is unknown whether the application of OPTIMAL factors (external focus of attention [EF], enhanced expectancies [EE], autonomy support [AS]), when combined, can improve children’s motor performance in ecologically valid and dynamic settings. This study examined impact of OPTIMAL factors on children’s performance on a dynamic FMS assessment battery. We hypothesised that an optimised assessment protocol (where EF, EE and AS factors are present) would enhance motor performance versus a standardised assessment protocol. Thirty-four children (Mage=9.88±0.93) completed the Dragon Challenge (DC) movement assessment battery; a dynamic assessment of FMS. Performance was measured via a scoring system were high scores represent better performance (max score N=54). Participants completed a standardised and optimised version of the DC in a counterbalanced fashion. For the latter, DC protocols where optimised via the provision of choice (AS); promoting an EF; framing of ability as malleable; biasing the EF benefits and providing positive non-generic feedback (EE). Moreover, aspects of intrinsic motivation where collected (perceived competence, importance, effort, enjoyment, and positive affect). Data collection is still in progress. Data trends suggest that optimised condition (M=29.56±6.27) will outperform the standardised (M=28.24±6.36) condition upon study completion. Time-to-completion was significantly quicker in the optimised-standardised order compared to the standardised-optimised order. Task enjoyment was significantly higher (p=0.022) quicker in the optimised-standardised order compared to the standardised-optimised order. Task enjoyment was significantly higher (p=0.035) for standard condition (M=6.82±0.45) vs optimised condition (M=6.71±0.86). Current results and data trends support the use of OPTIMAL theory to improve children’s FMS and suggest that optimising children’s FMS assessment batteries may uncover latent performance capabilities. However, an overload of information (eg. amount of choice and instructions) may impact task enjoyment. Funding source: N/A.

Mind Over Body: Creating an External Focus for Sport Skills
Harjiv Singh, University of Nevada, Las Vegas; Gabriele Wulf, University of Nevada, Las Vegas
In some studies examining the effectiveness of an external versus internal focus of attention on motor learning or performance, images were used to promote an external focus of attention. In one recent study examining the efficacy of different external foci (Singh & Wulf, 2020), an external focus instruction referred to parts of the body (arms). Specifically, the image of a “platform” was used to describe the area between the wrists and elbows when passing a volleyball. The present study followed up on that study by addressing the question whether a focus on an image that represents a body part (platform) would actually be more effective than a focus on the body parts (arms) themselves (i.e., internal focus). In a within-participant design, novice volleyball players were asked to continuously pass a volleyball to a target on the wall. All participants completed eight 45-s trials under each of the external (“focus on your platform”) and internal focus (“focus on your arms”) conditions, performed in a counterbalanced order. As hypothesized, the results showed that the total score (i.e., sum of scores over 45 s) was significantly higher when participants focused on the platform rather than their arms. Thus, invoking an image of an external object that “replaces” a body part can serve to promote an external focus that results in immediate performance advantages compared with an internal focus on the same body part. The findings suggest that instructors within a range of applied settings can creatively use such images to facilitate the performance of motor skills.

Sequence-Specific Implicit Motor Learning of a 3-Dimensional Whole-Arm Sequence Task in the Non-Dominant Versus Dominant Arm

Charles Smith, University of South Carolina; Joelle Via, University of South Carolina; Hannah Roard, University of South Carolina; Macie Watkins, University of South Carolina; Jessica Baird, University of Alabama – Birmingham; Jill Stewart, University of South Carolina

Implicit motor learning is essential when acquiring new motor skills. We recently showed sequence-specific implicit learning is present in an environment requiring three-dimensional (3D) reach movements in the dominant right arm. However, the non-dominant left arm controls whole-arm movements differently than the dominant right arm which may impact learning. Therefore, this study sought to compare sequence-specific implicit learning during practice of a 3D reach task between the non-dominant and dominant arms. Right-handed young adults completed a target task presented in a 3D virtual environment with either the right arm (N=15) or left arm (N=16) on two consecutive days. Targets were displayed one at a time alternating between a repeated sequence and a random sequence. On Day 1, both groups showed a decrease in response time (time to complete a sequence) with the Repeated sequence completed faster than the Random (p<0.001) and no differences between groups (p>0.1). The Right arm group lowered its response time through increasing peak velocity (p<0.05) and decreasing movement distance (a measure of hand path; p<0.01); the Left arm group, however, maintained relatively constant peak velocities (p>0.1) while decreasing movement distance (p<0.001) with both variables consistently higher than the Right arm group (p<0.05). Changes in performance were maintained on Day 2 in both groups (no significant forgetting). While sequence-specific learning occurred in both groups, different approaches to attaining similar response times indicate the two groups implemented different movement control strategies to learn the task. Improvements in the Right arm group were driven by both a shortened hand path and increased movement speed while improvements in the Left arm group were driven by a shortened hand path distance alone.

Focusing Attention Internally Negatively Effects Standing Long Jump Performance

Andrew J. Strick, University of Tennessee, Knoxville; Logan T. Markwell, University of Tennessee, Knoxville; Jared M. Porter, University of Tennessee, Knoxville

Motor behavior research has consistently demonstrated that an individual can consciously focus their attention internally or externally. An internal focus is when a performer focuses on a specific part of the body such as the knees when jumping. In contrast, an external focus is when attention is directed towards the desired outcome of the movement; such as jumping to a specific point on a landing mat. Previous research has routinely demonstrated that focusing externally improves performance more than focusing internally. However, no published reports have investigated how instructing an individual to focus their attention to various internal cues comparatively depresses motor performance. The purpose of this study was to determine how various forms of an internal focus of attention impact standing long jump performance. Following a 5-minute warmup, male and female participants (N=40) practiced a total of 10 standing long jumps. Participants were given instructions prior to each jump which were designed to direct attention towards a specific internal cue (e.g., toes, knees, arms or hips) with exception of the control condition. Participants were given a 1-minute rest between jumps. Jump distance served as the dependent variable. Data were analyzed using a 2(jumps) X 5(conditions) repeated measures ANOVA. The results of the ANOVA indicated that all of the internal focusing conditions jumped a shorter distance compared to the Right arm group, however, maintained relatively constant peak velocities (p<0.1). The Right arm group significantly increased its response time through increasing peak velocity (p<0.05). Changes in performance compared to trails completed in the control condition. The results of this study indicate that regardless of the locality of internal focus, motor behavior is equally depressed compared to trails completed in the control condition. This finding suggests that practitioners should strongly avoid instructions that focus attention internally towards any movement characteristic of the body.

The Effects of the COVID-19 Pandemic on Major League Soccer Goalie Saves

Andrew J. Strick, University of Tennessee, Knoxville; Logan T. Markwell, University of Tennessee, Knoxville; Jared M. Porter, University of Tennessee, Knoxville

Across the globe, the COVID-19 pandemic significantly impacted nearly all aspects of life, including sport. Along with many other professional sports organizations, Major League Soccer (MLS) created a tournament style environment with all teams moved to a singular location with quarantine protocols. This kind of competition would later become known as the “Bubble,” due to a combination of a centralized location, a lack of fan attendance, and quarantine protocols. During this time, there were reports indicating increases in shooting performance, suggesting that free kicks and goals scored reached a zenith unseen in previous seasons. The present study scientifically examined potential differences in shots taken, shots on goal, goals scored, goal saves, penalty kick goals scored, and penalty kick saves both before and during the COVID-19 “Bubble” season. Archival data were retrieved and analysed to examine potential performance differences. Results of the analysis showed that there were significantly greater goal saves and penalty kick saves in the COVID-19 season compared to the previous 2019 season. Specifically, the analysis revealed in the previous 2019 season, the percentage of saves relative to shots on goal in the MLS was approximately 63%, whereas during the COVID-19 “Bubble” season the percentage improved to roughly 70%. These findings may suggest that the withdrawal of fans at MLS games lead to changes in the environmental characteristics that affected goal saving performances. One interpretation is that goalies may be adversely over aroused in soccer games with spectators in attendance, therefore, the absence of fans may have led to a decrease in arousal levels felt by goalies in games. The decrease in arousal may have put goalies in a more optimal arousal state for goal saving performance in the “Bubble” compared to having fans in sporting arenas. Fan-less arenas following the COVID-19 pandemic in the MLS likely contributed to the improved saves performance reported in this study.
Learning Effect of Badminton Stroke in Accordance With Attentional Focus

Donghwi Suh, Seoul National University; Jaeuk Jeong, Seoul National University; Hyejin Seo, Seoul National University; Seonjin Kim, Seoul National University

This study aims to compare the learning effect of badminton in accordance with attentional-focus. We offered internal-focus-feedback and external-focus-feedback in order to IE-group, and external-focus-feedback and internal-focus-feedback in order to EI-group, and mixed feedback to Mixed-group. Dependent variables are results of motor performance, and coordination-structure of upper-limb. 39 male were recruited into three groups, asked to perform high-clear. 15trials for pre-test, 15trials×4blocks×4days for practice, each 15trials for post-test1, post-test2 respectively. The post1-test was performed after half of the practice period. From this period, the type of feedback was transposed to IE and EI-group. Nonparametric statistics was used to investigate the results. Mean-radial-error(MRE) was significantly decreased at post-test2 than in pre-test and post1-test1 in IE and EI-group. MRE was significantly decreased on IE than on mixed-group in post-test2. BVE was significantly decreased at post-test2 than in pre-test in IE and EI-group. BVE was significantly decreased on IE than on mixed-group on post-test2. ARP was significantly decreased at post-test2 than in pre-test in IE. ARP was significantly decreased on IE than on EI-group in post-test1. PRP was significantly decreased on IE than on mixed-group in post-test2. According to the results of the present study, it seems that motor control can appear differently according to the order of the provided attentional-focus. Collectively, the finding showed that the feedback presented in the order of IE could improve the results of motor performance and positive-ratio of relative-phase on upper-limb at impact better than mixed feedback. While the feedback presented in the order of IE could improve the absolute relative-phase on upper-limb better than the EI, which can interpret the change of coordination-structure of upper-limb differently. Thus the findings could provide a new insight into the mechanisms of motor learning, which suggest different attentional-focus in accordance with different purpose.

Kinematic and Kinetic Analysis of Three Sports Related Movements in Female Athletes and Non-Athletes

Ann Tuzson, Mary Baldwin University; Marty Fontenot, Mary Baldwin University

The purpose of this project was to compare lumbar, pelvic and COP changes during 3 simple dance movements in adult novice dancers before and after a 6-week learning period. Nine young adult participants with no dance experience performed a front tendu, a side tendu and a coupe movement before and after 6 weeks of practice including 4 dance lessons. (3 men, 6 women, 23.7 years +/- 1.3) Two female expert adult dancers performed the same 3 movements for kinematic comparison. We hypothesized that the novice dancers would demonstrate decreased lumbar, pelvic and COP excursion after the 6-week learning phase. Using a 3D Trakstar ascension system (248 Hz) and a Bertec forceplate (1000 Hz), we measured the total excursion of lumbar flexion, pelvic side bend, pelvic tilt, and COP during each of the three movements before and after 6 weeks of practice and lessons. For statistical analysis, we used four separate 2 by 3 repeated measures Anovas with a Bonferonni correction. We provided the kinematic measures from the experts descriptively but did not include those measures in our statistical analysis. For the lumbar flexion measures, only 6 complete data sets were available for comparison. All other analyses included data from all 9 participants. The results showed decreased lumbar flexion excursion (p=0.003) after the 6 week learning period in the three dance movements. Similarly, the participants demonstrated decreased pelvic side-bend after 6 weeks of practice compared to before (p=0.05). The COP values during the front and side tendu showed nonsignificant trends (p=0.098, p=0.095), however, contrary to our hypothesis, instead of decreased COP values after the learning phase, the COP excursion values increased after learning. Also contrary to our hypothesis, the expert dancers demonstrated kinematic and COP values very similar to our novice dancers. By demonstrating the kinematic changes taking place during the motor learning process, we hope to provide movement practitioners insight into how individuals of all abilities learn new motor skills. Funding source: None.

Choices Over Feedback Neutralize Conceptions of Ability Effects in Motor Learning

Matheus Valério, Federal University of Pelotas; Suzete Chiviacowsky, Federal University of Pelotas; Ricardo Drews, Federal University of Uberlândia

Providing learners with choices over feedback has been demonstrated to increase motivation and facilitate motor learning in different types of tasks and populations. Distinct motivational pathways have been detected for such effects, with studies primarily showing the satisfaction of learners’ autonomy and competence basic needs (for a review see Chiviacowsky, 2020). Conceptions of ability are another motivational variable that has been shown to influence learners’ perceptions of competence and motor learning. Participants induced towards a fixed conception of ability (implying skills are dependent on inherent capacities that define the limits of improvement) exhibited decreased self-efficacy and poorer learning.
relative to participants induced towards a malleable view of ability (implying skills are dependent on effort and learning). The objective of this study was to verify if conceptions of ability would still influence learning if individuals are provided with practice with choices over feedback. Adult participants were divided into three groups while learning a golf putting task. They received instructions inducing fixed (FCA group) or malleable (MCA group) conceptions of ability, or no instructions related to conceptions of ability (control group). After a pre-test, the participants performed 60 practice trials and were allowed to request feedback during practice according to their own needs and preferences. One day later, retention and transfer tests were performed in order to observe learning. Questionnaires measured motivation and preferences for feedback requests. The results revealed a significant preference of the participants in all groups for requesting feedback after good trials. Significant differences between groups in feedback frequency, self-efficacy, performance, and learning were not found. These findings suggest that the satisfaction of the autonomy and competence needs resulting from choices over feedback may nullify conceptions of ability effects. They also highlight the important motivational role of feedback in motor learning.

**Expectations About the Efficacy of Transcranial Direct Current Stimulation for Improving Motor Performance**

Peiyuan Wang, Arizona State University; Andrew Hooyman, Arizona State University; Alaina Dettmer, Arizona State University; Sydney Y. Schaefer, Arizona State University

Studies of transcranial direct current stimulation (tDCS) to enhance motor performance have yielded mixed findings, which have often been attributed to differences in study design and individual anatomy. However, placebo effects such as participant expectations have been largely ignored, despite their known influence on motor performance. Specifically, one's expectation about whether or not tDCS can improve their motor performance could theoretically produce an effect size equal to or greater than the actual tDCS treatment effect. Thus, the lack of consistent and reproducible findings could be explained by within and/or between group differences (i.e., active/sham tDCS groups) in participant expectation of tDCS. However, there are little to no data on whether people even have such expectations. We therefore surveyed the general public's expectations about whether tDCS could enhance motor performance, and tested whether expectations varied by prior experience and sex. 376 participants were surveyed through the Amazon Mechanical Turk platform on their expectancy of tDCS with questions adapted from the Credibility and Expectancy Questionnaire. Survey data showed higher-than-neutral expectations (μ(375) = 2.576, p = 0.005) of tDCS to improve motor performance. There was also an interaction between prior tDCS experience and sex on expectancy (F(1,372) = 3.758, p = 0.053), such that females with prior tDCS experience had higher expectations than females with no tDCS experience (95% CI [0.14, 1.06], p = 0.004). These findings suggest that expectations about tDCS for improving motor performance indeed exist, and vary depending on prior experience and sex. Thus, without quantifying or controlling for these tDCS expectations, the random group assignment in the commonly used sham-controlled study design could (unknowingly) yield spurious or null findings that may be misinterpreted as actual treatment effects (or a lack thereof). We therefore recommend consideration of tDCS expectations to attenuate (or leverage) any placebo-like effects within motor performance. Funding source: NASPSPA Graduate Student Research Grant.

**EMG-EMG Wavelet Coherence Between Homologous Muscles During Symmetric and Asymmetric Bimanual Coordination**

Yiyu Wang, Texas A&M University; Osmar Pinto, Anhembi Morumbi University; Madison Davis, Texas A&M University; Deanna Kennedy, Texas A&M University

Neural crosstalk is an often evoked concept to account for stability differences between symmetric and asymmetric bimanual coordination patterns. Nevertheless, how and when neural crosstalk influences bimanual coordination dynamics is not clear. The current investigation was designed to determine if EMG-EMG wavelet coherence between simultaneously recorded EMG signals from homologous muscles can be used as a tool to identify periods of common neural input to homologous muscles. Right limb dominant participants (N=12, mean age = 21.9, 6 females, 6 males) rhythmically produced patterns of isometric force in 1:1 symmetric and 1:2 asymmetric coordination patterns by exerting force on right and left limb force transducers. Participants performed 12 practice trials and two test trials per coordination pattern. On the test trials, muscle activity from the left and right triceps brachii were measured. EMG-EMG coherence between the two EMG signals were calculated using both Fourier-based and wavelet coherence. The results indicated significantly higher coherence for the symmetric than the asymmetric conditions. However, during the asymmetric task short periods of coherence were identified that appeared to coincide with the activation of the dominant triceps brachii muscle. In addition, the results indicated significantly high coherence in the alpha band (5-13 Hz), suggesting the influence was subcortical in nature. Overall, the results support a number of behavioral studies that have demonstrated perturbations consistent with neural crosstalk in the non-dominant limb which was attributed to the dominant limb. Importantly, the use of EMG-EMG wavelet coherence appears to be a rich source of information during bimanual tasks. Funding source: N/A.

**Unimanual and Bimanual Force Control in Parkinson’s Patients**

Yiyu Wang, Texas A&M University; Madison Davis, Texas A&M University; Deanna Kennedy, Texas A&M University

Previous research has indicated that mirror movements (MM) are prevalent in the vast majority of individuals with Parkinson’s disease (PD). The current experiment was designed to determine the influence of MM on unimanual and bimanual control of force in individuals with PD. PD patients (N = 8, Mean age = 71.8 years) and age-matched healthy control participants (N = 8, Mean age = 71.5 years) were required to perform three force production tasks with their index finger(s): (1) unimanual-left constant force, (2) unimanual-right constant force, and (3) bimanual constant force. Participants performed six 20 s trials at 10% of their maximal voluntary contraction (MVC) for each condition. In half of all trials, visual feedback was removed for the right hand, while in the other half visual feedback was removed for the left hand after 10 s to determine the extent to which the forces exerted by one limb influenced the forces produced by the contralateral limb. Mean force and the coefficient of variation (CV) of force were used to evaluate the accuracy and stability of each effector and time series cross-correlations between each effector were computed to determine the effects of MM. All participants were quite effective in producing the goal force for the active limb. However, the results indicated older adults produced force above baseline in the resting limb during the unimanual tasks that were positively correlated with the forces produced by the active limb. Similar baseline forces were not detected for the PD participants. In addition, no differences were detected between PD and healthy controls for the bimanual task. This result is consistent with previous research demonstrating the effective performance of bimanual coordination tasks that require symmetric coordination between the limbs.

**Exploring the Effects of Traditional and Expert-Derived Attentional Focus Cue Structures on Complex Skill Learning**

Kaylee Woodard, Western Kentucky University; Jeffrey Fairbrother, Auburn University; Logan Markwell, University of Tennessee, Knoxville
Instructions that direct attention externally have generally been shown to enhance motor performance. However, research in skilled performers has produced mixed findings. Further, many of the studies on attentional focus and motor learning have presented an overly simplistic view of attention, such that all internal focus protocols are contrasted with all external focus protocols. Contrary to this approach, skilled performers have reported adopting combined focus strategies, revealing the need to test more realistic instructional protocols in future research. The current study provided an experimental test of focus instructions that were modeled after the focus strategies of a group of elite jump rope athletes. Four groups of skilled jump rope athletes practiced new skills using various focus instructions. The internal focus (IF) and external focus (EF) groups were given traditional internal and external focus instructions, respectively. The expert modeled (EM) group was given instructions that were based on experts’ reported focus strategies. The expert modeled-autonomous (EM-A) group was given the expert modeled instructional set but was allowed to choose how they used the instructions. All groups completed a baseline assessment, four practice sessions, and a learning assessment. Results of a chi-square test of independence revealed no relationship between group assignment and performance during baseline or practice. There was a significant relationship between group assignment and performance during the learning assessment \( (p < .05) \). Specifically, the IF group performed worse than expected while the EM group performed better than expected. Findings support previous research showing learning deterrents associated with internal focus instructions and also provide new insight into the advantages of using instructional approaches that are modeled after experts’ strategies. Implications and suggestions for future research are discussed. Funding source: N/A.

‘Do Your Best’ is as Effective as a Combination of Autonomy and External Focus or an External Focus Alone in a Balance Task Under Distraction

Masahiro Yamada, The University of North Carolina at Greensboro; Louisa Raisbeck, The University of North Carolina at Greensboro

The OPTIMAL theory proposes that a combination of autonomy support (AS) and external focus (EF) is more beneficial than EF alone by “increasing the focus on the task goal”. The present study examined this increased focus effect. The combined (AS and EF) \( (n = 12) \), EF \( (n = 12) \), and control (CON) \( (n = 9) \) practiced a dynamic balance task using a stabilometer\(^\text{(20 deg deviation, 25Hz)}\). Prior to the acquisition phase, the combined group chose the color of tape they wanted on the board, and the tapes were attached to the board 90cm apart. The EF group was yoked with the combined group, and the CON group did not have any tape procedure. During the trials, the combined group and EF group were told to ‘keep the tape parallel to the floor,’ and the CON group was told to ‘do your best’. These instructions were repeated before every trial for 2 days of practice (90s/trial for 14 trials). On Day 3, participants completed 3trials of the retention test and 3trials of the transfer test under auditory distraction (80-90dB). After the transfer test, self-efficacy and the degree of distraction (0 – 100) were measured, and participants’ focus was coded into 4 categories. Performance was measured with Root Mean Square Error (RMSE), Mean Power Frequency, and sample entropy (SampEn). Results of 3-way ANOVA of Group x Day x Trial showed that participants improved in RMSE (Day: \( F_{1, 30} = 51.70, p < .001 \), partial eta squared (eta) = .633; trial: \( F_{1,08, 122.26} = 53.75, p < .001 \), eta = .642) and increased SampEn on Day 1 \( (F_{1,10, 158.67} = 6.13, p = .001 \), eta = .161) but tended to decrease on Day 2 \( (F_{1,30, 118.44} = 2.34, p = .064 \), eta = .068). There were no group differences in any variables during practice, retention, and transfer phases \( (p’s > .05) \). No increased focus on the task effect was found from the manipulation check, \( \chi^2(6,34) = 1.63, p = .951 \), or distraction scale \( (p > .05) \). Our results suggest that simply telling “to do your best” may be as effective as an EF or combined strategy.

Attentional Focus Effects as a Function of Task Difficulty and Experience in a Reciprocal Tapping Task

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The effect of an external focus (EF) over an internal focus (IF) has been shown to vary by task difficulty or experience. However, both difficulty and experience have not been considered simultaneously. The purpose of the study was to examine the effects of task difficulty and previous experience on an attentionally focused tapping task. Participants were randomly assigned to an EF \( (n = 20) \), IF \( (n = 20) \), or control (CON) \( (n = 20) \) group and practiced a 30s reciprocal tapping task between two targets. The task difficulty was calculated as Index of Difficulty (ID) by varying the distance between and the size of the targets \( (ID = 2, 4, and 6 for easy, medium, and hard, respectively) \). Participants practiced each ID for six trials on day 1 and day 2. During practice, the EF/IF instruction was “mentally focus on moving [the pen (EF)/hand (IF)] as fast and accurately as possible.” The CON group was told, “mentally focus on doing your best.” On day 2, a learning effect was measured as the performance during the 5-minute delayed retention, followed by 48-hour retention and transfer tests (i.e., naming as many animals that begin with a C, P, G while performing the task for easy, medium, and hard, respectively). Markers attached to the stylus were tracked by Qualysis 3D motion cameras at 100Hz. Performance was measured as Movement Time (MT) and Error (missed target) taps. Although no group difference was observed for MT in any phases \( (p > .05) \), Error taps, albeit non-significant \( (p = .183 \) at the beginning and \( p = .101 \) after practice), showed a medium effect size \( (partial \eta^2 = .063 \) and .08, respectively). Our secondary analysis on the precise accuracy (mean radial error) and variability showed that the IF group had a larger variability than the EF group on the right target \( (p = .008) \) at the beginning (Block 1). However, after practice (retention tests), the EF/IF difference disappeared, and the CON group showed lower variability than the IF group \( (p = .011) \). We think these results justify further research into how attentional focus effects change with experience.

Vertical-Horizontal (V-H) Illusory Effects With Gaze Restrictions Influence Planning But Not Completion of Length Estimations Using the Lower Limb

Shijun Yan, Shirley Ryan Ability Lab & Northwestern University; Matthew Yeomans, The University of Tennessee at Martin; Jan Hondzinski, Louisiana State University

When viewing an inverted-T (IT), the vertical segment often appears longer than the horizontal segment. Gaze direction can affect perceptions and manual length estimates of this vertical-horizontal (V-H) illusion. We questioned whether similar influences existed for length estimates using step displacements. Fifteen participants \( (M = 21 \) years) used a horizontally directed forward step to estimate lengths of the vertical segment of a vertically projected IT. After reporting judgment of the perceptually longer segment, participants tried to step forward so that their toe-to-toe distance of the right foot equaled the vertical segment length of the IT. Performances under three gaze conditions included: maintaining gaze on the IT intersection throughout a trial for target fixation (TF); viewing the intersection for 4 s then looking down and performing the step for movement fixation (MF); and maintaining gaze on the remembered location of the IT intersection and performing the step for remembered target fixation (RTF). We recorded ground reaction forces, feet positions, and gaze positions. Variables included step displacement, peak velocity (PV), and ground reaction force (GRF), as well as time to...
peak (time) and peak amplitude (amp) of the center of pressure (COP), associated with weight shifting and step planning prior to stepping. Strong illusory effects existed for perceptual judgments. Main effects of gaze on PV, GRF, COPtime, and COPamp ($p < .05$) revealed lower values for MF compared to TF and RTF, which did not exist for step displacement. Step displacement correlated significantly with PV across participants. Significant correlations between step displacement and other variables across and within participants did not exist or only existed for a few people to suggest differences between movement planning and movement completion. We concluded that exploitation of deceptive visual cues presented in a vertical plane may guide step planning and early step execution but do not guide completion of horizontal plane stepping according to V–H illusory influences.

**Electrocortical Activity and Postural Control During Eye-Hand Coupling and Decoupling Tasks in Aerobically Fit Versus Sedentary Individuals**

Matthew Yeomans, University of Tennessee at Martin; Fabian Steinberg, Louisiana State University; Gaülle Spielmann, Louisiana State University; Jan Hondzinski, Louisiana State University; Marc Dalecki, Louisiana State University

High fitness levels can associate positively with cognitively demanding sensorimotor abilities. We investigated whether fitness level of young adults affected eye-hand coordination, postural control, and electrocortical activity when performing visuomotor tasks with different cognitive demands. We expected more efficient electrocortical activation, hand movement, and postural control in fit ($VO_{2\text{max}} > 50 \text{ ml/kg/min}$) than sedentary ($VO_{2\text{max}} < 34 \text{ ml/kg/min}$) individuals, during the task with higher cognitive demand. Four highly fit and 3 sedentary college-aged (M=21 years; 3 females) adults moved a cursor using finger movements as quickly and accurately as possible along a vertical touchscreen while sitting and standing. In an eye-hand coupling (EH) task, participants moved their finger and eyes from a central to a peripheral target (up, down, left, right) on the touchscreen. The cognitively demanding eye-hand decoupling (EHD) task included a feedback reversal, i.e., moving the finger to the left moved the cursor to the right toward the target with eyes following the cursor. Finger kinematics, sway measures, and electrophysiological activity recordings were conducted via touchscreen, force plate, and electroencephalogram (EEG). ANOVAs yielded greater EEG alpha activity in centro-parietal area (at CP6 electrode), reaction times, response times, and absolute errors in EHD than EH ($p<.05$). No other significant differences existed ($p>0.05$). In contrast to our prediction, these preliminary data revealed no evidence of eye-hand coordination or postural control differences between highly fit and sedentary participants. Alterations in visually-guided reaching between eye-hand coupling and decoupling seem to depend on high-order cognitive control changes in attention, movement inhibition, as well as sensorimotor control and not on low postural threat changes or fitness level. Reaching performance declines accompanied by increased cognitive-motor demands by eye-hand decoupling may rather link to past/current athletic eye-hand coordination experience than to fitness level. Funding source: n/a.

**Effect of Ankle Load and Body Position on Knee Joint Kinematics During the Pendulum Test in Children With Down Syndrome**

Robert Zeid, Georgia State University; Diego Ferreira, Lebanon Valley College; Jianhua Wu, Georgia State University

Individuals with Down syndrome (DS) present with hypotonia and increased joint laxity, resulting in compensatory strategies that increase joint stiffness. Using the Wartenberg pendulum test with an upright sitting position, we previously found that children with DS demonstrate increased passive knee stiffness compared to typically developing children. We also found that adding an external ankle load equal to 2% of body mass tended to increase the passive motion of the knee. However, it is not known if different body positions and ankle loads would change test performances. The purpose of this study was to examine the effect of body positions and ankle loads on knee joint passive stiffness in children with DS. There were three body positions: lying supine, sitting reclined at a 45-degree angle, and sitting upright and two ankle loads: no load and ankle load equaling 6% of body mass, resulting in six conditions presented in a random order. Five children (3F/2M, 11.08±2.8 years) participated in this study. A Vicon motion capture system was used to collect kinematic data of the knee joint. Kinematic variables included a relaxation index (RI), duration to the first peak flexion (F1), number of swing cycles, peak velocity and acceleration of the lower leg in the first knee flexion. EMG variables were the integrated area of muscle activity. Two-way (3 position x 2 load) ANOVAs with repeated measures were conducted on dependent variables. Results showed that body positions did not affect the kinematic and EMG variables. In contrast, children with DS increased RI, F1, number of cycles, and peak acceleration in the first knee flexion but maintained similar EMG values from no load to ankle load condition. Additional subjects will confirm the trends observed in this pilot study, which will provide essential information on its potential clinical application. Funding source: N/A.

**Sport and Exercise Psychology Abstracts**

“*We Don’t Talk About It*”: Describing Menstrual Taboo and Concealment Within Competitive Sport Contexts

Margo E. K. Adam, University of Saskatchewan; Marta C. Erlandson, University of Saskatchewan

Within sport women athletes face challenges related to menstrual function and dysfunction. Menstruation has been described as a biological-psycho-logical-social process that can impact many facets of sport. However, menstruation in general is taboo and often women go to great lengths to conceal or alter their natural biological rhythm. Therefore, the purpose of this interpretive descriptive study (Thorne, 2008) was to explore if the social taboo extends to the sport context and impacts how athletes communicate about menstruation in sport. As part of a larger study 58 women athletes responded to a series of open-ended questions regarding their perceptions and experiences of talking about menstruation in sport. The findings of the current study highlight that menstruation is taboo within sport and that women athletes often actively conceal their menstrual function and dysfunction. Specifically, women athletes are only comfortable talking to other women athletes who they have a close personal relationship with and are uncomfortable and often actively avoid any conversation for various reasons regarding menstruation with coaches and other professional athletic supports. A range of topics were identified that women athletes perceive as taboo, uncomfortable, or to be avoided such as menstrual irregularity or dysfunction, heavy flow, perceptions of “not normal”, bleeding through/over flow, sex and pregnancy, long term health complications, suppressing their menstrual cycle, and impact on performance. The findings from this study highlight that because menstruation is taboo and athletes effortfully conceal their menstrual function and dysfunction many athletes do not receive appropriate support from other athletes, coaches, or sport staff. Further, the social taboo regarding menstruation is strong within competitive sport contexts and that many women athletes feel shame and suffer in silence, which may negatively impact many biological, psychological, and social aspects of their sport experience. Funding source: This research was funded by the Saskatchewan Health Research Foundation.
"They May Not All Be Sweet, Inspirational, and Saintly Figures": Examining Societal Perceptions of Parasport Coaches in the Newspaper Media

Danielle Alexander, McGill University; Lindsay Duncan, McGill University; Gordon Bloom, McGill University

Newspapers have a long-standing tradition of being the dominant print media source in society, capable of shaping the perceptions of media consumers around the world. To date, newspaper media analyses have been conducted on the Paralympic Games and parasport athletes, however, there has yet to be a focus on parasport coaches despite the important role they play in raising awareness of parasport. The purpose was to examine how newspaper media portrayed dominant discourses surrounding parasport coaches. Data were collected using the LexisNexis Academic database to search for full-text newspaper articles from January 1, 1999 to January 1, 2019. Eighty-three articles were included from 66 newspaper sources. We conducted a thematic analysis to identify common patterns and themes and used a critical discourse analysis to examine the social, political, and cultural discourses surrounding parasport coaches. Journalists played an important role in shaping the messages being portrayed by coaches, often presenting contrasting viewpoints. A large proportion of journalists portrayed parasport coaches using a generosity lens to accentuate their service-related personality characteristics (e.g., kind-hearted), while a smaller subset of journalists argued that parasport coaches can be equally as deceitful and competitive as their mainstream coaching counterparts. This generosity lens has the potential to inhibit the recruitment and retention of coaches in parasport due to stigma that parasport is considered more therapeutic than elite. The way parasport coaches are portrayed in the media may further reinforce preconceptions or hesitations that some coaches have in joining parasport. As such, it is pertinent that journalists be mindful of the terminology they use and consider the societal and professional ramifications that follow from portraying parasport coaches solely as kind-hearted individuals. Taken together, we believe this increased awareness has the potential to promote parasport participation at both recreational and competitive levels around the world. Funding source: Fonds de Recherche Société et Culture (FRQSC), Social Sciences and Humanities Research Council of Canada (SSHRC).

Interactions Between Features of the Physical Environment and Types of Motivation in Predicting Older Adults’ Physical Activity

Steve Amireault, Purdue University; Mary K. Huffman, Purdue University; Megan Deng, Purdue University; John M. Baier, Purdue University

The socioecological framework posits that factors across multiple levels of influence interact to impact health behaviors, such as physical activity (PA). An augmenting (a supportive environment helps those with high motivation engage in more PA) and an overcoming (a supportive environment helps those with lower motivation engage in PA) hypotheses have been proposed. The purpose of this study was to investigate the interaction between two environmental-level (walkability and bikeability) and two individual-level (autonomous and controlled motivation) factors in predicting PA among older adults. Members of the ALL IN for Health! volunteer registry aged ≥55 years without severe cognitive impairment were contacted via email to complete an online survey. At baseline, participants (N = 430; Mage = 64.65 years) reported their levels of controlled and autonomous motivation using the BREQ-2, and how often they engaged in PA in the past month. Walkability and bikeability scores were provided by Walk Scores® and matched with each participant’s county of residence. PA was assessed prospectively using the Physical Activity Scale for Elderly for four consecutive weeks; weekly PA scores were averaged. Controlling for past PA behavior, ordinary least squares regression analysis (model adj. R² = .35) revealed that bikeability, controlled and autonomous motivation interacted to predict PA (3-way interaction, p = 0.037). For those reporting lower levels of controlled motivation (mean – 1SD), both bikeability and autonomous motivation were independently and positively associated with PA. For those reporting higher levels of controlled motivation (mean + 1SD), bikeability was positively associated with PA, but only for those who reported lower levels of autonomous motivation (mean – 1SD). Walkability did not interact with the motivational constructs (p ≥ 0.05). Complete cases and multiple imputation analyses yielded similar findings. These results are consistent with the overcoming interaction hypothesis; however, attempts to validate the findings other samples are needed. Funding source: None.

Effects of the Shape Your Life Project on the Mental and Physical Health Outcomes of Survivors of Gender-Based Violence

Kirina Angrish, Brock University; Cathy van Ingen, Brock University; Kimberly L. Gammage, Brock University

Trauma-informed physical activity programs provide survivors with the opportunity to be in control of their body, facilitating recovery from traumatic experience. Yet, little is understood about the effects of a trauma-informed physical activity program on health outcomes in female-identified survivors of gender-based violence. Hence, the purpose of this study was to understand the effectiveness of a 14-week trauma-informed, non-contact boxing program, Shape Your Life (SYL), on mental and physical health, and quality of life (primary outcomes) and social support, self-esteem, resilience, physical efficacy, personal and interpersonal agency and financial strain (secondary outcomes). SYL is a free, trauma-informed program founded in Toronto, Canada in 2007. The program is informed by an anti-oppression framework and feminist trauma work; thus it is designed to address and be responsive to the lived experience of trauma survivors. In this study, 56 participants (Mage = 35 years), primarily Caucasian (41.2%), engaged in one 90-minute weekly session of non-contact boxing (e.g., learning footwork, punch combinations, but not sparring). Measures of primary and secondary outcomes were administered at baseline, in week 7, and week 14. A series of single-group repeated measures of analysis of variance were conducted to examine changes in each outcome. Significant improvements (all p’s < .05) were seen in physical and mental health, quality of life, social support, personal and interpersonal agency, resilience, self-esteem, and physical efficacy from pre-to-post-intervention. Financial strain, although not significant (p = .23), was lower post-intervention than pre-intervention. Findings from this study suggest that non-contact boxing, when implemented using a trauma-informed approach, can be a safe and positive experience aiding in the recovery of gender-based violence survivors. Funding source: Public Health Agency of Canada.

“Negative Things That Kids Should Never Have to Hear”: Exploring Women’s Histories of Weight Stigma in Physical Activity

Garcia Ashdown-Franks, University of Toronto; Angela Meadows, Western University; Eva Pila, Western University

Anti-fat bias and stigma are pervasive in traditional physical activity contexts and have been shown to disproportionately impact higher-weight women. Scholars have proposed that cumulative experiences of anti-fat bias and stigma contribute to detrimental physical activity experiences and contribute to social and health inequities among individuals in stigmatized bodies. As such, it is important to understand how enacted weight stigma experiences are constructed and impact physical activity engagement long-term. Eighteen women ranging in age from 18 to 33 (Mage = 27) who identified as having had negative experiences related to their body weight, shape, or size in physical activity contexts, participated in one-on-one semi-structured interviews. Participants completed historical physical

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activity timelines which guided interview discussions of how past weight stigmatizing experiences influenced their current relationship with physical activity. Using thematic analysis, four themes were identified including: (i) norms of body belonging, (ii) distancing from an active identity, (iii) at war with the body, and (iv) acts of resistance. Women highlighted the pervasiveness of weight stigma and fat phobia throughout the lifespan, and the permanence of early childhood memories, which shaped women’s lifelong relationships with their bodies and physical activity. These findings deepen understandings of experiences of weight stigma throughout the lifespan can have longstanding consequences on physical activity cognitions, emotions, and behaviors. In order to ethically and equitably promote physical activity, it is imperative that movement spaces (e.g., fitness centres, sport organizations) actively target anti-fat bias and stigma and adopt weight-inclusive principles. Funding source: Canadian Institutes of Health Research (CIHR); Social Sciences and Humanities Research Council (SSHRC).

Exploring School-Based Coaches’ Backgrounds, Philosophies, and Behaviors

Obidiah Atkinson, The Ohio State University; Travis R. Scheadler, The Ohio State University

The coach is instrumental toward fostering continued participation in sport for youth. Coaching scholarship to date however, has relatively small sample studies, examining single sports, and often fails to account for varying pedagogical practices. Moreover, few studies specifically explore practices and perspectives on life skill and positive youth development (PYD). This descriptive study examines coaching backgrounds, training interests, philosophies, and practices among middle and high school coaches. A total of 349 coaches (female = 100; male = 245) completed an online survey. The majority of coaches were 30 years of age or older (82.3%), White/Caucasian (86.8%), coached team sports (60.2%), and teams comprised of female athletes (43.4%). Coaches reported their previous playing experience, interactions with peer coaches, and status has a parent/caregiver as the most important influencers of coaching behaviors. Also, 62.9% reported that training/workshops had influenced their coaching. Almost all coaches in the study had reported participating in safety-related trainings. Nearly three-quarters were interested in future training in sport psychology principles, effective motivational techniques, and sport skills and tactics. Coaches reported less interest in training related to PYD principles. In relation to coaching philosophies, coaches primarily emphasized win-loss records, winning championships, and athletes securing scholarships (particularly among male, individual sports, and rural coaches) placing less emphasis on sport and life skill development (regardless of coaching female/male teams or team/individual sports). Findings shed light on the backgrounds, philosophies, and behaviors of school-based coaches, with relevance for the design and implementation of training and support for coaches in the future. Implications suggest there is a need for sport-specific contextualized trainings to address the diverse needs and perspectives of coaches. Findings also reinforce the need for additional work in the promotion of life skills and PYD in coaching practice.

Measurement of Physical Activity Self-Efficacy in Physical Activity Interventions in Adults: A Systematic Review

Andre Bateman, Michigan State University; Nicholas Myers, Michigan State University; Sisi Chen, Michigan State University; Seungmin Lee, Michigan State University

Self-efficacy is a psychosocial determinant of physical activity. Different physical activity self-efficacy scales have been used in physical activity interventions. This systematic review examines the theoretical and measurement quality of the available scales measuring physical activity self-efficacy in physical activity interventions. The search strategy was based on the PRISMA guidelines. Studies were included if they measured physical activity self-efficacy in adults aged 18 to 65. Fifty-eight studies were reviewed, and 19 measures were identified. Thirteen scales consisted of multiple items and 6 were single-item scales. The number of items in the scales ranged from five to 23. Two scales were reported as being multidimensional, the rest appear to have been treated as unidimensional. The theoretical, measurement-related, and administrative properties of the scales varied depending on the criterion examined. The following conceptual and measurement-related issues were identified: (a) not ensuring concordance between self-efficacy and physical activity measurement (e.g., matching levels of intensity), (b) scales not specifying physical activity levels to which the capability beliefs refer (e.g., intensity), (c) scales having theoretically imprecise construct labels, (d) scales not emphasizing essential conceptual properties (e.g., current capability), (e) studies not reporting dimensionality and (f) the use of single-item measures of self-efficacy. The scales showed good administrative properties in general. Recommendations are made to improve the measurement of physical activity self-efficacy in physical activity interventions.

Aerobic Fitness and Task Strategy Moderate the Acute Effects of Maximal Exercise on Inhibitory Control in Young Adults

Nicholas Baumgartner, Purdue University; Christian Nagy, Purdue University; Chun-Hao Wang, National Cheng Kung University; Shih-Chun Kao, Purdue University

A single bout of exercise has been shown to affect cognitive control, however, previous research has focused on moderate exercise, with limited evidence determining the cognitive changes in response to maximal intensity exercise. Of the available studies, inconsistent effects of maximal exercise on cognitive control has been reported, likely due to the lack of consideration of individual differences in fitness level and strategy utilization. Thus, the purpose of this study was to examine the impact of fitness level and strategy utilization on performance during a cognitive control task following maximal exercise. It was hypothesized that higher fit individuals would show greater cognitive control performance compared to lower fit individuals following maximal exercise, and the strategy utilized during tasks would moderate exercise-induced performance changes. Young adults (N = 104, Mage = 22.4±5 ± 2.7 years) completed a modified Eriksen Flanker task to measure inhibitory control. During the task, participants were instructed to respond as accurately (Accuracy condition) or as quickly (Speed condition) as possible in a counterbalanced order. Next, participants completed a graded exercise until exhaustion to test aerobic fitness and achieve volitional fatigue, followed by the completion of the same Flanker task. Following maximal exercise higher fit individuals showed increased response accuracy selectively during the Accuracy condition while no such effect was observed during the Speed condition as well as for the lower fit individuals in both conditions (F = 6.1, p = .015, ηp² = .06). Further, participants showed a significantly faster reaction time following exercise while utilizing the speed task strategy (F = 5.7, p = .018, ηp² = .05). These results highlight the moderating role of fitness level and strategy utilization on cognitive control performance in response to maximal exercise, suggesting the need to consider individual differences in aerobic fitness and strategy utilization when evaluating the acute impact of maximal exercise on cognitive control.

Young, Male, Inexperienced – What Factors Drive Overconfidence? Empirical Evidence From Marathon Running

Lisa Karolyn Beck-Werz, Paderborn University
The effects of overconfidence have substantial and far-reaching economic as well as social implications. A large body of literature has confirmed that overestimating one’s own abilities hinders accurate decision-making, considerably influences the quality of decisions, and thus leads to substantial negative consequences. In our study we explore the effect of gender, age and prior experience on the occurrence of overconfidence. We investigate these factors in the natural context of marathon races by analyzing the slowdown of runners, which is seen a direct and inevitable reaction to the overestimation of their initial race pace. Our dataset consisted of 88,876 marathon runners (28% women). The data were derived from two large flat-course marathons in Germany, both of which took place over four consecutive years (Hamburg 2016–2019, Frankfurt 2015–2018). We used linear regression models and different approaches for operationalizing slowdown. Our findings confirmed the large body of existing laboratory experiments and revealed a clear gender gap: men have a stronger tendency to overconfidence models and different approaches for operationalizing slowdown. Our estimated their own potential performance (p < 0.001). Furthermore, we showed that age correlates with overconfidence and particularly young (<30 years) and old (> 55 years) athletes overestimated their own potential performance (p < 0.001). Moreover, we found that men’s slowdowns were only significant from kilometre 30 onwards and that gender-specific differences in race performance only became apparent in the last quarter of the race. In addition, our study revealed that overconfidence is not affected by prior experience as the completion of previous marathon races does not correlate with overconfidence. Future studies should compare the results with detailed slowdown analyses in other race formats (e.g., half marathon or ultramarathon) in order to better understand gender-specific differences in the last quarter of the marathon race and investigate the effect of physiological factors.

Are Women More Resilient? Gender Differences in the Reaction to Negative Feedback
Lisa Karolyn Beck-Werz, Paderborn University; Thomas Fritz, Aachen University of Applied Sciences

Although the gender gap in labor markets is steadily narrowing, there is a persistent shortage of women in competitive high-ranking positions. A growing body of literature explains the gender gap in market labor outcomes with gender differences in preference for and reaction to competitive settings. The objective of this study was to better understand how women and men respond to negative feedback in the natural environment of marathon competitions. Our study analyzed the behavior of marathon runners, who showed a severe slowdown in the second half of a marathon race and thereby implicitly received negative feedback on their competitive approach and initial pace. In our study we explored if these athletes re-entered a marathon race in the following year and how they adapted their racing strategy. Using a total population of 88,878 athletes from two big marathons in Germany over four consecutive years, we identified 419 athletes (23.7% women) with a severe slowdown. Furthermore, a comparison group of 400 ‘average’ athletes (200 of each gender) was randomly chosen. We used linear regression models controlling for race, year, age, and speed of the athletes. We found that women who were subject to a negative experience displayed a 16%p higher likelihood to run a marathon again in the following year compared to men (p = 0.004). Furthermore, men who did not experience a severe slowdown displayed a 51%p higher probability (p < 0.001) to re-enter a marathon in the following year compared to men who experienced negative feedback. Contrarily, no significant differences were found between women with and without negative experience: Women made their decision to run another marathon regardless of their previous experience. Both women and men adapted their competitive approach one year after negative feedback and chose a significantly more appropriate initial pace. Our study revealed a new facet in the response to feedback. Further studies should build on this and investigate this phenomenon in more detail, especially in different settings such as the labor market.

Masters Coaches’ Professional Development: What They Learned and How it Was Employed into Their Coaching
Catalina Belalcazar, Cape Breton University; Bettina Callary, Cape Breton University

Masters athletes (MAs) are adults that engage in competitive leisure sport, train regularly, and are formally registered in clubs (Young, 2011). An aging population and continued participation in sport past the typical age of peak performance make MAs a fast-growing sport cohort in many countries (Weir et al., 2010). The psychosocial coaching needs of adults in sport have been documented (Callary et al., 2017); and an evidence-based self-assessment tool for Masters coaches (MCs) was created and validated, entitled the Adult Oriented Sport Coaching Survey (AOSCS; Rathwell et al., 2020). The AOSCS outlines five psychosocial adult-oriented coaching practices. The purpose of this presentation is to explore MCs’ learning needs and map those to the AOSCS to establish how the AOSCS can be used in coach development workshops. The participants were 20 MCs (60 years+) from a Colombian Masters football (soccer) league. Data was collected via semi-structured interviews and game observations. The data were thematically analyzed, and 10 themes emerged regarding what the coaches wanted to learn. These mapped on to the five themes of the AOSCS, and supports the notion of using the AOSCS in coach development workshops. The results indicate that personalized coach development workshops employing the AOSCS enabled more appropriate adult-oriented coaching for better-structured, quality Masters sport coaching. Funding source: SSHRC.

A Time-Telling Tale: Olympic and Paralympic Hopefuls’ Reactions and Adaptation to the Postponement of the Tokyo 2020 Games
Erica V. Bennett, The University of British Columbia; Lisa R. Trainor, The University of British Columbia; Andrea M. Bandon, The University of British Columbia; Myriam L. Tremblay, The University of British Columbia; Staci Mannella, The University of British Columbia; Peter R. E. Crocker, The University of British Columbia

After years of commitment and preparation, Olympic and Paralympic hopefuls are unexpectedly faced with a global pandemic and postponement of the Tokyo 2020 Games. The purpose of this research was to examine how athletes initially appraised, coped with, and adapted to the Covid-19 pandemic and rescheduling of the Games. Semi-structured interviews with 21 athletes (7 Paralympic; 14 Olympic) were conducted and analyzed using narrative thematic analysis. An overarching narrative of time permeated the athletes’ stories. Participants discussed the welcomed opportunity to take a break from sport without guilt as a result of distancing and lockdown protocols. They expressed gratitude for the time to rest and recover and for the ability to cultivate their relationships with loved ones. Within the first few months following the postponement, participants began to diversify their identities beyond sport; some returned to postsecondary education, others developed plans for retirement, and all engaged in hobbies for pleasure which would have been impossible in a usual Olympic cycle. Given the limited ability to train and compete due to public health guidelines, athletes adapted their physical training to suit their environments. They also spent time developing mental skills; they worked on shifting from a performance to mastery orientation, and practiced mindfulness and self-compassion to build resilience in the face of prolonged pandemic and sport-related uncertainty. Some athletes reframed the importance they placed on their sport careers in light of the global health crisis, which catalyzed adjustments to their future training, competition, and life plans. In this way, athletes were offered a perceived ‘risk-free’
opportunity to challenge the elite sport performance narrative by embodying a narrative of reclaimed time. These findings illuminate the challenges and growth experienced by athletes and self-regulation strategies used to dissipate psychological disruptions in pursuit of adaptation to unexpected events. Funding source: UBC Faculty of Education SSHRC Explore Grant.

Content Analysis of State High School Association Mission Statements

Jedediah Blanton, University of Tennessee – Knoxville; Rachel Williams, University of Tennessee – Knoxville; Jeff Graham, University of Tennessee – Knoxville; Scott Pierce, Illinois State University

Recent youth sport literature has advocated for more ecologically informed studies to understand the psychosocial development of young athletes (Dorsch, et al., 2020), while organizational sport psychologists have highlighted the importance of better understanding sport success through examining traits beyond the individual, such as support systems, and sport bodies (Wagstaff, 2016). Thus, the current study sought to understand the organizational aims of the high school sport system in the United States through examining the high school sport organizations’ mission statements for their participants and their member schools. Nearly 8 million students participate in high school sport each year, supported by state associations who are members of the National Federation of State High School Associations (NFHS, 2019). The NFHS includes in its mission statement that interscholastic sport “enriches the educational experience” and “develops leadership and life skills”. All 50 US States and the District of Columbia, then, have an interscholastic sport (and/or activities) association that are members of the NFHS. Using a directed content analysis approach, the researchers examined all 51 member organizations’ mission statements. Findings revealed three themes, indicating that mission statements include language around (1) the services they provide (e.g. tournament management, training officials, and coach training), (2) protecting participants (e.g. preventing the exploitation of minors), and (3) sports relationship with education (e.g. an educational experience intended to support the academic mission or a separate additional educational opportunity to learn more lessons). Findings will be discussed in relation to the psychosocial development of youth through high school sport, with future research recommendations targeting the critical examination of the congruence or incongruence between youth-centered mission statements and the behavioral realities in high school sport.

Pilates for Breast Cancer Survivors Experiencing Cancer-Related Fatigue and Cancer-Related Cognitive Impairment

Mackenzie Boyd, Elon University; Aaron Piepmeier, Elon University

Cancer-related fatigue (CRF) and cognitive impairment (CRCI) are two of the most common symptoms of cancer survivors that negatively affect their quality of life. This study assessed the feasibility of conducting an online exercise study examining the effects of acute exercise, CRF, and CRCI in breast cancer survivors. The long-term goal of this research is to create a method of using online Pilates programs as a strategy to provide immediate therapeutic relief from CRF and CRCI, thus improving quality of life. Using on online experiment platform, this study used a randomized, crossover, control design that consisted of questionnaires, an exercise and control condition, and cognitive tasks. Participants completed each condition with a one-week delay between sessions. Fitbit activity trackers were used to assess physical activity levels. Pre and post each exercise/control session, participants ranked their fatigue from 0-10 (no fatigue to total fatigue) and ranked their ratings of perceived exertion at post exercise/control. Our recruitment goal of 12 participants (n=12) was not achieved. Two participants (n=2) completed the study and six (n=6) partially completed the study. We identified major barriers relating to online recruitment, participant eligibility, and technical issues with the online platform. This feasibility study helped identify barriers to recruitment and retention, determine the acceptability of an acute bout of moderate intensity Pilates for breast cancer survivors. Data collected will be used to design a subsequent online randomized, controlled, crossover study that is sufficiently powered to examine efficacy.

Examining the Role of Behavioral Economics: Increasing Physical Activity and Charity Event Participation

Paige Bramblett, Appalachian State University; Kimberly Faszczewski, Appalachian State University; Sara Powell, Missouri State University; Jennifer Thornton-Brooks, Appalachian State University; Nolasco Stevens, Appalachian State University

Regular physical activity (PA) provides multiple health benefits, including decreased health risks, positive mental health outcomes, and increased overall quality of life. These health benefits are especially impactful to those living with chronic neurological conditions, like Multiple Sclerosis (MS). Although PA is beneficial for both the general population and those living with MS, participation levels are still low. To increase PA, it is critical to understand what motivates PA behavior. Current understanding of PA motivation suggests that increasing self-efficacy and intrinsic motivation increases PA participation; however, these approaches alone may be only marginally successful. Recently, health behaviors, including PA participation, have been examined using behavioral economics. This theory posits that social norms, biases, and habits influence decision making. For this reason, the current study aimed to use the lens of behavioral economics to explore PA motivation. Mixed-methods data were collected using an anonymous survey from individuals, both with (n = 47) and without MS (n = 67), that were past, present, or near-future participants and/or volunteers in a PA-based MS charity fundraiser event. Open-ended questions revealed participants’ perspectives of the importance of MS fundraising events and motivators for event participation. Themes from the data revealed intrinsic (i.e. enjoyment, sense of satisfaction for “doing good”) and extrinsic (i.e. social support) factors for event participation. These motivating factors may lead to habit formation for PA behaviors due to personal biases (feelings of competence and autonomy) and a sense of relatedness. Future intervention can use the concept of BE to increase PA and participation in charity events. Increasing education and awareness of MS and the benefits of involvement in charity events can shift “social norms,” frame events as enjoyable, and create feelings of community to increase the likelihood of individuals to participate in future events.

The Effect of Diet Composition on Mood in Highly Trained Cyclists: A Pilot Study

Robyn Braun-Trocchio, Texas Christian University; Andreas Kreutzer, Texas Christian University; Austin Graybeal, Texas Christian University; Petra Rack, Texas Christian University; Kaitlyn Harrison, Texas Christian University; Ashlynn Williams, Texas Christian University; Jessica Renteria, Texas Christian University; Elizabeth Warfield, Texas Christian University; Garrett Augsburger, Texas Christian University; Kamiah Moss, Texas Christian University; Jada L. Willis, Texas Christian University; Meena Shah, Texas Christian University

Highly trained endurance athletes traditionally consume a high-carbohydrate diet (HCD). A recent trend among some athletes is to consume a ketogenic diet (KD), a low-carbohydrate diet. The purpose of the study was to compare the effects of a habitual diet (HD), KD, and HCD on mood pre- and post-30-km cycling task and between the dietary conditions using the Abbreviated Profile of Mood States. Five highly trained (i.e. VO2max above 80th percentile for sex and age) male (n=1) and female (n=4) cyclists and triathletes, ages 18-70 years (33.4±9.0), consumed a KD and HCD, for 14 days each, in a randomized cross-over design. Participants completed the 30-km cycling task at the beginning of the study while on the HD and at the
end of the KD and HCD conditions. Mood was assessed pre- and post-exercise. Rating of perceived exertion (RPE) was collected during the cycling task (i.e., 3, 9, 15, 21, and 27-km) using the Borg 6-20 scale. A 3 x 2 ANOVA was used to measure the seven subscales on different diet conditions during pre- and post-cycling task. Significant results were found pre- to post-cycling task under all diet conditions on the mood subscales of tension (p=0.037), fatigue (p=0.01) and vigor (p=0.024). Fatigue and vigor increased while tension decreased. Depression trended towards significance (p=0.057) between the diets; the KD reported higher levels of depression. In the HD, there was no significant difference in RPE when comparing 3-km with 27-km (p=0.255). In the KD and HCD, RPE was significantly greater (p<0.001) at 27-km (M=16.8 for both) compared with 3-km (M=13.0 for both). This study was the first to investigate the effects of a diet composition on mood during a cycling task in highly trained male and female athletes. More research is needed to explore these diets.

Parents’ Perceptions of Body Image Experiences in Young Female Athletes

David Brown, University of Toronto; Alyona Koulanova, University of Toronto; Madison Vani, University of Toronto; Catherine M. Sabiston, University of Toronto

Body image concerns contribute significantly to poor sport experiences for many adolescent girls. Since parents play a major role in supporting young athletes in their sport participation, parents’ perceptions of body image in girls sport are important yet understudied. The purpose of this qualitative description study was to explore parents’ perceptions of adolescent girls’ body image experiences in sport. Ten parents (aged 45-54 years; 50% female) of adolescent female athletes participated in semi-structured interviews and the data were analyzed using an inductive thematic analysis. Three themes were identified: (1) Nutrition: The cause and the cure; (2) Body-talk in sport: Brawn over beauty; (3) Body image concerns: My daughter is different. Overall, parents showed a limited understanding of body image; operationalizing body image as athletes’ nutritional habits, and frequently highlighting calorie-dense food consumption and weight gain as indicators of body image concerns. While parents mentioned that the sporting environment emphasizes body functionality and sport performance over appearance, they also identified explicit weight and appearance focused comments from coaches, teammates and opponents, and other parents within the sport context. Also, parents struggled to recognise body image concerns in their child but were quick to identify these issues in other athletes. This study highlighted parents’ difficulty operationalizing and identifying negative body experiences in sport, which could significantly impact the sport experience of young girls. Future studies should aim to improve parents’ understanding of, and ability to identify and manage, negative body experiences in sports.

A Multi-Lab Pre-Registered Replication Examining the Influence of Mental Fatigue on Endurance Performance: Should We Stay or Should We Go?

Denver Brown, McMaster University; Ruth Boat, Nottingham Trent University; Jeffrey Graham, Ontario Tech University; Kristy Martin, University of Canberra; Benjamin Pageaux, University of Montreal; Ines Pfeffer, University of Hamburg; Ian Taylor, Loughborough University; Chris Englert, University of Bern

Psychological science has come under scrutiny over the past decade as several high-profile findings have not been replicated in large-scale replication projects. Amidst this replication crisis, sport and exercise psychology have received much less attention than the broader field of psychology. While scholars have put forward solutions and recommendations for reform, uptake in sport and exercise psychology has lagged somewhat behind, potentially resulting in vast amounts of resources being allocated to studies of effects that are too small to be meaningful or may not even exist. One area that has shown mixed evidence warranting closer inspection is research investigating the influence of mental fatigue (or ego depletion) on sport and exercise performance. Recent meta-analytic evidence indicates negative, small-to-medium sized effects exist for endurance performance as well as sport-related motor skills and decision making, whereas maximal force/power production appears unaffected. However, auxiliary meta-analytic techniques have suggested that the negative effects of mental fatigue on sport and exercise performance more broadly may be negligible due to publication bias or mere random chance. Furthermore, studies indicate questionable research practices may be common in this field, thus bringing the reliability and validity of these effects into question. Such uncertainty has sparked the development of an international collaboration to conduct a multi-lab pre-registered replication study examining the influence of mental fatigue on endurance performance. This talk will outline our research process and the open science practices we are adopting to determine whether we should continue to pursue research investigating the effects of mental fatigue on sport and exercise performance or give up on this topic altogether and move on to something else.

The Wellbeing and Mental Health of Athletes Within Elite Sport: The Case of Cycling

Georgia Brown, Swansea University; Denise Hill, Swansea University; Camilla Knight, Swansea University

There is a recognized need to develop, implement and evaluate evidenced-based interventions which can protect the wellbeing and mental health of elite athletes. Moreover, to elicit maximum impact, such interventions should be positioned within a broad ecological system. Thus, the aim of the study was to examine the factors that affect (both positively and negatively) the wellbeing and mental health of athletes with an elite sport (i.e., cycling), through an ecological systems approach. Semi-structured interviews and self-reported diaries were conducted with 6 elite cyclists (male=5 and female=1). Data were analyzed via thematic analysis and indicated that several factors affected the wellbeing and mental health of the athletes. They included: i) individual-level factors (e.g., body image/weight concerns and coping strategies); ii) microsystem-level factors (e.g., competition among teammates, social support, and previous negative coaching experiences); iii) exosystem-level factors (e.g., constant fear of deselection and inherent enjoyment of cycling), and finally; iv) macrosystem-level factors (e.g., COVID-19 and attitudinal changes towards mental health). By adopting an ecological systems approach, the study has identified the main factors which can positively and negatively affect the wellbeing and mental health of the elite cyclists. This information may be used to inform a multi-level intervention which can effectively support the wellbeing and mental health of athletes within performance sport. Funding source: Swansea University.

Boxing4Health With Parkinson’s Disease: A Qualitative Study to Understand Adult’s Experiences

Jennifer Brunet, University of Ottawa; Jenson Price, University of Ottawa; Amanda Wurz, University of Calgary; Meghan McDonough, University of Calgary; Julie Nantel, University of Ottawa

Parkinson’s disease (PD) is a leading neurological disorder. Although PD symptoms vary, the disorder has three defining motor symptoms (i.e., bradykinesia, resting tremors, and rigidity) that progress in severity over time, eventually leading to diminished ability to perform functional activities of daily living. PD motor symptoms may be mitigated by non-contact boxing-based training; yet, attrition from boxing programs is problematic in this population. Considering that motivation is a key predictor of physical activity adherence, this qualitative study was undertaken to explore adults’ experiences within a PD-specific boxing program
Breathing interventions can improve timed motor skills and are suggested to be influenced by arousal changes. Although evidence exists to support the role of arousal as a critical underlying mechanism of breathing interventions, methodological differences confound understanding of other potential contributing factors to the effectiveness of such interventions. We sought to determine the extent to which breathing frequency influences timing indices of motor performance, as well as potential mediating variables of arousal. Participants ($N = 35$, $M_{age} = 21.68$, $SD = 2.96$; 20 females) performed slow, normal, and fast metronome-paced breathing while executing a motor planning dominant memory-guided force pinch grip task. In addition, participants viewed neutral stimuli prior to execution of the pinch task. Performance was assessed via reaction time, variability, and absolute error. Assessment of indices of arousal included measuring heart rate variability and subjective arousal. Planned comparisons using repeated measures ANOVAs indicated slow breathing significantly increased reaction time compared to normal ($t(34) = 4.67, p < 0.001$, and fast breathing conditions, $t(34) = 4.37, p < 0.001$). Planned comparisons also evidenced increased error ($t(34) = 2.96, p < 0.01$ for fast breathing compared to normal breathing. Hierarchical multiple regression models showed that decreased breathing frequency predicted increases in HRV ($β = -0.42, p < 0.001$) and increases in reaction time ($β = -0.37, p < 0.01$). Overall, findings provide evidence that breathing frequency affects fundamental movement parameters, potentially mediated by factors other than arousal. In addition, our results inform the use of breath regulation as an antecedent emotion regulation strategy. Future research directions will be presented. Funding: NASPSPA Student Research Grant. Funding source: NASPSPA Graduate Student Research Grant.

Preparing for Return to Play: Understanding the Impact of COVID-19 on the Well-Being of Collegiate Student-Athletes

JoAnne Bullard, Rowan University

The Coronavirus (COVID-19) pandemic resulted in adjustments for higher education institutions beginning in the spring 2020 semester when education transitioned into a distance-learning format, which for many continued throughout the fall 2020 semester, raising mental health concerns among students. Many fall athletic seasons were canceled, enhancing concern about the mental distress student-athletes could be experiencing, especially following an abrupt cancellation of the fall athletic season. This research examined the mental distress and areas of concern of Division III student-athletes in response to the pandemic ($N = 682$). Anxiety was assessed through the Generalized Anxiety Disorder-7 Item scale (GAD-7), suggesting that both genders experienced anxiety related to perceived challenges, including being away from teammates and having proper academic resources. Significant findings revealed concerns regarding athletics, academics, career, and season cancellation. Findings also revealed a common theme among genders regarding an emotional response related to the cancellation of the fall season. Understanding these concerns is necessary to provide appropriate modalities while navigating through this pandemic. Athletic administration, coaches, and practitioners need to be prepared to assist student-athletes returning to play and understand the impact the pandemic has had on student-athletes that lost their final competitive season as they transition out of sport and into the next phase of their career.

The Effect of a Teacher-Guided and -Led Indoor Preschool Physical Activity Intervention: A Pilot Study

Alexandra Carroll, Auburn University; Katherine Spring, Auburn University; Danielle Wadsorth, Auburn University

and understand how the program affects motivational processes using a self-determination theory lens. Nine adults (5 men and 4 women; $M_{age} = 64.2$, $SD = 5.67$) with PD who took part in the Boxing4Health PD-specific boxing program (https://www.boxing4health.com) completed face-to-face semi-structured interviews post-program. Data were analyzed using inductive-deductive thematic analysis. The analysis yielded five themes: (1) I made an informed decision to participate and it feels good, (2) boxing helps me stay active and keep moving, (3) to keep me going, the boxing program needs to have variety and allow for input, (4) a program that can be adapted to me is important, and (5) the instructor and the group facilitate my continued participation in the program. Collectively, the findings from this study suggest that providing adults with adapted non-contact boxing exercises, varied sessions, and opportunities to provide input into group-based PD-specific boxing programs may be conducive to increasing motivation for physical activity. In addition, the findings suggest that it may be beneficial to encourage social support and connectedness amongst participants to further promote motivation for physical activity. Last, the findings suggest that self-determination theory may be a useful theoretical framework for developing and evaluating PD-specific programs.

Acute Exercise Effects on Positive Emotional Reactivity in Major Depression: Evidence From the Late Positive Potential

C.J. Brush, Florida State University; Greg Hajcak, Florida State University

Major depressive disorder (MDD) is characterized by a broad dampening of positive and negative emotional reactivity to environmental stimuli. Research has shown that acute exercise may specifically boost positive emotional reactivity in healthy adults; however, it is unknown if acute exercise can alter positive emotional reactivity among individuals with MDD. The present study examined the impact of acute exercise on positive emotional reactivity in a community sample of adults with current or a lifetime history of MDD ($n = 41$), and healthy controls ($n = 18$). Positive emotional reactivity was assessed from 59 adults ($M_{age} = 34.39$ years; $Min_{age} = 18$; $Max_{age} = 61$) before and after 30 min of moderate-intensity aerobic exercise using the late positive potential (LPP) component of the event-related brain potential. Results indicated a significant Time x Group interaction, $F(1,57) = 4.95, p = .03$, with a pre-to-post-increase in the LPP for healthy controls ($M_{diff} = 2.35$ μV; 95% CI: 0.68, 4.01; $p = .007$), but no change in the LPP among those with current or a lifetime history of MDD ($M_{diff} = 0.13$ μV; 95% CI: -0.98, 1.23; $p = .818$). A secondary aim of the present study was to identify if subgroups of adults with current or a lifetime history of MDD experience acute exercise-related changes in positive emotional reactivity. Although pre-to-post changes in the LPP did not differ by current or lifetime history of MDD ($t(39) = -1.23, p = .228$), examination of current MDD subtypes indicated a pre-to-post LPP reduction for adults with current MDD with melancholic features ($n = 14$; $M_{diff} = -1.65$ μV; $SD = 2.62$) compared to those without melancholic features ($n = 17$; $M_{diff} = 0.94$ μV; $SD = 3.08$; $t(29) = 2.50, p = .018$). These findings highlight important individual differences in positive emotional reactivity following acute exercise. More work is needed to understand the role of acute exercise in the prevention and treatment of MDD—and whether longer-term exercise interventions are needed to resolve positive emotional reactivity deficits among individuals with MDD. Funding source: Google LLC.

The Influence of Breathing Frequency on the Speed, Accuracy, and Variability of Motor Performance

Taylor Buchanan, University of Florida; Christopher Janelle, University of Florida

The Coronavirus (COVID-19) pandemic resulted in adjustments for higher education institutions beginning in the spring 2020 semester when education transitioned into a distance-learning format, which for many continued throughout the fall 2020 semester, raising mental health concerns among students. Many fall athletic seasons were canceled, enhancing concern about the mental distress student-athletes could be experiencing, especially following an abrupt cancellation of the spring athletic season. This research examined the mental distress and areas of concern of Division III student-athletes in response to the pandemic ($N = 682$). Anxiety was assessed through the Generalized Anxiety Disorder-7 Item scale (GAD-7), suggesting that both genders experienced anxiety related to perceived challenges, including being away from teammates and having proper academic resources. Significant findings revealed concerns regarding athletics, academics, career, and season cancellation. Findings also revealed a common theme among genders regarding an emotional response related to the cancellation of the fall season. Understanding these concerns is necessary to provide appropriate modalities while navigating through this pandemic. Athletic administration, coaches, and practitioners need to be prepared to assist student-athletes returning to play and understand the impact the pandemic has had on student-athletes that lost their final competitive season as they transition out of sport and into the next phase of their career.
Preschoolers are not meeting physical activity recommendations and spending an extensive amount of their day sedentary. Interventions targeting teacher-led strategies can benefit children’s physical activity levels the most. The purpose of this study was to examine the effectiveness of an indoor teacher-guided and -led preschool physical activity intervention in low-income schools. Thirty-six preschoolers and twelve preschool teachers participated in this study. Intact classrooms were randomly assigned to either an intervention or control group. A 2×3 mixed ANOVA was used to test changes by group and time. Follow-up measurements included Post-hoc analysis. There was a significant group by time interaction in children’s MVPA levels during indoor time (p = 0.036) and a significant effect on time in children’s MVPA levels during outdoor time (p = 0.002). Teacher’s identified that when planned, physical activity opportunities are easy to implement during indoor time. Moreover, teachers indicated that they enjoyed providing physical activity opportunities into the classroom setting and the children enjoyed participating in the activities implemented.

Effects on Sleep Efficiency of Cranial Electrotherapy Stimulation in Athletes With Poor Sleep Quality

Wen-Dien Chang, National Taiwan University of Sport; Yung-An Tsou, China Medical University; Shu-Ya Chen, China Medical University

Athletes often have poor sleep quality before the race. Cranial electrotherapy stimulation (CES) is an electrotherapy sleep, and it is also a non-invasive neuromodulation technique that can be applied to manage sleep problems. This is a randomized controlled study to explore the effects of 2-week CES on the sleep efficiency of athletes with poor sleep quality before the game. The athletes, who were less than 2 months away from the latest competition and had poor sleep quality (Pittsburgh Sleep Quality Scale score > 5), were recruited. All of them were grouped into an experimental group, which received a 2-week CES treatment, and a placebo group, which received 2-week sham CES treatment. Actigraph activity recorder were used to measure during the treatment. Forty athletes with sleep quality completed the study. The change in the slope for sleep efficiency in CES (n=20, R² = 0.09) and placebo groups (n=20, R² = 0.58) decreased over time, indicating worsening sleep over the days of the study, whereas the CES group had a less decreasing slope, indicating that worsening of sleep efficiency was decreasing over the days of the study. The changes in the slope of sleep efficiency were statistically significant (p = 0.02). While the athletes with poor sleep quality received 2-week CES during facing a close game time, it could slow down the deterioration of sleep efficiency. Funding source: Ministry of Science and Technology in Taiwan (MOST 109-2410-H-028-002).

Sedentary Behaviors and Cognitive Control: An EEG Study

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The theory of effort minimization in physical activity (TEMPA) argues that individuals have an automatic attraction toward effort minimization. To engage in a physically active behavior such automatic attraction must be controlled. However, direct evidence that cognitive control is required to avoid effort minimization is lacking. Here, we used go/no-go tasks and recorded electroencephalography (EEG) to assess the neural correlates of cognitive control toward physically inactive (vs. active vs. neutral) stimuli in 50 healthy young individuals. The N2 event-related potential (ERP) component amplitude indexed cognitive control. We observed a significant two-way interaction between the type of trials (i.e., go vs. no-go trials) and the type of stimuli (physical activity vs. neutral vs. physical inactivity images) on N2. Consistent with neutral stimuli, results showed a more negative N2 amplitude for go-no trials compared with go trials for stimuli depicting physical inactivity (β = -0.58 μV, 95% CI = -1.08 to -0.08 μV, p = 0.025). In contrast, for stimuli depicting physical activity, we found no evidence of significant differences in N2 amplitude between no-go and go trials (β = 0.20 μV, 95% CI = -1.08 to -0.08 μV, p = 0.445). The findings provide evidence that avoiding physical inactivity requires higher cognitive control than avoiding physical activity. Automatic attraction toward effort minimization seems therefore to have a role in the regulation of physical activity.

The Death of One’s Sport Cured by Categorizing It as Grief? A Theoretical Perspective

Kaitlin Cohen, Florida State University; Svenja Wolf, Florida State University

The termination of one’s sport is the inevitable reality and final stage of one’s athletic career. This can be due to perhaps a career-ending injury, reaching eligibility (Moesch, 2012), or from the natural biological progression of ‘aging-out’ (Wylleman et al., 2004). When post-retirement plans are non-existent accounting for increased security and stability, ineffective transition out of sport will often lead to adverse outcomes such as psychological distress, resulting in anxiety, depression, humiliation, reduced self-worth, identity confusion, and/or social dysfunction in the days and months following sport retirement (Brown & Potrac, 2009). We are therefore of the impression this transition can be conceptualized as ‘grief’. Acute grief is characterized by behaviors and emotions that would be considered unusual in normal everyday life, such as intense sadness and crying, difficulty concentrating, anxiety, anger, and relative disinterest in other people and in activities of daily life (Bowby, 1961). Parallelising to the experience of grief, sport retirement is often followed by almost identical symptoms, such as decreased self-confidence, sadness, and a lack of motivation (Menke & Germany, 2019). It has also been described to exist as a non-finite loss characterized by feelings of continuous loss with aspects of life repeatedly falling short of expectations (Bruce & Schultz, 2001). While warranted with the question of what it is these athletes are supposedly grieving, we presume it is the absence of one’s athletic identity (AI). To provide convincing evidence of this notion, we apply Brewer & Gardner’s (1996) overview of ‘multiple selves’, the self-categorization theory, and the self-identity theory. By categorizing sport retirement as ‘grief’, the anticipated added value is existing grief models and frameworks can provide a means to which we can refer to, and work from. We can expand the sport psychology field of research, teaching, and application. We can provide the solution to this all-consuming crisis for athletes so desperately needing our assistance.

A Qualitative Exploration of Parental Influence on Group Dynamics in Youth Sport

Taylor Coleman, Wilfrid Laurier University; Mark Eys, Wilfrid Laurier University

Due to the amount of time spent with young athletes (Fredericks & Eccles, 2004), parents are important individuals who can have positive (e.g., self-esteem) and/or negative (e.g., performance anxiety) effects on youth sport experiences (Schwebel et al., 2016). Recently, it has been suggested that parents may also influence team development and, more generally, group dynamics (Keegan et al., 2009). Researchers posit that parents may
specifically influence the group environment and structure in youth team sport contexts (i.e., motivational climate, roles; Godfrey & Eys, 2020; Keeghan et al., 2009). Therefore, the purpose of the current study was to explore possible parental influences on group dynamics (i.e., team structure and environment) in youth sport from multiple perspectives. By means of qualitative semi-structured interviews, data were collected from parents (n = 7; Mage = 50.29; SD = 5.82), parent coaches (n = 4; Mage = 46; SD = 7.80), and non-parent coaches (n = 10; Mage = 42.30; SD = 15.17) from various youth sport teams across Canada. Thematic analysis was used to analyze the responses (Braun & Clarke, 2006). Themes included specific aspects of group dynamics potentially impacted by parents (e.g., cohesion, role clarity), as well as the mechanisms (e.g., parent actions, attitudes, and characteristics that impact team dynamics), timing (i.e., when in the season parents are likely to impact team dynamics), stability (i.e., the consistency of parental influence over the course of the season), and outcomes of parent influence in youth team sports (e.g., quality of coach and athlete experiences, team conflict). The results of this study make a meaningful contribution to both the youth team dynamics and sport parenting literature by suggesting ways in which external influences (i.e., parents) affect team functioning. Further, we highlight that parents influence not only their child’s sport experiences, but those of other athletes and coaches in the youth sport environment. Funding source: Ontario Graduate Scholarship.

Reading Between the Lines: Gender Stereotypes in Children’s Sport-Based Books

Jennifer Coletti, Queen’s University; Veronica Allan, York University; Luc Martin, Queen’s University

A child’s first contact with media and culture typically comes in the form of books that they read at home or in school. In particular, children’s books involving sport narratives can reinforce gender roles and norms that influence the way young girls perceive and experience sport. The purpose of this study was twofold: First, to explore the narratives conveyed in sport-based books geared towards young girls, and second, to evaluate if these narratives promote girls’ engagement in sport. A pragmatic literature search was conducted and 28 books met our inclusion criteria. These books were organized into three groups pertaining to the age of the targeted audience (ages 3–5, 6–8, and 9–12 years) and analyzed using a thematic narrative analysis with a critical feminist lens. Themes across all age groups included an emphasis on ‘feminine’ sports (e.g., gymnastics, dance) as a context for diversity and learning, the need to understand skill development as a process, the importance of relationships (e.g., support), and implications pertaining to perceptions of capability as women athletes. However, an underlying theme—the reinforcement of gender stereotypes—also permeated the storylines. Whereas all books appeared to promote girls’ participation in sport, the reinforcement of gender stereotypes (e.g., provide example) ultimately undermined their intended adaptive messaging. These findings suggest a need for greater attention toward the complexity of women’s sport, rather than simply increasing sport access for girls and women. Instead, a critical evaluation of the socialization processes and messaging girls are exposed to reveals a need for a significant cultural shift toward gender equity in women’s sport and the broader society.

A Scoping Review of Grit in Sport

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Given that high-level competitive sport is rife with moments when athletes experience personal failure, slumps in performance, and various stressors, identifying and understanding the characteristics that facilitate or hinder an athlete’s long-term success is likely of great interest to various stakeholders. Grit—a person’s dispositional tendency towards passion and perseverance for long-term goals—is a personality characteristic thought to positively impact goal-attainment and long-term success. Because grit may function differently in the domain of sport than in other achievement domains typically examined by grit researchers, a summary of the existing body of literature would be invaluable for sport researchers in determining current trends and gaps in the literature, and would inform stakeholders of the value of assessing and/or fostering grit in athletic contexts. This research used scoping review methodologies to identify peer-reviewed and grey literature with the purpose of establishing the scope of grit in sport. After data characterization of full-text articles, 64 unique studies were determined to have met the review inclusion criteria. Six collegiate-level coaches were recruited as knowledgeable stakeholders for the final step of this review, and were interviewed after all data had been assembled. Much of the research included in this review assessed the relationships between grit and athletic performance, motivation, mindfulness, self-compassion, deliberate practice, and other determinants of success (i.e., hardness, resilience, mental toughness, self-control, & conscientiousness) in sport contexts. This scoping review also collated inconsistencies in the measurement of grit in the extant body of sport-specific literature. Implications for interventions aimed at increasing athlete grit levels and the identification of other future research directions are also discussed.

Self-Talk Action Framework

David Cutton, Texas A & M University-Kingsville; Daniel Burt, Texas A & M University-Kingsville

The first step in the effective use of ST is to become aware of self-talk (ST) and its origin. Acknowledging ST is important, thereby fostering a better understanding of interior dialogue. What ST is being used (where and when), and was it positive or negative? What behaviors occurred with the ST, while controlling awareness? Is the source of ST from personal interpretation or from another voice? Furthermore, do the words originate from within, or from an external source? Occasionally, ST involves our true motivations, including a judgment about one’s better/worse motivations, motivations that could involve conscience. Some even suggest that ST or interior dialogue is imparted by a supernatural entity, especially those who believe in a higher power. Additionally, the written word in books and other media could influence interior dialogue, which in turn could affect ST, reason, and motivation. Secondly, once aware of ST, reflect upon what succeeded and what failed (why and how ST has been used). For example, has ST and its cue words been helpful or hurtful, encouraging or disparaging, instructive or vindictive? Understand why ST may have worked in a particular situation, and how to possibly change or improve ST for future situations. The prevalence of controlled emotions and attention to what is most important at a particular point in time are important. In conclusion, take action once understanding the previous ST attempts. Practice ST for use in upcoming situations to improve behaviors, speech, or motivation. Rehearse ST, based upon what has worked or not worked, and use what is best. The resulting ST could enhance the ability to decide upon an appropriate action. Following action, restarting the process of executing the three steps is paramount, after recognizing the outcomes of ST while further refining the use of ST.

Can Additional Practice Counteract Selection Bias? The Relative Age Effect and Training Time Amongst Adolescent Alpine Ski Racers

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The use of fixed age cutoff dates in sport competition has resulted in an overrepresentation of athletes born earlier within a competition year
(relative age effect; RAE). However, while the RAE’s prominence across sports is well established, few researchers have attempted to identify how relatively younger athletes respond to selection bias. We examined training and performance changes over time in earlier- and later-born adolescent alpine ski racers from Austria (AUT) and the United States (US). These countries have distinct talent filtration systems that could differentially impact training. We collected performance data using the FIS database (US: \(N = 2172\); AUT: \(N = 516\); \(M_{agg} = 17.2 \pm 0.8\)) and administered practice history questionnaires (PHQ) to athletes attending developmental academies to assess training time (US: \(N = 169\); AUT: \(N = 209\); \(M_{agg} = 16.3 \pm 1.4\)). We used chi-squared analyses and mixed regressions to analyze birth quarter distribution and training/performance respectively. We report an underrepresentation of later-born athletes in Austria (Q1 vs Q4; \(p = .003\)) and the US (Q2 vs Q4; \(p < .001\)). Later-born athletes in Austria spent more time in coach-led and individual practice throughout development (\(p’s < .030\)), while later-born athletes in the US spent more time in play (\(p’s < .036\)). Finally, Austria-based athletes showed equivocal performance trends across birth quarters, while relatively younger athletes in the US had greater performance improvements over time (\(p’s < .029\)). Findings suggest that in sports with a RAE, relatively younger athletes who stay in their sport must train more to keep up with the performance of their older counterparts. In the US specifically, cultural promotion of other more-commercialized sports may steer relatively younger ski racers who are exposed to selection bias into different sports or into more ski-related play to maintain enjoyment. Coaches and practitioners should be aware of selection bias and provide younger athletes with sufficient opportunities to demonstrate competence and improve skill in practice. Funding source: United States Ski and Snowboard.

Examining Profiles of Collegiate Athlete Psychosocial Factors and Burnout and Their Associations With Injury Status and Psychological Well-Being

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Athlete burnout is a cognitive-affective syndrome characterized by emotional and physical exhaustion, reduced accomplishment, and sport devaluation (Raedeke, 1997). This represents an important psychosocial health concern for collegiate athletes with implications for injury and psychological well-being (PWB). Informed by the biopsychosocial model of athletic injury (Brewer et al., 2002), the study purpose was to examine profiles of athlete psychosocial perceptions (stress, social interactions) and burnout dimensions and their association with markers of injury status and PWB. We hypothesized that a profile exhibiting heightened burnout perceptions combined with a maladaptive psychosocial profile (high stress, high negative social interactions, low positive social interactions) would be associated with injury or participating in sport while injured and lower PWB scores. Participants were 510 American collegiate varsity or club sport athletes (\(M = 19.8 \pm 2.0\) years) who were majority female (\(n = 309, 61\%\)) and White/Caucasian (\(n = 448, 88\%\)). 25% of the athletes in the sample (\(n = 126\)) were also injured or competing while injured. Aggregating common data elements from studies of collegiate athletes, participants completed valid and reliable self-report assessments of athlete burnout, psychosocial variables, injury status, PWB, and demographics. Following data screening, a cluster analysis was conducted to probe the existence of burnout and psychosocial variable profiles. Resultant profiles where than compared on injury status and well-being outcomes via group difference analyses. Supporting study hypotheses, a maladaptive profile of psychosocial perceptions and heightened burnout levels was associated with injury/participating while injured (\(\chi^2(4) = 17.9, p < .01\)) and the lowest PWB (\(F(2) = 44.4, p < .001\)). Findings have implications for sport scientists seeking to further delineate the importance of psychosocial factors and burnout to injury rehabilitation outcomes. Such work warrants future theory-driven prospective and interventional research efforts. Funding source: n/a.

Post-Secondary Mental Health Care Providers’ Perspectives and Practices Towards Exercise as an Alternative Depression Treatment: A Mixed-Methods Study

Melissa L. de Jonge, University of Toronto; Ashley E. Stirling, University of Toronto; Brendon Stubbs, King's College London; Catherine M. Sabiston, University of Toronto

Post-secondary campuses are experiencing challenges with increasing reports of students coping with mental illness, including depression. Exercise is supported as an evidence-based alternative depression treatment. Yet, student mental health care providers’ (MHCPs) attitudes and beliefs about exercise prescription practices for students experiencing depressive symptoms are not documented. The current mixed-methods study examined post-secondary MHCPs’ prescription practices and beliefs towards exercise as a depression treatment. MHCPs (\(N = 153\); \(M_{age} = 42\) years; 47% psychologists) completed an online self-report questionnaire to examine prescription practices, beliefs, and theoretical determinants of exercise prescription practices guided by the COM-B model of behavior. Data were analyzed using descriptive statistics and a path model. Semi-structured interviews (\(N = 12\)) were also conducted to provide contextual details to the quantitative findings and were analyzed using thematic analysis. The majority (67%) of professionals reported prescribing exercise ‘most of the time’ or ‘sometimes’. In partial support of the COM-B, 48% of the variance in exercise prescription practices was explained with significant paths from capability (\(\beta = .21, p < .05\)) and motivation (\(\beta = .55, p < .001\)). The majority (66%) of the effects of capability on exercise prescription were indirect through motivation. Based on the qualitative findings, exercise prescription practices and beliefs were situated under two overarching themes: 1) perceptions of exercise as a depression treatment approach and 2) strategic approaches: supporting exercise as a campus-wide depression treatment strategy. Based on the integration of the findings, the current study provides implications for targeting MHCPs’ capability and motivation to incorporate exercise within depression treatment plans. Future work is needed to develop tailored evidence-based resources, programs, and initiatives to help facilitate mental health care providers’ exercise prescription practices.

Perceptions of Peer Support for Exercise in Members of a Program for Those With Mobility-Related Disorders

Taranjot K. Dhillon, Brock University; Kimberley L. Gammage, Brock University

Conditions affecting mobility, including spinal cord injury or multiple sclerosis, can have a negative effect on physical, psychological, and social wellbeing. One approach to improving wellbeing is exercise – however, participation in physical activity programs in these groups remains low. Existing research shows the effectiveness of peer support programs for physical activity in a variety of populations including those with spinal cord injury in the short term; however, peer support programs have varied greatly in terms of design, type of support (e.g., exercise, reintegration) and mentors (e.g., healthcare professionals, peers), and long-term viability has been inconsistent. The present study qualitatively explored perceptions of the use of peer support for physical activity in members of an exercise program for those with spinal cord injuries or multiple sclerosis. Twelve participants, aged 33-65 years, took part in focus groups to discuss their perceptions of a peer support program, including preferences for...
characteristics of mentors, factors affecting the willingness to serve as or have a mentor, and preferences of sources and types of information provided. Two primary themes emerged: 1) barriers and motivators to exercise that can be affected by peer support; and 2) preferences for peer support. Barriers and motivators (i.e., accessibility, socialization, intrinsic factors) were consistent across all participants. However, there was greater variability in preferences for peer support delivery. For example, mentors (students versus peers) and structure of the program (long- versus short-term commitment) were all noted as preferences. These findings suggest that although participants valued and recognized the importance of peer support, there is diversity in how people think about how to effectively deliver programs. Peer support programs may need to offer flexibility in their design in order to meet individual needs. It may be useful in designing peer support programs to allow people to choose the type of support they prefer.

Implementing Recommendations for the Development and Dissemination of Physical Activity Messages Targeting Parents of Children With Disabilities

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Evidence-based approaches are needed to enhance physical activity participation among children with disabilities (CWD). Recommendations were recently established to guide organizations in the development and dissemination of physical activity information targeting parents of CWD. Strategies are required to support stakeholders in the implementation of these recommendations. Guided by an adaptation of the AGREE II instrument, the purpose of the present study was to seek feedback from stakeholders regarding how to 1) implement and disseminate the recommendations, and 2) develop knowledge products (e.g., toolkits) to support recommendation implementation. Canadian stakeholders in the sport, physical activity, recreation, health promotion, and disability communities (N=53) provided feedback via an online questionnaire. Mean scores were calculated for questions that required participants to respond using a Likert-style scale. Results indicated that stakeholders found the recommendations to be clear (4.61/5), important for their organization (4.40/5), appropriate for implementation (5.58/6), and beneficial to follow (5.19/6). Additionally, comments from open response questions were analyzed to identify key suggestions. Stakeholders suggested that the recommendations should be accompanied with clear examples, and that resources (e.g., infographics) should be developed to assist organizations with following the recommendations. This research employed a scientifically rigorous design to serve as model for studies that involve collecting, interpreting, and applying feedback from community stakeholders. This is one of a series of studies to examine the creation and implementation of physical activity messaging guidelines specifically targeting parents of CWD. Insights gained from these studies will advance understanding of how to support organizations when developing and disseminating physical activity information targeting parents of CWD. Future research will evaluate the implementation of the recommendations, along with the emerging knowledge products. Funding source: Social Sciences and Humanities Research Council.

Efficacy Beliefs, Indispensability and Motivation Gains in Swimming Relays

Lori Dithurbide, Dalhousie University; Kaitlynn Sedabres, Michigan State University; Seunghyun Hwang, Kyungpook National University; Simon Taylor, University of Stirling; Deborah Feltz, Michigan State University

This study examined the moderating effects of self-, other-efficacy, and perceived indispensability on individual effort gains and losses in collegiate swimming relays in terms of relay members’ relative strength or serial position. Participants (N = 199) were collegiate swimmers in the 200, 400, or 800-yard freestyle relay at fall invitational meets. Relay times performed at the meet as well as individual best times for each participant were collected. Participants reported self-, other efficacy, and perceived indispensability of their relay performances. Due to multicollinearity between self- and other-efficacy, self-efficacy was removed from hypothesis testing. Using a series of hierarchical multiple regressions, results indicated that fourth ranked (but not last positioned) members performed faster in the relay compared to their individual performance, demonstrating an effort gain. No moderating effects enhanced the effort gains of fourth ranked relay swimmers. First ranked (but not first positioned) members swam slower in the relay compared to their individual event demonstrating an effort loss. However, other-efficacy mitigated this effort loss in relay performances of first ranked swimmers. No moderating effects were found for serial position of relay members. Findings contribute to the Collective Effort Model and Köhler effect in sport.

National Trends in Youth Sport During the COVID-19 Pandemic: Understanding the Perspectives and Experiences of Parents in the United States

Travis Dorsch, Utah State University; Jordan Blazo, Louisiana Tech University; Skye Arthur-Banning, Clemson University; Dawn Anderson-Butcher, Ohio State University; Neeru Jayanthi, Emory University; Amand Hardiman, Utah State University

A majority of American children engage regularly in youth sport, and many parents are highly involved in their participation. A broad literature highlights the positive physical, emotional, and psychosocial benefits that can result from participation in well-designed youth sport contexts. However, the novel coronavirus 2019 (COVID-19) pandemic has led to wide restrictions on organized sport activities, leaving athletes and their families in a unique and evolving position. The purpose of the present study was to better understand parent perceptions of youth sport in the United States amidst the COVID-19 pandemic. To address this purpose, a large and statistically representative subset of youth sport parents in the United States (N = 2603; Mage = 38.72) was recruited via Qualtrics panel to complete a study-designed instrument assessing: (a) their children’s weekly hours of sport participation before and during COVID-19, (b) perceived barriers to resuming regular sport participation after restrictions are lifted, and (c) comfort in their children’s return to various forms of organized sport after restrictions are lifted. Findings suggest that sport and physical activity opportunities have been limited during the COVID-19 pandemic, that COVID-19 is affecting marginalized groups disparately with regard to sport participation, and that parents differ in the comfort they will have sending their children back to various youth sport settings after the pandemic. Importantly, data suggest that there may be attrition from competitive youth sports and that parents may seek more recreational, community-based, or self-defined sport opportunities for their children after the pandemic. These findings bring youth sport parents’ experiences during the COVID-19 pandemic into focus and have the potential to inform how families, organizations, and communities will engage with youth sport once COVID-19 restrictions are lifted. Funding source: Aspen Institute Sports & Society Program.

Examining Best Practices for Family Members’ Integration in Parasport as a Path to Rehabilitation for Adults With Acquired Disabilities

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Families play an integral role in an individual’s rehabilitation following an acquired disability. From supporting psychosocial well-being to promoting initiation of parasport participation, families help facilitate an individual’s recovery while also undergoing their own recovery journey. Research has often focused on the experiences of families of children with disabilities, but rarely on the experiences of families of adults with acquired disabilities. The Invictus Games are an international parasport competition for military personnel with illnesses and injuries that integrates families as central to the Games. As an example of a quality parasport experience for families, the Games serve to further the understanding of the impact disability has on family members and their important role in recovery. The aim of this case study was to examine how the Invictus Games deliver programming to support the psychosocial well-being of competitors’ families. Data collection consisted of semi-structured interviews conducted with families of Toronto 2017 Invictus Games competitors ($n$=20); as well as observations during the Toronto 2017 and Sydney 2018 Invictus Games. An inductive reflexive thematic analysis was conducted of interview transcripts, observational field notes, documents, artifacts, and visual materials. Findings indicate that the importance of families was highlighted through critical aspects of the Invictus Games, with program delivery strategies including financial support (e.g. covering travel and meals for families), transportation at the Games, VIP access to ceremonies and sporting events, day trips and celebrations, and deliberate direct messaging throughout the Games to create a welcoming environment for families. These elements of Invictus Games programming can serve as best practice for other parasport events aiming to support families of competitors. By focusing on the well-being of the social support systems surrounding adults with acquired disabilities, parasport programs may better support the healing of both athletes and their families. Funding source: Invictus Games Toronto 2017, Forces in Mind Trust UK, Social Sciences and Humanities Research Council of Canada.

Women Athletes’ Positive Body Image in Sport: A Scoping Review
Abimbola Eke, University of Saskatchewan; Leah Ferguson, University of Saskatchewan

Though sport may facilitate building confidence in physical appearance, the relationship between sport participation and body image is complex. Women athletes are at risk for body image disturbance because of performance, weight, and social pressures to attain an ideal physique. In contrast, positive body image includes an overarching love and respect for the body. The purpose of this scoping review was to explore the associations between positive body image and sport participation among women athletes. Following Arksey and O’Malley’s (2005) framework for scoping reviews (i.e., study identification and selection, charting, interpretation, etc.), 41 potential studies were identified using broad search terms within scholarly databases (i.e., MEDLINE, EMBASE, and PsycINFO via Ovid and CINAHL, Gender Studies and Sport Discus via EBSCO) from January 1, 2009 to August 30, 2019. A rigorous evaluation guide was followed for inclusion and exclusion of the identified journal articles. Ten studies (50% quantitative and 50% qualitative) were included in this scoping review. Quantitative studies mostly examined the relationship between sport participation and positive body image perceptions and compared positive body image in athletes to non-athletes. Qualitative studies explored athletes’ body image experiences in sport. Findings indicate that the promotion of positive body image in sport helps reduce pressures for thinness. Additionally, women athletes may face more pressures to attain sociocultural ideals of thinness than demands for sports performance, while differences exist in the perception of body image (e.g., diverse body acceptance as a result of the type of sport and level of competition) across sports. Fostering positive body image allows for an appreciation of the body and its function to perform within sport. Even with advances to the positive body image literature, more research is needed to develop theoretical and conceptual understandings of positive body image in sport.

From Physical to Virtual: University Athletes’ Perceptions of Team Communication During the COVID-19 Pandemic
Frank O. Ely, University of Windsor; Katherine E. Hirsch, University of Windsor; Myles M. Doan, University of Windsor; Krista J. Munroe-Chandler, University of Windsor; Todd M. Loughead, University of Windsor

The COVID-19 pandemic has resulted in changes to the sporting world, including the cessation of competition (Parnell et al., 2020) along with the cessation of team training and practices (Toresdahl et al., 2020). Teams have been forced to adapt to virtual environments. This includes the manner by which team members interact and communicate (Kelly et al., 2020) which is fundamental to team functioning (Weinberg & Gould, 2015) and can impact member perceptions of collective efficacy and team cohesion (McEwan & Beauchamp, 2014). Moreover, when faced with shared stressors (e.g., a pandemic), team members collectively interact using either facilitative (e.g., information sharing) or debilitative (e.g., task-disengagement) strategies (Leprince et al., 2018). As such, the purpose of the current study was to examine how the COVID-19 pandemic influenced teams’ communication (e.g., structure, frequency) and determine athletes’ perceptions of factors that promoted and/or inhibited communication amongst the team members. University athletes ($N=25$; male $n=12$; female $n=13$) participated in one-on-one semi-structured interviews as part of a larger study assessing athletes’ experiences during the pandemic. Interviews were conducted in June 2020, transcribed verbatim, and analyzed using a thematic analysis (Braun & Clarke, 2006; Deurig-Gunby et al., 2011). Five themes were identified, including: (1) modes of communication (e.g., video calls), (2) purpose and topic of communication (e.g., social topics), (3) general decrease in communication (e.g., less frequent), (4) inhibitors of communication (e.g., disengagement), and (5) strategies that improved communication (e.g., athlete only meetings). Although the long-term implications of how communicating virtually will impact team functioning is unknown, strategies perceived to have improved communication may be considered in the short-term as teams continue to navigate the challenges of the pandemic.

Creating a Climate of Athletic Success
Arna Erega, University of North Carolina at Charlotte

There are over 480,000 student-athletes who compete in National Collegiate Athletic Association (NCAA) intercollegiate athletics programs across the three divisions (NCAA, 2019). Leonard (1984) identified sport as a “microcosm of society” and further argued that as such it is difficult for the sport to isolate or insulate itself from the wider societal interactions (p.64). Student-athletes have a quite different college experience in comparison to general student population as they experience more rigorous athletic, health, and time constraints, which are placed upon them (Beyer & Hannah, 2000; Rubin & Moses, 2017). In the last couple of decades major college programs have invested into building academic centers exclusively for student-athletes. Development of these centers raises concerns regarding the consequences of the specialized services offered within the centers. It is surprising that there is very limited research that shows us what the climate is like within athletic-academic centers given there are such large investments into the development of the centers and services offered. Hence, it is important to examine how student-athletes feel within an environment designed and developed specifically for them. The purpose of this study was to explore the culture within athletic-academic centers and assess
The purpose of this study was to: (a) examine athletes’ correlates; however, further investigation is needed to identify personal experiences, challenges, and preferences. Thirty-one women (19-70 years old; mean = 35.68 years) participated across six focus groups. Participants arrived from 12 different countries including Ethiopia, India, Iran, Iraq, Japan, Korea, Libya, Mexico, Somalia, Syria, Taiwan, and Turkey (mean time since arrival = 31.22 months; range = 2 months-8 years). Participants experienced commonly cited barriers to PA (e.g., time, money) and unique intersecting challenges for participation (e.g., language, setting, knowledge of opportunities). Generally, participants expressed the desire for group-focused, women-only programming that stresses social opportunities with individuals from a variety of backgrounds. The results of this study provide important practical considerations for the design/execution of current programming being facilitated by the ACTIVEIntegration Partnership to promote PA and social integration opportunities for newcomer women. Funding source: SSHRC; Sun Life Financial Centre for Physically Active Communities.

High Stakes or Safe Space: Comparing Self-Compassion in Differing Sport Contexts

Leah J. Ferguson, University of Saskatchewan; Serena Saini, University of Saskatchewan; Margo E. K. Adam, University of Saskatchewan

Competitive sport exposes athletes to demanding and evaluative environments fraught with challenges that can result in maladaptive emotions, cognitions, and behaviors. Researchers continue to focus on self-compassion as a resource for athletes, as it involves extending kindness, understanding, and connectedness towards oneself during setbacks or failure. Self-compassion has been associated with a number of advantageous correlates; however, further investigation is needed to identify personal and environmental factors that facilitate or deter athletes’ self-compassion. The purpose of this study was to: (a) examine athletes’ (N = 146; M_age = 22.86 years) self-compassion across differing sport contexts; and, (b) explore perceptions of self-compassion as enabled and/or restricted in athletes’ sport contexts. Aesthetic sport athletes had lower self-compassion (M = 2.95) than non-aesthetic sport athletes (M = 3.16; Cohen’s d = 0.34), and athletes competing locally had higher self-compassion (M = 3.32) than those competing provincially (M = 3.04), nationally (M = 2.99), and internationally (M = 2.86; η² = .06). Self-compassion levels did not differ between genders, team and individual sport athletes, or same-sex and co-ed sport athletes. Salient environmental factors that nurture athletes’ self-compassion included providing a safe space, emphasizing doing one’s best in sport, and supporting athletes’ choices to be self-compassionate. Excessive negativity from others, perceived pressures in sport, and contexts that rejected self-compassion were identified as inhibiting athletes’ use of self-compassion. Our study advances the notion that the use of self-compassion is likely highly individualistic and is impacted by each athlete’s unique sport environment. Findings suggest possible target groups for intervention and considerations for fostering self-compassionate sport environments. Future research is needed to expand athlete representation so as to not limit generalizability and enhance the sport experiences of diverse athletes.

A Citation Network Analysis of Research on Perfectionism in Sport

Daniel J. M. Fleming, Utah State University; Travis E. Dorsch, Utah State University; Matthew Vierimaa, Acadia University; Helen Sullivan, Utah State University

Perfectionism in sport has generated both scholarly and popular attention. Early research on perfectionism focused largely on clinical patients, students, and non-athletes. However, research examining perfectionism in sport has grown exponentially over the last two decades. Recent reviews from Hill and colleagues (2018, 2020) provide useful insight into conceptual and theoretical advances within the field. Notwithstanding, there remain a number of gaps that have yet to be addressed. Namely, scholars possess limited understanding of (a) the lineage from foundational papers to more contemporary work in this area, (b) the theoretical and methodological approaches typically utilized by sport perfectionism researchers, and (c) the nature of the participants who have been investigated. Citation network analysis provides a potentially useful means to synthesize the sport perfectionism literature while addressing these three gaps. In the present study, multiple scientific databases were searched using a combination of the keywords “sport” and “perfection*”. A three-step filtering approach was employed to consolidate the article population. Articles were retained if they were written in English, published in peer-review journals, and included material pertaining to perfectionism in sport. In an effort to harvest an inclusive sample of journal articles, no parameters were set for participant age, date of publication, or level of competition. The search and consolidation process yielded a final sample of 158 peer-reviewed publications across 53 peer-reviewed outlets since 1991. Across the sample, 93% of the articles were conducted using quantitative methods, while 4% utilized qualitative methods, and 3% employed mixed-methods. UCI Net and Pajek software were employed to catalog the most widely cited articles, cohesive subgroups of reciprocally cited articles, and a genealogy of the most influential articles in the sport perfectionism literature. The use of citation network analysis proved useful in identifying potentially fruitful paths for future empirical work.

Effects of Attentional Focus and Mental Fatigue on Performance and Perceived Exertion During Exercise

Ashley Flemington, McMaster University; Daniel Trafford, McMaster University; Steven Bray, McMaster University

Mental fatigue impairs performance of physically-demanding tasks and increases ratings of perceived exertion (RPE). However, motor learning research has shown external-focus instructions to lead to improved
performance and lower RPE compared to internal-focus instructions. Therefore, adjusting the focus of one’s attention either internally, to body movements, or externally, to movement outcomes, may be a way of overcoming performance decrements associated with mental fatigue. The purpose of the present study was to investigate attentional focus as a potential moderator of the mental fatigue – endurance performance and mental fatigue – RPE relationships. Undergraduate students (N = 78) completed two endurance wall-sit tasks, separated by cognitive and attentional focus manipulations. Participants were randomly assigned to complete either an incongruent Stroop task (high mental fatigue; HMF) or watch a documentary film (low mental fatigue; LMF) and then further randomized to receive internal (INT) or external (EXT) focus instructions to follow while performing the second wall sit. Manipulation checks confirmed both mental fatigue (p < .001, d = .873) and attentional focus (p < .001, d = .883) manipulations were effective. However, there was no moderating effect of attentional focus on wall sit performance (p > .500) or RPE (p > .500). Exploratory between-group analyses were conducted to probe differences in performance and RPE. Results indicated the largest group-focus group difference in performance was between the HMF/INT and LMF/EXT groups (p = .032, d = .610) and, while not reaching significance, the HMF/INT group also performed worse than the HMF/EXT group (p = .052, d = .553). RPE was also significantly higher during trial two compared to trial one for the HMF/INT group (p = .009, d = .592). Overall, data indicate a potential moderating effect of internal attentional focus that may exacerbate the detrimental effects of mental fatigue on performance and RPE, but may be countered by external attentional focus.

“It’s Just Not Real”: Examining Perceptions of Online Exercise Programming for Individuals With Multiple Sclerosis
Sarah Galway, Brock University; Olivia Parker, Brock University; Matheiu Dagenais, Brock University; Kimberley Gammage, Brock University

Exercise can preserve physical, cognitive, and physiological functioning in adults living with Multiple Sclerosis (MS). However, adults living with MS report many barriers to exercise (e.g., fatigue, accessibility), which have been exacerbated by COVID-19 and corresponding public health restrictions. Thus, it is critical to understand exercise programming options, such as online programming, that may reduce barriers in this population. The present study examined the perceptions and experiences of online fitness programming among adults living with MS. Seven individuals recruited from a specialized exercise centre in Southern Ontario completed semi-structured interviews to discuss their perceptions and experiences of online fitness programming during COVID-19. Interviews were audio recorded and transcribed verbatim, and data were analyzed using thematic analysis. Three major themes emerged across interviews including accessibility, technology and community. Participants described increased accessibility to exercise, specifically a reduction in transportation and scheduling barriers, associated with the online programming. However, barriers to accessibility were also articulated. Perceptions of technology (positive and negative) were strongly impacted by previous experiences and attitudes using online platforms. Lastly, perceptions of community impacted participants’ experiences and motivation to engage in the online exercise programming. In comparison to face-to-face programs, social experiences were hindered; however online fitness programming offered more social opportunities than having no online options. Our findings highlight the perceptions of online fitness programming for individuals with MS. Although the use of online fitness programming offered several benefits for participants, particularly in relation to dealing with COVID-19 restrictions, it did not appear to be a comparable replacement of face-to-face exercise programming. Practitioners should attempt to address challenges of online exercise offerings to create a better experience for those with MS.

Athletes’ Narratives of Caring Coaches Who Made a Difference
Lori Gano-Overway, James Madison University

The purpose of this study was to explore athletes’ experiences with caring coaches who had influenced their lives. The researcher interviewed college students who were former high school athletes about their experiences with caring coaches using a narrative inquiry approach. Eight participants told stories about their high school coaches. Working with the athletes, the researcher created narratives that described the thoughts, feelings, and behaviors surrounding the relational experience with the coach associated with positive development through sport. While each narrative was unique to its personal and social context, the researcher, using a thematic narrative approach, shared four approaches to caring connecting to theoretical and empirical work on caring. These approaches to care included supporting and encouraging athletes, creating community and connection, balancing care with other aspects of team culture, and engaging in tough love. Findings provide further insight into how coaches might establish caring practices to further holistic athlete development. Funding source: Note: While this presentation has not been published, it is under review with a journal. Please let me know if I should inform you if it is published prior to potential acceptance at this conference.

Temporal Triangulation as a Qualitative Methodology to Determine Hot topics in Applied Sport Psychology
Jordan Goffena, George Mason University; Zachary McCarver, University of Northern Colorado; Travis Scheadder, Ohio State University

The purpose of the present study was to explore and examine contemporary hot topics in applied sport psychology (ASP) through multiple sources of qualitative data. An iterative multi-cycle approach was developed that combined consensus coding with Saldaña’s (2016) two-step coding procedure. Consensus was attained after three independent researchers collaborated across nine cycles of coding. Temporal triangulation was achieved through using data which were situated in the past (phase one), present (phase two), and future (phase three) perspectives. Phase one established a set of a priori codes via a textbook analysis and represented categories of historically published topics in sport psychology. Phase two consisted of two content analyses from research journals spanning a decade of current research in ASP (Narticles = 448; Ntopics = 1247). Phase three examined survey data that investigated ASP students’ perceptions of contemporary hot topics, their favorite topics, and topics they are interested to learn more about in the future. The iterative multi-cycle coding scheme delineated nine overall themes, 23 topic codes, and 10 subcodes. Topics surrounding ASP interventions and mental skills (e.g., stress, arousal, and anxiety), motivation, and peak performance were among the most salient topics discovered through temporal triangulation procedures. Topics such as mindfulness, mental toughness/resilience, and cultural diversity and inclusion were among the most dissontant across the three time points (i.e., topics ranking high in social popularity without as much evidence in ASP research). Temporal triangulation demonstrated to be an adequate and justifiable qualitative methodology to assess the evolution of ASP topics from past to present while considering future research trajectories. It is recommended that future research should explore a priori coding themes based on our qualitative findings and use additional statistical approaches (e.g., kappa statistic).

Enhancing Novice Learners’ Skill Development and Transfer Through Self-Regulation Coaching
Jordan Goffena, George Mason University; Anastasia Kitsantas, George Mason University

The purpose of the present study was to examine the impact of a Self-Regulated Learning coaching intervention on novices’ development and
transfer when learning a new motor skill. Self-regulation coaching, grounded in social cognitive theory, involved teaching learners how to set strategy-oriented goals, self-monitor their performance, and self-reflect on their goal attainment and performance. Using a mixed methods experimental design 29 novice-level learners were randomly assigned to a control condition (i.e., practice only; n = 15) or an experimental condition (i.e., self-regulation coaching; n = 14). A three-ball cascade-juggling task was used and was measured by Counts Per Attempt (CPA). Participants underwent six practice sessions of 150 learning attempts and performance was evaluated during pre-, mid-, post-, and transfer tests. A 2 x 4 repeated measures ANOVA produced a significant within-subjects effect (F (1, 27) = 49.4, p < .001) but did not produce a significant between-subjects effect (F (1, 27) = .02, p = .88). Though group differences were non-significant, the experimental group post-intervention CPA scores (M_post = 30.29; M_transfer = 32.05) were higher than the control group (M_post = 22.16; M_transfer = 18.87) and yielded an increase in CPA performance by 6.4% from pre-test to the transfer test. Consistent with prior findings, the highly proficient performers in the control group decreased their CPA performance by 23.69% on the transfer test. However, contrary to prior findings, the highly proficient performers in the experimental group increased their transfer task performance by 7.06%. Emergent qualitative findings indicated that highly proficient performers (a) used prior experiences from other contexts, (b) used strategies from other contexts, and (c) described those experiences and strategies as transferable skills. Implications for further research and practice using the self-regulation coaching model will be discussed.

Coaching Today’s Gen Z Student-Athletes: Attentional, Motivational, and Communication Perspectives
Daniel Gould, Michigan State University; Michael Mignano, Michigan State University

Most of today’s collegiate student-athletes belong to Generation Z (Gen Z), the first generation of youth who have grown up in a totally digital world. While they are the best-educated generation in history and have excellent technology skills, they are also thought to have shortcomings like reduced attention spans and a lack of independence. It has been found that experienced tennis coaches believed that their Gen Z athletes were highly motivated, had excellent technology skills, poor communication skills, an inability to deal with adversity and are influenced by technology and the structure provided by their parents (Gould et al., 2019). Many of these characteristics were perceived as a challenge for the coaches, as well as finding ways to connect with Gen Z youth and working with their support networks. The current study was designed to replicate and extend these findings as the original study focused only on non-school coaches from one sport and athlete perspectives were not assessed. Specifically, in the present study, 12 NCAA Division I collegiate coaches and 18 student-athletes were interviewed with the goal of determining the attentional, motivational and communication characteristics of today’s collegiate student-athletes and the best strategies for coaching them. Exploring the influence of social media was a focus as was assessing athletes’ stress levels and experiences coping with adversity as they are currently key but understudied topics of discussion in the research literature (DesClouds et al., 2018; Durand-Bush & DesCloads, 2019; Twenge, 2017). Results revealed that while the coaches perceived several desirable attributes in their athletes (e.g., motivation to succeed, athletic ability), areas of concern were also identified and included less ability to handle stress and adversity, shorter attention spans and in-person communication concerns. Student-athlete interviews verified many of the coaches’ perceptions and showed how social media influences today’s student-athletes. Funding source: Gwen Norrell Professorship in Youth Sport and Student-Athlete Well-Being at Michigan State University.

Exerciser Self-Efficacy and Other-Efficacy in Online Fitness Instructors: Initial Measure Development and Examination of Correlations
Rachel Grantham, East Carolina University; Alexis Schroeder, East Carolina University; Christine Habeeb, East Carolina University

Self-efficacy (SE) is a well-documented predictor of exercise behavior (Samson & Solmon, 2011). In settings involving an exercise instructor, other-efficacy (OE; exerciser’s confidence in the instructor; Lent & Lopez, 2002) also plays a role in exercise behavior (Bray et al., 2014). Given that modes of exercise involving an instructor, such as group fitness and personal training, are becoming increasingly popular (Thompson, 2019), it is imperative to better understand the association between SE and OE during exercise. When measuring SE and OE in physical activity settings, however, a task-based approach is often utilized (Jackson et al., 2011). This approach negates the additional relationship-based tasks that play a role such as communication and motivation. The purpose of this study was (a) to develop measurements for SE and OE for an instructor-led fitness setting that included relationship-based tasks, and (b) examine the extent to which OE is associated with exercisers’ SE. To address the study purposes, 77 participants completed adapted items from Jackson et al. (2011) on SE and OE measures via an online survey. Items were adapted from a coach-athlete relationship context to an instructor-exerciser relationship context. Participants also responded to two open-ended items to describe qualities of an ineffective and effective fitness instructor to provide additional support for the OE measure. EFAs and CFA were conducted on the SE and OE measures. The final measures consisted of single factor 7-item SE measure, $X^2(14) = 24.32, p = .042; CFI = .94; SRMR = .06$, and 6-item OE measure, $X^2(9) = 21.98, p = .009; CFI = .93; SRMR = .07$. All item loadings (.514 – .932) were in the acceptable range for both measures. Participant responses to the open-ended questions supported item validity. A structural equation model indicated that OE was a significant predictor of SE, $R^2 = .33, p = .002$, while controlling for age and gender. This study provides preliminary support for the measure; however, more research is needed to ensure measures are sufficiently reliable and valid.

Intuitive Exercise and Embodied Physical Activity Among Low, Moderate, and High Active Women
Christy Greenleaf, University of Wisconsin Milwaukee; Alexandra Rodriguez, University of Wisconsin Milwaukee; Mellanie Nai, University of Wisconsin Milwaukee

Piran’s (2006) theory of positive embodiment conceptualizes ways in which women’s connections to their bodies can be grounded in comfort, agency, and self-care. Building upon this framework, we explored physical activity (PA) group differences in health-supporting approaches to exercise (e.g., intuitive exercise and embodied physical activity) among women. We were curious about the extent to which women, BMI ≥ 25 with low, moderate, and high levels of PA might differ in their engagement in intuitive exercise and their experiences of embodied PA. Women ($N = 117$, $M_{age} = 58.2 ± 14.7$ years) completed the International Physical Activity Questionnaire (IPAQ, Craig et al., 2003), Embodied Physical Activity Questionnaire (EPAQ; author developed) and Intuitive Exercise Scale (IEXS; Reel et al., 2016). A one-way multivariate analysis of covariance (MANCOVA) was used to assess group differences in IEXS and EPAQ among PA groups. Physical activity was used as the independent variable and the four IEXS subscales and EPAQ were used as dependent variables. Age, BMI and race were used as covariates. Study results showed a significant multivariate effect [Wilks’ Lambda $F(2,214) = 3.24, p < .01, \eta^2_p = .0414$]. Follow-up univariate analyses indicated significant differences in EPAQ and Exercise Variety (EV), Mindful Exercise (ME), and Exercise Emotion (EE) subscales of IEXS ($p < .05$). Low active women engaged in greater EE compared to moderately active women. Highly active women...
engaged in greater ME compared to low active women. Low active women engaged in lower EV compared to moderately and highly active women. Moderately and highly active experienced more frequent embodiment during PA in comparison to low active women. Although women are often socialized to adopt pathogenic attitudes toward PA, study results provide initial evidence that not all women internalize such attitudes and, in fact, adaptive approaches to PA are positively associated with PA. Further investigation to determine directionality of associations between intuitive exercise, embodied PA, and PA is needed. Funding source: None.

Association of Parent-, Coach-, and Peer-Initiated Motivational Climate With Athlete Burnout and Engagement: Direct and Indirect Effects

Christine Habeeb, East Carolina University; Thomas Raedeke, East Carolina University; Jordan Barbee, East Carolina University

Parent-, coach-, and peer-initiated motivational climates (MC) have all been independently associated with athlete burnout and engagement (e.g. Curran et al., 2015; Gustafsson et al., 2016; Smith et al., 2010). Despite theoretical contentions suggesting that coaches, parents, and peers have simultaneous influences on athletes, very few studies have examined the impact of these climates on athletes concurrently (e.g. Atkins et al., 2014; O’Rourke et al., 2014). In addition to having a direct association, it is also possible that coach-initiated MC impacts athletes indirectly via its impact on the MC created by peers. The current study’s purpose was to examine (1) the direct associations of parent-, coach-, and peer-initiated MC with burnout and engagement and (2) evaluate the possibility that peer-initiated MC mediates the association of coach-initiated MC with burnout and engagement. High school student-athletes (n = 150) completed a survey on perceptions of parent-, coach-, and peer-initiated MC, burnout, and engagement. Two path analyses were conducted to test the hypotheses: (1) parent-(mastery/ego), coach-(mastery/ego), and peer-(mastery/ego) MC directly relate to burnout and engagement, and (2) peer-(mastery/ego) MC mediate the association of coach-(mastery/ego) MC with burnout and engagement. Results indicated excellent fit of the data for both the burnout (χ²(16) = 20.48, p = .200; CFI = .98; SRMR = .04) and engagement models (χ²(24) = 29.53, p = .201; CFI = .99; SRMR = .03). Coach-mastery (β = -.32, p = .005) and peer-mastery (β = -.28, p = .005) were direct predictors of burnout. Coach-ego (β = .21, p = .027), parent-mastery (β = .18, p = .046), and peer-mastery (β = .37, p < .001) were direct predictors of engagement. Further, peer-mastery partially mediated the association of coach-mastery with burnout (β = -.08, 95% CI [-0.17, -0.03]) and engagement (β = .18, 95% CI [0.09, 0.29]). While coaches’ and parents’ motivational styles play an important role in burnout and engagement, peers are central to how motivational climate impacts high school athletes.

Coach-Created Motivational Climate and Self-Efficacy in the Coach-Athlete Relationship: The Role of Relational Efficacy Beliefs

Noam Hadadi, East Carolina University; Christine Habeeb, East Carolina University; Thomas Raedeke, East Carolina University; Charles Kemble, East Carolina University

Athletes who perceive their coaches are confident in them (i.e., Relation-Inferred Self-Efficacy, RISE; Lent & Lopez, 2002) tend to have higher self-efficacy than those with lower RISE (Jackson et al., 2007). Research has also shown that RISE can be bolstered by coaches that create a mastery motivational climate (MC; Saville et al., 2014). Despite evidence that coach-created MC predicts RISE, and RISE predicts self-efficacy, minimal research has examined whether RISE mediates the MC and self-efficacy relationship. Further, other-efficacy (i.e. athletes’ confidence in the coach; Lent & Lopez, 2002) has only been examined as a direct predictor of self-efficacy, although there is the potential for moderation effects to emerge. Finally, the perceived MC may be reported differently by coaches and athletes, which may also impact athlete efficacy beliefs. The purpose of this study was to examine the extent to which (a) coach-created MC predicts athlete self-efficacy, (b) RISE mediates the coach-created MC and self-efficacy relationship, (c) other-efficacy moderates the RISE and self-efficacy relationship, and (d) coach-athlete agreement on the perceived MC impacts RISE and other-efficacy. Individual sport athletes (n = 57, 65% male,Mage = 32.44) and their coaches (n = 18, 83% male, Mage = 34) completed an online survey on MC (coaches and athletes) and self-, other, and relation-inferred self-efficacy (athletes only). Athlete perceived mastery climate was a significant predictor of self-efficacy (β = .41, p < .01), while outcome climate was not. Further, RISE was a significant mediator of the relationship between mastery climate and self-efficacy (β = .23, 95%CI [.09, .48]). Other-efficacy did not moderate the relationship between RISE and self-efficacy (r = .29, p = .77). Finally, the difference between coach and athlete perceived MC was negatively correlated with other-efficacy and RISE (r = -.37; -.30, p < .05). This study indicates a coach-initiated mastery MC is positively linked to athlete self-efficacy, and RISE is an underlying mechanism of this relationship.

Prediction of Intention-Behavior Profiles in Canadian Secondary School Students Using the Multi-Process Action Control Framework

Imran Haider, McMaster University; Denver M.Y. Brown, McMaster University; Steven R. Bray, McMaster University; Matthew Y.W. Kwan, Brock University

The intention-behavior gap reflects how intention is considered a proximal determinant of behavior, yet often insufficient to enact physical activity (PA) behaviors in accordance with public health guidelines. The processes by which youth translate their intentions to action are largely unexplored. The Multi-Process Action Control (M-PAC) model provides a framework to better understand factors to help bridge this gap. Using the baseline cohort data from the ADAPT study, we investigated the ability of M-PAC to predict intention-behavior profiles in Canadian youth. Secondary school students (n = 1253) completed an online survey assessing the reflective, regulatory, and reflexive variables outlined within the M-PAC model, in addition to measures of intention and self-reported moderate-to-vigorous PA. Participants with complete data (n = 962; Mage = 15.91 ± 0.50; 53% female) were classified into four distinct profiles based on (dis)coherence between their intentions and PA (intenders vs. non-intenders, meeting vs not meeting PA recommendations). All four intention-behavior profiles were identified within the data: successful intenders (n = 443), unsuccessful intenders (n = 59), unsuccessful non-intenders (n = 275) and successful non-intenders (n = 185). Linear discriminant function analysis predicted intention-behavior profiles at 86% accuracy. Separate one-way analysis of variance and follow-up post hoc tests revealed significant differences between the profiles for each of the M-PAC variables (p < 0.05) except for instrumental attitudes, with successful intenders reporting the highest values, followed by unsuccessful intenders and non-intenders. Overall, findings indicate the reflective, regulatory and reflexive processes within M-PAC are key predictors of successful PA guideline adherence. Thus, M-PAC represents a promising framework to understand adolescent PA behaviors, but future research needs to examine its application over time. Funding source: SSHRC.

Youth Sport Participation During the COVID-19 Pandemic: The Influence of Race and Affluence on Athlete Participation

Amand L. Hardiman, Utah State University; Daniel J. M. Fleming, Utah State University; Travis E. Dorsch, Utah State University; Jordan A. Blazo, Louisiana Tech University

Restrictions due to COVID-19 have led to a nearly 50% decline in youth sport participation across the United States (Aspen Institute, 2020). Many communities and sport organizations have resumed offering youth sports
Title IX, originally passed in 1972, has in
Amand L. Hardiman, Utah State University; Travis E. Dorsch, Utah State
Girls and Their Families
Specialization in Elite Club Volleyball: The Experiences of Adolescent
af
(Crenshaw, 1991) is needed to further explore the link between race,
COVID-19 pandemic. Theoretically designed intersectionality research
opportunities afforded to adolescent females (O
' high af
fi
COVID-19 pandemic. Overall,
focus group interviews were conducted with athletes (sport specialization among adolescent female elite club volleyball athletes.
The present study, informed by an integrated model of the youth sport
3.4 million adolescent females who competed in high school athletics in
2018-19 are more than ten times the 294,015 who participated in 1971-72
(NFHS, 2020). Meanwhile, organized extracurricular (i.e., club and travel)
sport has become a regular domain in which female athletes choose to specialize year-round. One byproduct of increased female sport participation is the proliferation of intercollegiate athletic scholarships (Brooks et al., 2018). Although there is a growing literature on sport specialization (see Disanti & Erickson, 2019 for a review), relatively little research has investigated the attitudes and experiences of female athletes as specialists. The present study, informed by an integrated model of the youth sport system (Dorsch et al., 2020), was designed to explore the experiences of sport specialization among adolescent female elite club volleyball athletes. Focus group interviews were conducted with athletes (n = 11; Mage = M = 14.5) and parents (n = 10; Mage = M = 47.4) to investigate their perceptions of specialization. Data were synthesized and interpreted using thematic analysis (Braun & Clarke, 2012). Results yielded two primary themes. First, female athletes sought a specialized sport context largely to pursue intercollegiate athletic scholarships. Second, within the elite club model, parents offered support for the pursuit of athletic scholarships as well as a sense of belonging and life-skil development. Overall, our findings indicate that adolescent female athletes are encouraged by kin (e.g., parents) and non-kin (i.e., administrators and coaches) to participate in elite club sports as a means of sport specialization in pursuit of athletic scholarships. Importantly, this study underlines how phenomenological research can examine the attitudes, roles, and experiences about female athlete specialization from multiple stakeholders within a youth sport organization.

Development and Preliminary Validation and Reliability of a Measure of Self-Efficacy for Self-Control (SESC)
Sheereen Harris, McMaster University; Jeffrey D. Graham, Ontario Tech University; Kira L. Innes, McMaster University; Steven R. Bray, McMaster University

Self-control refers to people’s abilities to override thoughts, emotions, and behaviors to pursue goals and avoid temptations. Exerting self-control on an initial task often leads to impaired aerobic, resistance, and isometric performance. In addition, self-control exertion has been shown to reduce people’s intentions to exert physical effort. Resource perspectives posit self-control can be depleted and lead to subsequent lapses in self-control, while motivational perspectives argue self-control exertion is dependent upon the perceived benefits and costs associated with the target behavior. According to Social Cognitive Theory, self-efficacy (SE) is a powerful motivator for action, which may offer unique explanatory power to understand self-control. For example, task SE has been shown to mediate the effect of self-control exertion on subsequent exercise performance. However, SE to perform a specific task may be precipitated by a more generalized perception of confidence in their abilities to exert self-control (self-efficacy for self-control; SESC). The present study reports on the development of a measure of SESC. An initial pool of 32 items was created and administered to 111 undergraduates who evaluated the clarity of the concept and instruction set, completed the measure, identified items considered redundant or unclear, and generated additional items thought to be relevant. Principle Components Analysis (PCA) yielded a 5-component solution accounting for 69% of the variance. Inter-item correlations were examined and highly correlated, redundant, or unclear items were removed or revised, resulting in a 17-item instrument. The second scale iteration was administered to a separate undergraduate sample (N=155). All items received high clarity and relevance ratings. PCA resulted in a 3-factor solution (64% variance explained). After removal of 5 cross-loading items, a 12-item unidimensional scale was extracted (Cronbach’s alpha = .92). Future studies will evaluate the construct validity of the SESC scale in sport and exercise settings. Funding source: SSHRC 435-2017-1271.

Doping Moral Disengagement Predicts Anticipated Guilt and Doping Consideration Within the Context of Social Norms
Tyler Harris, Adrian College; Alan Smith, Michigan State University; Nicholas Myers, Michigan State University

Doping moral disengagement (MD) is suggested to decrease feelings of anticipated guilt from doping and increase the consideration one would give to doping (Boardley et al., 2017, 2019). These cognitions do not occur in isolation and may be better understood within the social context of competitive sport. Subjective norms (perceived social approval or support for doping) and descriptive norms (perceived doping prevalence) reflect this social context and are also suggested to influence doping-related outcomes (Ntoumanis et al., 2014). The purpose of this study was to test an integrated conceptual model that specifies these three constructs (doping MD, subjective norms, and descriptive norms) to predict doping consideration, directly and indirectly through anticipated guilt. Athletes from various sports (N = 238, M age = 27.86, 59.2% female) responded to an online survey composed of the Doping Moral Disengagement Scale-Short (Boardley et al., 2018), three items for subjective norms (Lazuras et al., 2010), three items for descriptive norms (Barkoukis et al., 2014), five items measuring anticipated guilt from a hypothetical doping situation (Boardley et al., 2017), and one item for consideration of a hypothetical doping opportunity (Gucciardi et al., 2010). Good model-data fit was observed in the SEM framework and supported the direct and mediated relationship from doping MD to doping consideration. No such relationships were found for subjective or descriptive norms. The direct effects of MD were
robust against socially desirable responding and removal of outliers. Results therefore suggest doping MD to be a dominant predictor of doping-related cognitions, even when controlling for norms that characterize the doping social context of sport. Anti-doping programs, which typically do not address doping MD and may be sub-optimally effective (Backhouse et al., 2007), could benefit from deliberately targeting moral constructs like doping MD alongside provision of educational information (Kavussanu et al., 2020).

**Exploring Adolescents’ Anti-Doping Perceptions: An Experimental Test of an Intervention to Influence Perceived Susceptibility**

*Sean Harrop, McGill University; Evelyne Bédard, McGill University; Lindsay Duncan, McGill University*

Comprehensive primary prevention interventions have helped prevent the initiation of doping in adolescent athletes; however, they require substantial resources that limit their wide-spread implementation. The efficacy of interventions to prevent doping may be enhanced among adolescents who perceive themselves to be susceptible to doping. Drawing on the tenets of the elaboration likelihood model, the purpose of this study was to test the relative effect of two brief interventions, alone or in combination, on the perceived susceptibility to doping among adolescent athletes. Using an online survey software, adolescent athletes (*N* = 309, *M*<sub>age</sub> = 15.0 ± 1.1 years) were randomly assigned to one of four groups: 1) control, 2) common product intervention, 3) vignette intervention, or 4) combined common product and vignette activities. A 23-item questionnaire was administered pre- and post-intervention to measure change in perceived susceptibility, attitudes toward doping, self-esteem, and refusal self-efficacy. None of the interventions elicited a change to any of the outcome variables. However, the data revealed that participants who had received doping education prior to this study had significantly higher perceived susceptibility to doping. The athletes who felt they had a high likelihood of “going pro” reported higher esteem toward their participation in sport and higher self-efficacy to refuse doping. They were also found to have higher perceived susceptibility and likelihood of encountering banned substances and more favourable attitudes toward doping in sport. Although education has become central to the latest iteration of The World Anti-Doping Code, this study highlights some of the challenge of effectively educating adolescent athletes about their risk of initiating doping. Continued attempts to create personally relevant and engaging interventions is warranted to ensure educational programs have lasting effect on the clean sport movement.

**Transcranial Direct Current Stimulation (tDCS), Self-Reported Intensity-Tolerance, and Affective Responses to Exercise**

*Mark Hartman, University of Rhode Island; Panteleimon Ekkekakis, Iowa State University*

Affective responses during exercise predict adherence. High-intensity exercise confers greater health benefits than low-intensity exercise but these benefits may come at the cost of declining affect and lower adherence. Individual differences in the ability to continue exercise at intensities associated with displeasure (i.e., intensity-tolerance) are positively associated with affective responses during high-intensity exercise. On the other hand, the effect of neuromodulation on affective responses to exercise remains unresearched. The present study examined affective responses to heavy- and severe-intensity exercise (a) among high- and low-tolerance individuals, and (b) under 2-mA continuous transcranial direct current stimulation (tDCS) of the dorsolateral prefrontal cortex (dlPFC) or sham stimulation. In counterbalanced order, 30 participants (12 women, 18 men, 20.8 ± 3.2 y) completed four conditions: heavy- and severe-intensity cycle ergometry for up to 20 min or until volitional termination, with active and sham tDCS. Participants were divided into low- (LT) and high-tolerance (HT) groups based on a median split of their scores on the Tolerance scale of the Preference for and Tolerance of the Intensity of Exercise Questionnaire. Affective valence ratings (Empirical Valence Scale; EVS) were collected each min. A three-way repeated-measure ANOVA on EVS scores showed only a significant interaction between intensity condition and tolerance group, *F*(1, 28) = 6.895, *p* = 0.014, *η*<sup>2</sup> = 0.198. The HT group reported higher EVS scores during heavy intensity but lower EVS scores during severe intensity than the LT group. The latter, seemingly counterintuitive, finding could be due to a (nonsignificant) trend for LT participants to terminate the exercise prematurely due to increasing displeasure. These results suggest that (a) individual differences in intensity-tolerance influence affective responses (and possibly perseverance) during high-intensity exercise, whereas (b) tDCS of the dlPFC may be ineffective in improving affective responses to high-intensity exercise.

**Physical Activity Participation and Coping in College**

*Dorian Hayden, Michigan State University; Leapetswe Malete, Michigan State University*

Almost 50% of university students suffer from psychological distress or related diseases. Research shows ethnic minorities and low socioeconomic status students additionally adversely affected. This online mixed methods study identified levels of mental health based on participant demographics in university students. In addition, student obstacles, their opinions on on-campus resources, and how to improve those was evaluated. Participants (58.2% female) aged 18-24 or older (*M* = 20.73, *SD* = 1.77) completed a demographics questionnaire, 21 item Depression Anxiety Stress Scale (DASS-21), and a college experience qualitative questionnaire. Results showed ethnic minorities (*M* = 4.24, *SD* = 4.94) with higher levels of depression compared to non-minorities (*M* = 3.50, *SD* = 4.42) (*t* (455) = 1.49, *p* = .015); low SES students (*M* = 6.00, *SD* = 6.00) had significantly higher levels of depression (*F*(2,454) = 5.83, *p* = .003) compared to those from a medium (*M* = 3.59, *SD* = 4.22, *p* = .01) or high SES (*M* = 3.33, *SD* = 4.14, *p* = .001); anxiety levels were significantly higher for individuals not engaging in organized physical activity (*PA: 4.145 ± 3.936*) compared to Club Sport Participants (*4.800 ± 3.296*, *p* = .01) and Intramural Sport Participants (*2.468 ± 2.606*, *p* =.001). Stress levels were significantly higher in individuals not engaging in organized PA (*6.321 ± 4.806*) compared to Club Sport Participants (*4.028 ± 4.246*, *p* = .012) and Intramural Sport Participants (*4.857 ± 3.884*, *p* =.005). Several obstacles and opinions were stated by participants. Results fall in line with predicted outcomes of minorities and low SES students struggling additionally with negative mental health, with PA being a positive way of decreasing those levels across all individuals. Qualitative results highlight several aspects that can and should be addressed on university campuses while giving methods of improving the usability and effectiveness of on-campus resources. Future research should examine nuanced student mental health disparities and mediational effects of on-campus recreational programs.

**An Exploration of Coach-Athlete Interactions During Intermittent Breaks in Diving Competitions**

*Siobhan Henderson, McGill University; Gordon A. Bloom, McGill University; Danielle Alexander, McGill University*

A great deal of research on coach-athlete interactions during competition has focused on team sports, something which does not consider the many contextual differences between team and individual sports. One individual sport in particular, diving, is particularly unique because it has recurrent intermittent breaks between dives during which athletes and coaches have opportunities to communicate and interact. Therefore, the purpose of this study was to understand elite divers’ desired coaching behaviors during an
Making Gut Decisions in Sport: The Influence of Stress Type and Level on the Option Generation and Selection Processes

Teri J. Hepler, University of Wisconsin-La Crosse; Matt Andre, George Mason University

The “take the first” (TTF) heuristic, which reflects intuitive decision-making, has been shown to be particularly influential in decision-making in sport. However, little is known about how stress affects TTF. Thus, we conducted 2 studies that examined how stress type (no, mental, physical), stress level (low/no, moderate, high), and the stress type x level interaction affected the major predictions of TTF. Each study required participants to complete a mental stress (i.e., color word task and mental arithmetic) and/or a physical stress (i.e., incremental running on a treadmill) task and then perform a video-based decision task in basketball. Various outcome variables were assessed, including TTF frequency, first option quality, first option generation speed, and total number of generated options. Study 1 used a between-subjects design to examine the option generation and selection processes of 100 undergraduate students. Participants (n = 20) were randomly assigned to each of the 5 stress conditions: no/low, low/no, moderate, high, and high/low. Based on the results, participants in the high stress conditions were slower to generate first options than participants in lower stress conditions. Stress level, type, and the type x level interaction did not have a significant effect on any other variables of interest. Study 2 used a within-subjects methodology to replicate the design and aim of Study 1. In this study, 42 undergraduate students completed all 5 stress conditions across 2 testing sessions. Similar to the previous results, high stress was associated with slower decisions. Overall, the major tenets of TTF were robust under various types and levels of stress. In other words, TTF was shown to be an ecologically rational heuristic for making decisions under stress in sport. However, high levels of stress may slow the option generation process. Further research should continue to examine the influence of stress type and level on decision-making in sport.

Using Sports Science Data in Collegiate Athletics: Coaches’ Perspectives

Augustine Herman, Seattle University; Erica Rauff, Seattle University; Sarah Shultz, Seattle University; Sean Machak, Seattle University; Douglas Berninger, Seattle University

Limited research has been conducted examining American collegiate coaches’ perceptions of collecting data for informing their training practices. From the limited research available, coaches perceive data science to be important for improving both mental and physical sport performance, but the translation of data into practice is currently lacking in many American collegiate settings. The purpose of this study was to conduct focus groups with collegiate coaches to examine their perspectives and needs for collecting data with their athletes. Four focus groups were conducted with Division I coaches (N = 12) of men’s and women’s soccer, basketball, track and field, golf, swimming, baseball, softball and women’s volleyball and rowing at a mid-sized liberal arts university. Principles of thematic analysis were used to analyze the interviews. Most coaches (66%) felt that collecting data would provide evidence needed to support training methodologies, and that they would benefit from monitoring progress in their athletes over time. Coaches (25%) were most interested in assessing biomechanical movements, as well as the mental and emotional states of their athletes during games, practices, and outside of sport. The primary questions that coaches (17%) wanted to answer through data collection procedures related to monitoring athletes’ levels of fatigue, recovery, mental health states, and related health behaviors (i.e., sleep, diet). Coaches (25%) did express concerns over finding an optimal time of the year to test their athletes, how to coordinate this testing with other sport teams on campus, how to effectively present data to their athletes regarding utilization of the data to change training practices and lifestyle behaviors, and limiting assessments of body composition due to athlete discomfort. Findings from these focus groups suggest that coaches would like to collect data to learn more about athletes’ physical and mental states, but several logistical and practical concerns still exist regarding how to efficiently collect and utilize the data.

The Creation of Safe(r) Spaces for LGBTQ+ Physical Activity Participation

Shannon S.C. Herrick, McGill University; Tyler Baun, McGill University; Lindsay R. Duncan, McGill University

In recent years, physical activity contexts have been thoroughly established as inherently exclusionary towards LGBTQ+ participation. Using a cross-sectional survey, distributed online via LGBTQ+ community forums and affiliated Facebook pages, self-identified LGBTQ+ adults (N = 766) throughout North America responded to the following open-ended question, “in what ways do you think physical activity could be altered to be more inclusive of LGBTQ+ participation?” The resulting texts, which ranged from 2 to 468 words, were analyzed using qualitative content analysis by two coders. Suggestions outlining how to create safe(r) physical spaces for LGBTQ+ participation were submitted by 558 participants. The results have been organized according to the different components identified by participants as integral to the creation and maintenance of safe(r) spaces and presented in descending submission frequency: (a) membership: Who is the space for? (b) informative signage: “A big Pride flag in the window”, (c) anti-discrimination policies: “Comprehensive policies protecting LGBTQIA2S+ people and affirming their right to use workout spaces”, (d) inclusivity training: “LGBTQ+ inclusive training for trainers/facilitators, specifically cis, straight male trainers”, and lastly, (e) diversity: “Representation matters.” Suggestions for membership specifically highlighted the nuanced and tenuous relationship between exclusivity and inclusivity, wherein many participants advocated for LGBTQ+ only spaces and programs. Our findings detail a myriad of practical suggestions for increasing LGBTQ+ inclusivity that could and should be adopted across fitness facilities to better support LGBTQ+ physical activity participation.

Strategies for Evaluating Publication Bias in Meta-Analyses

Christopher Hill, California State University, San Bernardino; Stephen Samendinger, SUNY- Farmingdale; April Karlinsky, California State University, San Bernardino

Limited research has been conducted examining American collegiate coaches’ perceptions of collecting data for informing their training practices.
Meta-analysis is a set of techniques that are intended to combine and synthesize findings from a set of studies that investigate a similar phenomenon. For a variety of reasons, there has been a recent increase in the number of meta-analyses that are conducted in sport and exercise psychology. Often in sport and exercise psychology meta-analyses there is a perfunctory attempt to understand the bias that might exist in the selected set of studies. As a result, one form of bias that is commonly unaccounted for is publication bias. Publication bias occurs when there are concerns over how representative findings are from a set of studies compared to the true underlying effect. This type of bias is likely to occur in disciplines that almost exclusively publish statistically significant findings. When a body of literature omits findings that are not statistically significant, estimated effect sizes for the published studies are likely to be inflated. In order to understand how publication bias has influenced the published results, various analytical techniques must be utilized. In particular, this presentation will focus on outlining the role of selection methods, which are a class of techniques designed to be applied to quantify publication bias within a meta-analysis. The selection methods reviewed in this presentation will include the p-curve, p-uniform, and the maximum likelihood estimation strategies. Each of these aforementioned approaches has been advocated for by researchers looking to better understand bias in a sample of studies. P-curve, p-uniform, and maximum likelihood estimates each have unique model assumptions that impact both the utility and usefulness of the technique. The model assumptions will be reviewed and best practice recommendations for assessing bias within a meta-analysis will be discussed. Additional bias evaluation resources for use in future meta-analyses will also be provided.

A Crisis Management Framework for Athlete Leaders: Reflections From University Athletes’ Experiences During the COVID-19 Pandemic

Katherine Hirsch, University of Windsor; Frank Ely, University of Windsor; Myles Doan, University of Windsor; Todd Loughead, University of Windsor; Krista Munroe-Chandler, University of Windsor

In the wake of the COVID-19 pandemic, sport teams were required to implement guidelines mandating physically distanced training along with the cancellation or postponement of their season (Toresdahl & Asif, 2020). As a result, many athletes experienced negative outcomes (di Fonso et al., 2020; Schinke et al., 2020), which warranted the pandemic to be classified as a crisis (i.e., an unplanned event with potential to harm group functioning; King, 2002). Although little is known about how sport teams and their athletes should manage crises, research conducted in business settings underscores the importance of effective leadership (Choi et al., 2010). Boin et al. (2013) advanced a crisis management framework that highlights behaviors that leaders should adopt during times of crises. The utility of this framework for athlete leaders in sport contexts is unknown. Thus, the purpose of the current study was to investigate the crisis management behaviors that athlete leaders exhibited during the COVID-19 pandemic. Male and female university athletes (N = 25) participated in one-on-one interviews in June 2020 to explore their leadership behaviors during the pandemic. A combination of deductive and inductive analyses was used to determine which components of Boin et al.’s crisis management framework applied to athlete leaders during the pandemic, while also allowing for new crisis management behaviors to be generated from the data. Based on the findings, a modified framework unique to sport was advanced to explain appropriate steps for effective athlete leadership during times of crises, including, (1) early recognition, (2) early action, (3) collective understanding, (4) shared leadership, (5) involvement in decision making, (6) coupling and decoupling, (7) meaning making, (8) interpersonal connection, (9) personal responsibility, (10) accountability of teammates, (11) learning, and (12) preparedness for future crisis. This modified framework highlights the behaviors for athlete leaders to display during times of crises that are relevant and critical to sport teams.

Exploring Home (Dis)advantage Patterns in the National Hockey League Since the Implementation of 3-on-3 Overtime

Matt Hoffmann, California State University, Fullerton; Desmond McEwan, University of Bath; Roy Baumeister, University of Queensland; Joel Barnes, Independent Researcher; Michelle Guerrero, Children’s Hospital of Eastern Ontario Research Institute

Research investigating National Hockey League (NHL) data from the 4-on-4 overtime era (2005-06 through 2014-15) demonstrated that the home (dis)advantage pattern was inconsistent across periods of the game. Home teams that were superior to their visiting opponents had marginally greater odds of winning in regulation compared to overtime. In contrast, home teams had lower odds of winning in the shootout compared to overtime regardless of team quality, suggesting enhanced home crowd pressure may have a deleterious effect on individual performance. The purpose of this study was to explore home (dis)advantage patterns during the five NHL seasons (2015-16 through 2019-2020) in which the league instituted 3-on-3 play during overtime (possibly enhancing individual pressure for home players competing in 3-on-3 overtime). We used archival data from the regular season (N=6,084 games) to compare home teams’ odds of winning in regulation (5-on-5 skaters per team), to overtime (3-on-3), and in the individual shootout, adjusting for the relative quality of home and visiting teams. On average, home teams won 55.1% of games that ended in regulation, 50.5% that ended in overtime, and 55.8% that ended in a shootout. Main analyses were conducted using logistic regression, in which home teams were categorized as being superior, inferior, or evenly matched to their opponents. Results showed that superior home teams were 3.03 times (95% CI [1.80, 5.10]) more likely to win than inferior home teams when games concluded in regulation rather than overtime; however, the comparison between evenly matched and inferior home teams was not significant (OR = 1.28, 95% CI [0.87, 1.87]). Thus, it is apparently more difficult for superior home teams to win in overtime than during regulation, suggesting such teams may be susceptible to choking in overtime. In contrast to the earlier 4-on-4 overtime era, home teams did not have lower odds of winning in the shootout compared to overtime. The results may have practical implications for NHL coaches’ and players’ tactical decision-making.

Are Current Measures of Physical Activity Regulatory Styles and Physical Activity Identity Robust for the Older Adult Population?

Mary Katherine Huffman, Purdue University; Sharon Christ, Purdue University; Kenneth Ferraro, Purdue University; David Klenosky, Purdue University; Kristine Marceau, Purdue University; Steve Amireault, Purdue University

Self-determined regulatory styles and physical activity identity are motives theorized to support physical activity participation. Having high quality measures of these constructs is critical to understanding how they relate to physical activity, how they change in response to intervention strategies, and how they correlate with other relevant constructs. The purpose of this study was to provide evidence for the robustness of modified versions of the Behavioral Regulation in Exercise Questionnaire and the Exercise Identity Scale for use in the older population (ages ≥ 55 years). The scales were modified such that they measured regulatory styles for physical activity and physical activity identity, respectively, as opposed to psychological constructs related to exercise. This study assesses the measurement invariance between gender and across time and the convergent and divergent validity of the scales. Participants (N = 495, 34.9% female, Mage = 66.29, SDage = 7.06) filled out an online survey twice across four weeks. Measurement invariance was assessed within a structural equation
modeling framework using confirmatory factor analysis and Lagrange multiplier tests. A two-factor model of identity representing role identity and physical activity beliefs provided the best fit. Both instruments were found to be invariant between gender and across time. Identity dimensions and more self-determined regulatory styles were positively related to each other. Additionally, identity dimensions were positively related to physical activity \( (r = 0.55 \text{ and } 0.62) \), as were more self-determined regulatory styles \( (r = 0.51 \text{ to } 0.61) \). Interojected regulation was positively related to physical activity beliefs \( (r = 0.54) \) but not role identity \( (r = 0.19) \). Together, these findings emphasize the implication that a one-factor model of physical activity identity should not be considered the default when intended for use with older adults. These modified scales are robust measures of physical activity regulatory styles and two dimensions of physical activity identity for older adults.

**Effects of 30-Minute Single Sessions of Yoga and Pilates on Frailty in Psychiatric Disorders: A Pilot Randomized Controlled Trial**

Saeko Iki-Tani, University of Toronto; Hideaki Tani, Centre for Addiction and Mental Health; Saki Kamiyama, Keio University; Masaru Mimura, Keio University; Hiroyuki Uchida, Keio University

Frailty and subsequent falls are grave concerns, especially in patients with chronic psychiatric disorders in light of less exercise. We evaluated the effects of a 30-minute single session of Hatha yoga, Pilates, and group therapy on the frailty in this population. In this open-label randomized controlled trial, participants with any psychiatric diagnoses and no changes in antipsychotic treatment over the last eight weeks were randomly assigned to a single session of yoga, Pilates, or group therapy between August 2017 and June 2018 at the Minami-Hanno Hospital in Japan. Participants in each group received a 30-minute session of Hatha yoga, floor-based Pilates, or group therapy focusing on a healthy lifestyle with tips on fall prevention in addition to their ongoing psychopharmacological treatments. We measured postural stability using the clinical stabilometric platform, salivary alpha-amylase (SAA) activity, anteflexion, handgrip, the Fatigue Visual Analogue Scale as well as the Subjective Happiness Scale before and after each session and at the one-week follow-up. Thirty-one patients participated in this study (19 men; mean±SD age, 52.6±9.5 years; schizophrenia, 80.7%; mean±SD duration of illness, 14.7±10.8 years). Participants in the yoga group \( (n=11) \) and the Pilates group \( (n=10) \) demonstrated a significantly greater improvement in the range of trunk motion than those assigned to the group therapy \( (p<0.001) \). In addition to this, the yoga group showed decreased SAA activity in comparison to the Pilates group \( (p=0.046) \). However, these improvements were not sustained at the follow-up. This study found beneficial but transient effects of a 30-minute single session of Hatha yoga and Pilates on postural stability in patients with chronic psychiatric disorders. Future investigations should not be considered the default when intended for use with older adults.

**A Bout of Physical Activity Improves Cognition for the Unhappy Mind: Evaluating Moderating Effects of Positive Affect on Inhibitory Control Outcomes**

Megan N. Johnson, University of North Carolina Greensboro; Caroline C. Meadows, University of North Carolina Greensboro; Kinley A. McKay, University of North Carolina Greensboro; Derek J. Hevel, University of North Carolina Greensboro; Jaclyn P. Maher, University of North Carolina Greensboro; Eric S. Drollette, University of North Carolina Greensboro

Recent research suggests intra-individual differences may be a moderator of cognitive benefits following a single bout of physical activity. The present study seeks to evaluate moderating mental states –specifically positive affect – on inhibitory control following a single bout of physical activity. Using a within-participants pre-post cross-over design, eighty young adults \( (54 \text{ females}; 21.7±2.7 \text{ years old}) \) completed a flanker task and affect measures directly before and after 15 minutes of seated rest or a single bout of self-selected aerobic physical activity. A post hoc median split of positive affect ratings prior to the bout of exercise was used during analyses to determine groups of high affect \( (HA; n=41) \) and low affect \( (LA; n=39; p ≤ 0.01) \) groups. Repeated measures ANOVAs were performed with HA and LA groups as the between-subjects factor. Results for flanker reaction time (RT) for the HA group did not differ between the physical activity and rest sessions \( (p ≤ 0.15) \). The LA group had faster RT after physical activity compared to before physical activity and after rest \( (p ≤ 0.01) \). For flanker accuracy, physical activity revealed improvements for the LA group compared to rest \( (p = 0.02) \), while the HA group-maintained accuracy across conditions \( (p = 0.43) \). Additionally, while the HA group was more accurate than the LA group during rest \( (p = 0.02) \), LA performance during the physical activity session was equivalent to the HA group \( (p = 0.16) \). Lastly, positive affect in the LA and HA groups decreased from before to after rest; however, positive affect increased among the LA group only from before to after physical activity \( (p ≤ 0.01) \). These results reveal that inhibitory control performance is moderated by positive affect.
suggested individuals with more negative emotions before engaging in physical activity experience greater subsequent cognitive improvements. Such findings highlight the need for future research to explore individual differences in mental states as a possible mechanism for cognitive improvements following acute physical activity.

Unaffected Memory Consolidation Following Acute Bouts of Intense Interval and Moderate-Intensity Continuous Exercise in Young Adults

Shih-Chun Kao, Purdue University; Nicholas Baumgartner, Purdue University; Christian Nagy, Purdue University; Chun-Hao Wang, National Cheng Kung University

Exercise has been shown to have acute benefits to memory consolidation, however, whether such effects are moderated by the type of exercise and memory remains unexplored. The purpose of this study was to determine the acute effects of high-intensity interval training (HIIT) versus moderate-intensity continuous exercise (MICE) on the consolidation of memory. Healthy young adults ($N = 94$, $M_{age} = 22.8 \pm 2.7$ years) were randomly assigned to three experimental groups (HIIT, MICE, control) and completed two encoding tasks in counterbalanced order. During the relation-based encoding task, participants were required to determine whether two objects presented were related to each other (i.e., can one object fit into the other?). During the item-based encoding task, participants were required to identify features within each of the presented two objects (i.e., is either object alive?). Immediate object (i.e., recognize previously encoded objects) and relation (i.e., recognize the relation between previously encoded objects) recognition tasks were completed, followed by the assigned bout of 15-min intervention. Delayed object and relation recognition tasks were completed after a 1-hour and 48-hour delay following the initial encoding. Results showed no difference in object recognition or relation recognition performance outcomes during the 1-hour and 48-hour delayed recognition tasks between the three groups after controlling for the relation recognition performance outcomes during the 1-hour and 48-hour initial encoding. Data were gathered following sport competitions from 509 participants from 50 independent sport teams ($M_{age} = 19.0$, $SD = 3.1$). Analysis of the data using structural equation modeling revealed that received affect-improving and worsening IER were not associated with anxiety and goal attainment, whereas affect-improving ($b = .40, p < .001$) and worsening ($b = -.19, p = .001$) ESR were associated with goal attainment. Yet, further analysis showed that received affect-improving IER was associated with goal attainment ($b = .43, p < .001$) if the path coefficients from ESR to goal attainment were set to zero. This result can be interpreted to indicate that emotion regulation actions between teammates are important for performance outcomes, albeit that this effect is attenuated in the presence of athletes’ own self-regulation. Overall, these results demonstrate the importance of emotion regulation for athletes and call for more research examining the interaction between ESR and IER in performance contexts. Funding source: SSHRC.

Breathing Training has a Positive Effect on Children With Sleep Disordered Breathing

Sergey Kiselev, Ural Federal University

Introduction: It is known that children with sleep disordered breathing (SDB) have a risk for development of inattention, impulsivity, hyperactivity and deficit in executive abilities. It is important to develop approaches for helping children to overcome behavioral problem.Objectives: The goal of this study was to reveal the effect of breathing training on executive functions in 6-7 years of age children with SDB. We compared the efficacy of two methods of training (breathing training vs. conventional motor exercises) in a randomized controlled pilot study.Methods: 16 children with SDB between 6 and 7 years of age (mean age 6.72±1.02 years, 12 boys and 4 girls) were included and randomly assigned to breathing training conditions according to a 2×2 cross-over design. The training included the breathing techniques from yoga. Children participated in 12 weeks of training. A total of 36 sessions lasting 30 minutes were performed. To assess the executive functions in children we used 3 subtests from child neuropsychological technique NEPSY (Auditory Attention and Response Set, Visual Attention, Statue). Effects of training were analyzed by means of an ANOVA for repeated measurements. Results: The ANOVA has revealed ($p<.05$) that for all used neuropsychological subtests the breathing training was superior to the conventional motor training, with effect sizes in the medium-to-high range (0.40-0.83). Conclusions: The findings from this pilot study suggest that breathing training has a positive effect on executive functions in children with SDB. We are going to perform the longitudinal research for revealing long-term effect of this training on children with this SDB.

A Model of Quasi-Experimental Designs for Sport Psychology Research

Jason Kostrma, Florida International University; Elizabeth Perez, Florida International University; Anamaria Astudillo, Florida International University; Stephanie Svoboda, Florida International University; Sabrina Gomez, Florida International University

Although Randomized Controlled Trials are considered the gold standard for studying causal relationships, they are not always feasible, appropriate, or ethical in sport psychology research (Harton & Locascio, 2018). Applied sport psychology studies are frequently limited to a small number of participants who meet inclusion criteria due to logistical constraints in recruiting participants (Barker et al., 2011). Moreover, randomization is often limited by individual participants nested within teams, and teams nested within close-knit leagues or academies. Alternatively, quasi-experimental designs (i.e., designs without randomization to groups) produce strong causal inference through carefully selected comparisons and observations in the absence of randomization (Shadish et al., 2002). This review presents an overview of the current research limitations within applied sport psychology literature, identifies problems associated with
common study designs, and considers potential solutions including a proposed model of quasi-experimental designs based on Shadish et al.’s (2002) work. This model assists sport psychology researchers by providing insight into additional quasi-experimental design elements that reduce the plausibility of threats to internal validity in the absence of randomization.

To Exercise or Not to Exercise: Effects of Mental Fatigue and Physical Activity Enjoyment on Exercise Decision-Making
Dusan Kovacevic, McMaster University; Sheereen Harris, McMaster University; Steven R. Bray, McMaster University

Current evidence indicates the majority of North American adults do not meet the recommended levels of physical activity (PA) despite the many well-known health benefits. Mental fatigue is a common barrier to PA and has been shown, experimentally, to bias people away from exercise by reducing subjective benefit versus cost ratings of a physical task. However, research looking at other factors that may interact with mental fatigue to affect exercise decision-making has been limited. PA enjoyment is positively associated with PA behavior. Accordingly, mental fatigue may have less impact on people who enjoy PA more compared to those who enjoy PA less. This study investigated the effects of mental fatigue and PA enjoyment on people’s decisions to engage in an acute bout of exercise or sedentary alternative. Undergraduates (N=84, Mage=19.07±1.86 years) completed a measure of PA enjoyment and either a 12-min, high cognitive demand (incongruent Stroop) task intended to increase mental fatigue levels, or low cognitive demand (documentary viewing) task intended to maintain mental fatigue levels. Participants then made a choice between engaging in a 20-min, self-paced moderate-to-vigorous intensity stationary cycling task or sedentary task. Tertile split of PA enjoyment scores was used to create higher and lower PA enjoyment groups. Chi-square analyses revealed no effect of mental fatigue grouping on choice (p=.57, d=.15), no effect of PA enjoyment grouping on choice (p=.28, d=.29), and no interaction between mental fatigue grouping and PA enjoyment grouping on choice (p=.66, d=.34). Results suggest mental fatigue and PA enjoyment do not directly affect acute exercise choice; however, the cycling task provided may not be the preferred mode of PA for some participants. Future work should offer more exercise alternatives and explore other factors that contribute to people’s decisions to better understand the exercise decision-making process and inform the design of PA promotion interventions. Funding source: Harry Lyman Hooker Sr. Fellowship.

Making Mistakes: What Athletes Perceive as Most Harmful to Performance and Well-Being
Ashley Kuchar, The University of Texas at Austin; Katherine Van De Walle, The University of Texas at Austin; Nicole Mitchell, The University of Texas at Austin; Amber Mosewich, University of Alberta

Committing a mental or physical error is one of the most frequently cited sources of competitive stress for athletes (Anshel, 1996; Anshel & Wells, 2000; Anshel et al., 2000). In two descriptive studies, we investigated sport mistakes committed by athletes and the perceived impact of these errors. In Study 1, we used an inductive content analysis to develop a Performance-Related Mistakes Inventory based on responses from 234 athletes (122 men, 107 women, 5 unspecified). Study 2 engaged a new athlete sample (N=223; 94 men, 129 women) to explore which of these mistakes were perceived as the most harmful to athletes. The majority of participants (n=74, 33%) reported that negative emotions were the most harmful overall, followed by poor execution of a skill/technique (n=44, 20%). Chi-square tests revealed no significant relationships between the mistakes athletes found most harmful and individual characteristics including gender, type of sport, race, and skill level (ps>.05). To explore potential reasons for athletes’ choices of the most harmful mistakes overall, pairwise t-tests were conducted. Results suggest that although negative emotions were equally as harmful as poor execution of a skill/technique to performance, t(116)=-0.693, p>.01, they were significantly more harmful to well-being, t(116)=-4.285, p<.01. Our findings highlight the importance of emotion regulation interventions as athletes reported that experiencing negative emotions were perceived to be equally as harmful to performance as poor execution of a skill/technique. Finally, the nine types of common sport errors we identified may enable researchers to use a more standardized approach when conducting quantitative and mixed methods studies that investigate how coping with mistakes is affected by the specific types of errors athletes commit.

With Great Data, Comes Great Responsibility: New Interpretations of Early Specialization and Lifespan Patterns of Sport Participation
Heather K. Larson, University of Alberta; Bradley W. Young, University of Ottawa; Tara-Leigh F. McHugh, University of Alberta; Wendy M. Rodgers, University of Alberta

The research literature on early sport specialization has been critiqued as having inconsistent definitions and measurement, and a lack of data-driven research on the topic. This presentation will draw on five of our recent data-driven papers—each featuring a different analytical approach—to weave a cohesive research narrative that challenges prevalent conceptions of early specialization and sport participation. All five constituent studies relate to studies of developmental and lifespan trajectories in competitive swimming in Canada. Based on our insights from this research, our aims are to advance a more useful definition of early specialization, promote avenues for further data-driven research, and invite careful consideration of public-facing messaging around single or multi-sport participation. Questions to be explored include, “How common is early specialization, anyway?” “Are we measuring it correctly?” “What evidence do we have for an association between early specialization or training volume and burnout or dropout?” “How might early specialization and high levels of training volume in youth sport impact adult participation in the same sport?” and “What are the inconsistencies between current developmental models and the available evidence regarding pathways from youth sport to adult sport?” Our work raises the possibility of over-inflation of the problem of early specialization, and a mistaken assumption of sport activity tracking from youth to middle-aged stages of sport. Discussion will focus on evidence-based interpretations of our five prior works and what they mean for key takeaways, new empirical questions, and promising directions for future research.

Classification in Para Sport: Exploring Athletes’ and Classifiers’ Experiences With and Understanding of Classification
Janet A. Lawson, Queen’s University; Toni Williams, Leeds Beckett University; Amy E. Latimer-Cheung, Queen’s University

Classification is a defining feature of Para sport; however, little empirical evidence describes the experience of classification and how it can be improved. To date, the primary focus of research related to classification has been on the development of evidence-based classification procedures. Meanwhile, the limited literature which has focused on experiential aspects of classification has shown classification to be a potentially negative experience for athletes. As well, classifiers have been identified as important social actors within the Para sport context, yet no research has simultaneously examined athletes’ and classifiers’ experiences with classification. Therefore, the purpose of this study was to elucidate athletes’ and classifiers’ experiences with classification in Para sport. Semi-structured interviews exploring the experience of classification were conducted with 18 internationally classified Canadian athletes and an international sample of eight internationally certified classifiers. Hermeneutic
phenomenological analysis was used to conceptualize athletes’ and classifiers’ classification experience. The results show that athletes and classifiers experience classification in one of three ways: as a neutral experience, a negative experience, or a positive experience. Furthermore, it was shown that athletes and classifiers construct their understandings of classification by reflecting on themselves (The Self), their interactions with one another (The Athlete-Classifier Interaction), and the classification system itself (The Classification System). Together, these findings provide novel insight into athletes’ and classifiers’ experiences with, and understanding of, classification and may inform future interventions aimed at improving the experiences of athletes and classifiers. Funding source: The Ontario Parasport Collective.

An Exploration of the Effectiveness of the Fun For Wellness eHealth Intervention to Promote Health in Adults With Obesity

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Worldwide obesity has almost tripled since 1975, resulting in more than 650 million obese adults. To reduce the prevalence of adults with obesity, the World Health Organization recommends that individuals engage in regular physical activity. To encourage sustained engagement in physical activity, the potential for experiencing health benefits across a broad array of health dimensions (e.g., physical, mental) may be targeted and emphasized. Fun For Wellness (FFW) is an online behavioral intervention developed to promote multidimensional well-being by enhancing the self-efficacy of participants. The objective of this study was to evaluate the effectiveness of FFW to promote health in adults with obesity in the United States in a relatively uncontrolled setting. The study design was a large-scale, prospective, double-blind, parallel group randomized controlled trial. Data collection via self-report occurred at three time points: baseline, 30 days, and 60 days after baseline. Health was measured with the 36-item Optum SF-36v2 Health Survey that comprises two components: physical health status, mental health status. Participants (N = 667) who were assigned to the FFW group (nFFW = 331) were provided with 30 days of 24 hr access to the online intervention. A path model was fit to the data. There was evidence for a positive direct effect of FFW on physical health status (b = 1.33, p = .005, d = 0.24) at 60 days after baseline. In addition, there was evidence of a positive indirect effect of FFW on mental health status at 60 days after baseline through psychological well-being self-efficacy (b = 0.44, 95% CI = [0.05, 0.94]). Results from this study show that, compared with participants in the Usual Care condition, those who took part in the FFW intervention improved their physical and mental health status. The FFW intervention may have the potential to become useful, in some small (i.e., meaningful effect size) but important ways (i.e., online intervention delivery) to promote, either directly or indirectly, the physical and mental health in adults with obesity. Funding source: The Erwin and Barbara Mautner Endowed Chair in Community Well-Being at the University of Miami.

If It’s Not on Strava, It Didn’t Happen – Identifying User Archetypes of Sport-Specific Social Media Platforms Based on Motivation and Behavior

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Sport-specific social media platforms such as Strava have become very popular in recent times. Users can upload their exercise and competition activities, analyze, share, and compare them with fellow athletes, and even compete in (semi-)virtual challenges through such platforms. By now, more than 3 billion activities (e.g., runs or cycling exercises) have been uploaded to Strava. Strava reports that currently 20 new activities are uploaded every second, this is 19 million every week. Anecdotal evidence suggests strong motivational and behavioral effects of using such platforms. To explore this phenomenon, we conducted a survey among 557 recreational German triathletes, covering socio-demographics, platform usage and training activities, as well as psychological traits and dispositions. Using standardized items of the questionnaire, a principal component analysis revealed two underlying motivational themes of the platform usage: “external social acknowledgement” and “self-directed transparency”. For behavior, two main themes were identified as well, i.e., “social interaction” and “competitive usage”. A k-means clustering on these principal components and few other items revealed four distinct user archetypes, which were named based on their mean characteristics on the relevant items: “Casual Consumers”, “Lone Wolves”, “Competitors”, and “Socializers”. ANOVA (p < 0.01) and post-hoc Tukey tests validated this clustering solution. Further descriptive analyses helped understand the characteristics of the user archetypes. Our findings can enable platform operators to increase customer centrality by individualizing the platform’s features and, thus, increase the users’ willingness to pay. For platform users, the results are helpful to understand, reflect, and evaluate their own platform usage to increase positive and mitigate negative effects on psychological well-being and their exercising. Further research should focus on complementing these findings using other methods (e.g., experiments) and investigate the behavioral differences we identified here in more detail.

Manipulation of Runner’s Cadence With Interactive Auditory Stimulation

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The dynamics of the running cycle, usually modelled as a mass-spring system, depends on the contact time of the foot on the ground and associated cadence. Good runners are expected to exhibit high cadence which translates into high leg stiffness. Higher stride frequency has been reported to be less prone to elicit injuries and to favor better energy efficiency. Interactions with external rhythmical events can contribute to the stabilizing, or destabilizing of running dynamics. Music with tempo matching the runner’s cadence is often advocated as a factor of performance and motivation. We developed a technological architecture, which continuously measures foot strikes in real time, and allows the manipulation of musical beats according to running kinematics. The objective was to entrain the runner toward a target cadence, considered as ideal in terms of biomechanical constraints. We compared the entraining ability of two beat manipulation algorithms, an adaptive one, which followed the runner tempo, and a periodic one, which assigned a constant musical tempo matching the target tempo. During a 9-week training program including 17 running sessions in ecological conditions, 30 participants listened to music manipulated by the alternative algorithm during the second half. Participants experienced 15 minutes of silence and 10 minutes of auditory stimulation during the two post-tests sessions following exposure to one specific algorithm. Participants were more prone to be entrained toward higher cadence with the adaptive algorithm (relative increase of cadence with adaptive 3.5 ± 1.7 steps.min⁻¹ vs. periodic music 1.5 ± 1.1 steps.min⁻¹, p = .033, partial η² = .28). The ability of the periodic algorithm to entrain cadence depended on participants’ exposure to the adaptive algorithm. These results support the alignment of predictable and interactive auditory cues as a factor of auditory-motor coupling enhancement. Funding source:

A Closer Look at Burnout: A Prospective Study of Self-Compassion, Athletic Coping, and Burnout in Canadian Varsity Athletes

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Varsity athletes are expected to manage the high demands of academics and athletics. Lacking proper coping skills and personal resources to attenuate stress may leave them susceptible to burnout. As such, this prospective study aimed to understand how self-compassion and athletic coping skills are related to burnout in varsity athletes. Self-compassion and athletic coping skills measured at the start of the fall semester were explored as prospective predictors of burnout at the end of the winter semester in a cohort of Canadian varsity student-athletes (N = 110, Mage = 24.18 years, SD = 1.79). As hypothesized, trait self-compassion and athletic coping skills were significant negative predictors of burnout (F(1,110)=10.76, p < .01, R² = .09; F(1,110)=54.35, p < .001, R²=.34). Further analysis suggests subscales reflecting a lack of self-compassion were stronger predictors of burnout than those reflecting the presence of self-compassion, and specifically that over-identification (β = .43, t(109)= 3.33, p<.001) was the best predictor of burnout. Confidence (β = -.41, t(109)= -3.60, p < .001) was found to be the best negative predictor of burnout out of the seven athletic coping skills measured, followed by coachability (β = .25, t(109)= -1.31, p<.01). Finally, trait coping skills (β = -0.15, BCα [-0.28, -0.07]), specifically confidence and coachability, mediated the relationship between self-compassion and burnout (β = 0.12, BCα [-.23, -.03]; β = 0.06, BCα [-.18, -.001]). The results of this study suggest that trait self-compassion and athletic coping skills are significant predictors of burnout, and provides novel evidence that certain conceptual components suggesting a lack of self-compassion (i.e., over-identification) and specific athletic coping skills, (i.e., low confidence and coachability) are related to burnout. Further, this study revealed that self-compassion and athletic coping skills may potentially work together to attenuate burnout. Funding source: SSHRC.

“Shes Thinks She’s Fat? What Does She Think of Me?” A Qualitative Investigation of Body Talk in Girls Sport

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Adolescent girls report less sport participation and poorer sport experiences compared to boys. Critically, negative body image is common and has been identified as a potential contributor to this disparity. Outside of sport, body talk (i.e., direct or indirect, complimentary or negative verbal comments about the body’s appearance) can cultivate an environment that promotes negative body image. However, body talk among girls involved in non-aesthetic sports (where successful performance is not predicated on the body’s appearance) has not been explored using an in-depth, person centered approach. Therefore, the purpose of the present study was to explore girl athletes’ body talk experiences within non-aesthetic team sports. Twenty girls athletes (Mage = 16.7; SD = 1.4) who were registered in organized non-aesthetic team-based sports in the Greater Toronto Area participated in one-on-one semi-structured interviews. Using a qualitative description approach, three themes were generated through thematic analysis. The theme “body talk as a performance tactic” reflected that complimentary and negative body talk was intended to enhance performance and was sourced from coaches, spectating parents, and opposing players. The theme “casual conversations and body talk” highlighted that body talk unrelated to sport performance also occurred from teammates and young male spectators within the sport context. Finally, the theme “coping with body talk” reflected that although the athletes considered negative body talk as ‘normal’, they still tried to dispute the negative body talk teammates directed towards themselves. Overall, the findings suggest that body talk served many purposes within sport (e.g., distracting opponents, reinforcing ‘positive’ body changes, bonding among teammates). Research is needed to further explore the diverse motivations and perceived utility of body talk across sport sources, to inform potential strategies to alter the sport environment and promote positive sport experiences for girls. Funding source: Social Sciences and Humanities Research Council of Canada (SSHRC) Insight Grant.

Self-Regulatory Variables Differentiate Behavioral Patterns of Long-Term Exercise Maintainers

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Maintaining long-term exercise is an often-heard public health message. However, long-term maintenance of exercise (e.g., years) is rarely studied. Reviews of social-behavioral theories identify self-regulatory factors that influence maintenance. Behaviorally, do all long-term maintainers regulate their exercise similarly? Different behavioral patterns (e.g., consistent vs variable) of long-term maintenance may differ in the strength of self-regulatory variables. We examined this idea by comparing groups of different long-term behavioral maintenance patterns on the strength of variables thought to influence maintenance self-regulation. The sample included 356 exercise maintainers (Mage = 32 ± 12 years) active 2 to 7 days per week for 6.98 ± 3.91 years. An online survey assessed psychosocial variables of self-regulatory efficacy (barriers, recovery), and outcome expectations. Three groups had identifiable long-term weekly maintenance patterns: consistent: same time, location, and exercise (n = 204), variable: intermittent exercise pattern with periods of un-patterned exercise (n = 113), and no pattern: differing exercises, times, locations (n = 39). A MANOVA compared the groups. The between-groups MANOVA was significant, p = .006. Adjusted post-hoc comparisons (p<.02 to .05) revealed the consistent exercise pattern group reported significantly higher self-regulatory efficacy – barriers versus variable and no pattern groups. Higher self-regulatory efficacy – recovery was evident for consistent and variable groups versus the no pattern group. This initial study of persistent long-term exercise behavior revealed maintenance was accomplished through different behavioral patterns. These patterns can be differentially characterized by the strength of self-regulatory variables.

Effects of Message Framing on Physical Activity Effort Discounting

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Current guidelines recommend adults engage in at least 150 minutes of moderate to vigorous intensity physical activity (PA) each week to attain important health benefits. However, the majority of North American adults are insufficiently active. Prior research has shown gain-framed messages (GFM) can be used to increase motivation to engage in PA. The present study examined the effects of message framing on participants’ willingness to engage in PA using an effort discounting paradigm to indirectly measure motivation. Using an online data collection protocol, participants (N=115) were randomized to read either GFM about the benefits of being physically active or loss-framed messages (LFM) about the risks of not being physically active. Next, they made a series of hypothetical choices between
engaging in PA of three intensities [light, moderate, vigorous] crossed with six durations [10, 20, 30, 40, 50, 60 minutes] for a fixed reward ($20) or a sedentary task for varying reward amounts ($2–$20). A point of indifference score, representing the monetary value at which the PA and sedentary activity would be chosen equally, was computed for each intensity-duration combination. An area under the curve (AUC) composite score was calculated to represent overall motivation for PA at each intensity level. Participants exposed to GFM were expected to exhibit greater motivation (larger AUC) to engage in PA than those exposed to LFM. A 2 (frame) X 3 (intensity) ANOVA of AUC scores revealed a significant main effect for intensity (p<.001, \( \eta^2=0.48 \)), with larger AUC scores for lower PA intensities. The main effect for message frame (p=.09, \( \eta^2=0.03 \)) and intensity X frame interaction (p=.48, \( \eta^2=0.01 \)) were not significant. In general, participants were more motivated to engage in lower intensity PA. However, exposure to framed messages did not differentially affect participants’ willingness to engage in PA. Results suggest a small, non-significant effect of GFM over LFM on motivating people to engage in PA.

Impact of COVID-19 Restrictions on Physical Activity Behaviors Among College-Aged Undergraduate Students

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The COVID-19 pandemic has led governments and institutions worldwide to adopt rules to mitigate exposure to the SARS-CoV-2 virus such as sheltering-in-place, maintaining a distance of at least six feet apart when in public, wearing face masks, and the closure of non-essential businesses. In addition, many universities closed their campuses and transitioned to virtual instruction. While these decisions helped reduce the spread of the SARS-CoV-2 virus, these restrictions may have had unintended negative consequences on physical activity behavior. Using a constraints-based model, our goal was to understand how the rules adopted to mitigate the transmission of the SARS-CoV-2 virus affected physical activity behaviors among college-aged undergraduate students. Sixty-nine undergraduate students (40 females and 29 males) completed an online survey that assessed how the COVID-19 lockdown affected individual psychological and environmental/sociocultural variables known to influence physical activity. The survey consisted of 26 questions organized into two sections – pre-COVID and during COVID – and paired t-tests were used to compare pre- and during COVID means. Results indicated significant differences for the following statements: (a) “I feel motivated to exercise” (p<.001), (b) “I have access to outdoor recreation areas or fitness facilities which helps me stay physically active” (p<.001), and (c) “I increased my physical activity goals” (p=0.02). These findings suggest shelter-in-place directives and social distancing guidelines may have led to decreased undergraduate students’ motivation to exercise, reduced access to recreational and fitness facilities, and diminished their goals for physical activity. A constraints-based model allowed us to specifically identify how the COVID-19 directives influenced physical activity behaviors among college-aged students. We suggest that universities should provide students with resources to help them either maintain or start a physical activity program as it benefits both mental health and academic performance. Funding source: N/A.

Social Outcomes of Physical Activity Among Older Adults in Group Physical Activity Programs: Stakeholder Perspectives

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Social participation and inclusion are components of age-friendly communities, and contribute to well-being in older adults. Group physical activity programs can lead to positive social outcomes because they bring people together and provide a meaningful context for interaction. However, lack of clarity in defining and assessing social outcomes, and demonstrating alignment with stakeholder values, are barriers to developing programs that address social outcomes. The purpose of this study was to identify valued social outcomes among stakeholders implementing an age-friendly cities strategy, and to identify challenges in promoting social outcomes in group physical activity programs for older adults. Based on interpretive description methodology, group discussions were held with eighteen stakeholders from the City of Calgary and two older adults with experience with City group physical activity programs. Data were analyzed inductively, and in light of social outcome theories. Four categories of outcomes were identified: increasing social networks, social participation, inclusion and connection, and social support. Social network outcomes included providing a meaningful platform to develop connections, and social bridging. Social participation outcomes included providing a reason to leave the house, fostering informal social ties, and providing opportunities to be others. Social inclusion and connection outcomes included access to social spaces to make friends, and building emotional connections, trust, belonging, and community. Social support outcomes were primarily discussed in terms of access to emotional support, and as a way to promote belonging. Challenges included funding barriers; challenges collaborating across sectors; difficulty demonstrating social outcomes in program evaluations; and structural barriers limiting program access. The findings identify targets for future research and program design innovation to target an array of social outcomes in group exercise for older adults. Funding source: Social Sciences and Humanities Research Council of Canada.

Coaches’ Influence on Team Dynamics in Sport: A Scoping Review

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Research examining coach effectiveness in sport has largely focused on how coaches’ behaviors impact individual rather than team-level variables. Accordingly, the current study sought to assess (a) the breadth of existing research that examines coaches’ influence on team dynamics and (b) the quality and quantity of this research by investigating methodological and reporting-based practices used in the literature. Adhering to the PRISMA guidelines for Scoping Reviews, 9,454 peer-reviewed studies were identified using four electronic databases. Ultimately, 82 studies met our inclusion criteria. Included studies were grouped based on research involving interpersonal, intrapersonal, and professional coach behaviors. Within these groupings, established team dynamics frameworks (i.e., Carron & Eys, 2012; McEwan & Beauchamp, 2014) were used to explore the investigated team-level variables involving (a) structures (e.g., roles, norms), (b) processes (e.g., communication, conflict, teamwork), and (c) emergent states (e.g., cohesion, collective efficacy). The results demonstrated that the majority of studies have assessed the influence of coaches’ interpersonal behaviors (93%; \( n=76 \)) on teams’ emergent states (e.g., cohesion), while largely overlooking the influence of coaches’ intrapersonal behaviors (5%; \( n=4 \)) and professional behaviors (2%; \( n=2 \)) on teams’ structures or processes. Regarding methodological trends and reporting practices, findings indicated a preference for cross-sectional designs (86%; \( n=71 \)) and that numerous studies omitted important coach demographic information (e.g., coaches’ age, years of experience; 80%; \( n=66 \)). This review advocates for the diversification of methodologies employed and targeted investigations guided by established team dynamics frameworks to better understand the complex nature of the coaches’ influence on sports teams as a whole.
Assessing Lifetime Stress Exposure in Sport Performers: Relationships With Stress Appraisals, Health, Well-Being, and Performance
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Research has found detrimental effects of greater lifetime stress exposure, including various mental and physical health problems (e.g., depression, cardiovascular disease). Despite this, few studies have examined the effects of stressors across the lifespan on sport performers’ health, well-being, and performance. This is due, in part, to the absence of an appropriate psychometric questionnaire for use in sport contexts. To address this issue, we developed a sport-specific stress assessment module (Sport SAM) for the Stress and Adversity Inventory (STRAIN), and then analyzed the instrument’s usability, acceptability, validity, and test-retest reliability. Furthermore, we examined whether stress appraisals mediated the relationship between lifetime stress exposure and health, well-being, and performance. Participants were 395 sport performers (Mage = 22.50 years, SD = 5.33) who completed an online survey. Results revealed that the Sport SAM demonstrated good usability and acceptability, as well as good concurrent validity (rc = .23 to .29) and test-retest reliability (rcc = .87 to .89). Furthermore, the Sport SAM was significantly associated with symptoms of depression (β = .21 to .24, ps ≤ .001) and anxiety (β = .13 to .19, ps ≤ .012), and general physical (β = .24 to .27, ps ≤ .001) and mental (β = .23 to .32, p ≤ .001) health complaints. In addition, stress appraisals significantly mediated the relationship between total severity of lifetime stress and health outcomes. Consequently, these findings can help practitioners better identify, and intervene with, sport performers who are at elevated risk of developing stress-related health problems.

Acute Interval Exercise Does Not Alter Mind-Wandering During a Working Memory Task in Young Adults
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Mind wandering, characterized by shifts in mental thoughts away from the present task, frequently occurs during daily living among young adults. Although research is conclusive regarding improved mental functioning following a single bout of exercise, the effects on mind wandering remain unknown. The present study aims to determine the after effects of acute interval exercise on mind-wandering during a cognitively demanding working memory task. Undergraduate students (n = 85) enrolled in an upper-level kinesiology course completed this study as part of a class assignment and provided consent to use their data for research purposes. All participants completed one bout of exercise and one bout of inactivity in a laboratory setting on separate counterbalanced days. Before and immediately after each session, participants completed a working memory change detection task with mind-wandering thought probes – including on-task thoughts, task-related interference (TRI), and task-unrelated thoughts (TUT) – occurring approximately every two minutes throughout the task. The exercise session consisted of 15-minutes of circuit training including 60-seconds of activity (10-meter shuttle run, 20 jumping jacks, 10-meter skipping, 15 air squats, 10-meter walking lung, and 20 high knees) followed by a 30-second rest period. The inactivity protocol consisted of studying class notes while seated. A repeated measures ANOVA revealed a reduction in TRI (p = 0.04) and an increase in TUT (p = 0.05) from before to after for both the exercise and inactivity sessions, with no difference observed between the physical activity and inactivity session (p’s > 0.28). These data suggest that among college students mind-wandering is not affected immediately following a single session of 15-minutes of interval exercise. Findings from this investigation expand current understanding regarding acute effects of exercise on other aspects of mental functioning during a cognitively demanding task.

A Preliminary Exploration of Contextual Factors and Burnout in Collegiate Athletes
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Contextual factors have the potential to influence athlete burnout. Few studies have examined organizational stress and peer variables in relation to burnout. In line with self-determination theory, the purpose was to examine associations between burnout and (a) contextual factors (organizational stress, peer leadership, cross-domain relationships with teammates [CDRTs]), and (b) psychological need satisfaction among college athletes. A second purpose was to explore how COVID-19 colored these athletes’ experiences. NCAA student-athletes (N=38) completed an online survey of study constructs and responded to 3 open-ended questions asking how COVID-19 affected them and their sport. Means, standard deviations, and correlations were calculated for quantitative data. Qualitative data were coded and grouped into emergent lower- and higher-order themes. Athletes reported relatively low to moderate burnout and organizational stress. CDRTs and psychological need satisfaction were perceived as relatively high, and formal and informal peer leaders were perceived as high on leadership qualities. Burnout was moderately positively related to organizational stress (r=.47) and strongly negatively related to psychological needs (r=-.56 to -.81) and CDRTs (r=-.65). Formal peer leadership was moderately negatively related to burnout (r=-.39), while informal peer leadership was weakly negatively related to burnout (r=-.28). Thirteen lower-order themes within 3 higher-order themes emerged: daily changes (e.g., fewer, slower, smaller practices), effect on mental state (e.g., hard to stay motivated, more internal drive), and effect on social relationships (e.g., more support and cohesion, less time to bond). This preliminary study suggests contextual factors can differentially impact athletes, as some reported enhanced motivation and social support while others reported difficulties with motivation and cohesion due to COVID-19. Correlations demonstrated the importance of CDRTs as a contextual factor—athletes perceived lower burnout when they felt their teammates knew them off the field.

A Person-Centered Approach to Burn-Out in Collegiate Athletic Coaches
Michael Mignano, Michigan State University; Dan Gould, Michigan State University; Andy Driska, Michigan State University

Burn-out is a persistent “syndrome conceptualized from chronic workplace stress that has not been successfully managed” (World Health Organization, 2018). More specifically, Maslach and colleagues (1993) proposed three dimensions of burn-out; emotional exhaustion, cynicism/depersonalization, and a lack of professional accomplishment. Burn-out has been extensively studied in athletes, coaches, and exercisers. However, most studies have taken a variable-oriented approach, using quantitative analyses such as correlation coefficients, regression, and structural equation modeling. A more person-centered approach can provide insight into how certain variables may group within subgroups and individuals. Since burn-out is multidimensional in nature, long-term, and related to other job-specific constructs, a person-centered approach has the potential to add new directions for studying the prevalence and trajectory of the phenomenon. The purpose of the current study was to use a person-centered approach to ascertain meaningful data about a subgroup (n = 5) from a
sample of collegiate golf coaches (n = 96) that met the criterion for burn-out. Using a mid-point split approach (Leiter & Maslach, 2016), five participants were labeled in the “burnout” category, meeting critical boundaries of all three dimensions of the MBI – Educators Survey. Demographic, individual, situational, and organizational variables are analyzed within the burn-out subgroup using mean comparisons, z-scores, and qualitative methods to complement the variable-oriented approach performed with the full sample. Future directions in studying the phenomenon of burn-out with a person-centered approach are offered, as well as limitations of this method.

Changes in Social and Physical Activity Participation in Older Adults Prior to and After the Onset of COVID-19

Lindsay Morrison, University of Calgary; Meghan H. McDonough, University of Calgary; Stephanie Won, City of Calgary; AJ Matsune, City of Calgary; Jennifer Hewson, University of Calgary

Social connections and physical activity participation contribute to quality of life as one ages. Public health messages responding to COVID-19 have caused disruptions to both social and physical activity opportunities. This study examined older adults’ social participation and physical activity before and during COVID-19 and their perceptions of precautionary measures and alternative physical activity program delivery options. Older adults (N = 100, M-age = 70.5 + 4.6 years) who had participated in physical activity programs at City recreation centers before the pandemic completed an online survey in August-September 2020. Measures assessed current and pre-pandemic (retrospective) reports of physical activity and social participation behavior and barriers, and satisfaction with participation, precautionary measures and alternate forms of program delivery. On average, social participation (t(143) = -23.79, p < .001), moderate-to-vigorous physical activity (t(140) = -2.34, p = .02), and resistance (t(106) = -5.18, p < .001) and flexibility (t(106) = -2.78, p = .006) exercise declined from pre-pandemic levels. Most participants (79.86%) had not attended an in-person exercise class, and 33.57% had attended an online exercise class since COVID-19 began. Only 20.00% were satisfied with their physical activity levels during the pandemic. During the pandemic, the top physical activity barrier was accessibility, and the top social activity barrier was range of activities. The majority of participants indicated that most safety precautions (e.g., physical distancing, enhanced cleaning protocols) would make them more comfortable attending in-person exercise classes, except for wearing a mask during strenuous exercise and exercising outdoors. While many older adults are interested in being more active and are open to precautionary measures, the findings regarding how COVID-19 has negatively affected older adults’ physical activity and social participation and barriers to alternate delivery and in-person classes can help recreation providers to adapt in light of COVID-19. Funding source: Social Sciences and Humanities Research Council.

Why Sport? An Examination of Youth Sport Program Consumption Behaviors in Canadian Ice Hockey Parents

Alex Murata, Queen’s University at Kingston; Jean Côté, Queen’s University at Kingston

Participation in sport has been shown to influence many outcomes associated with positive youth development across a variety of populations (Holt et al., 2017; Vierimaa et al., 2018). Despite this, growing concerns surrounding accessibility to youth sport—as a result of rising costs and time commitments—have made participation more challenging for many children and their families (Erdal, 2018). While many young athletes undoubtedly make decisions regarding their own involvement in sport, ultimately, parents are generally responsible for the final selection of youth sport program type and intensity due to their role as financiers and primary caregivers. Although previous work has explored how the parents of young athletes behave within the youth sport context as well as how these behaviors may influence their children’s sport participation (Harwood & Knight, 2009; Omli & LaVoi, 2012), few studies examine how sport parents make decisions related to the types of sport activities in which their children participate. Using a framework from the consumer behavior literature, 15 semi-structured interviews were conducted with the parents of children (aged 10-14) participating in recreational and competitive ice hockey programs in Canada. It was found that parents encouraged their children to participate in ice hockey as they saw the activity as a positive means to foster athletic as well as non-athletic development. Parents also recognized that, within the Canadian context, ice hockey held specific benefits for their children due to the sport’s popularity when compared to other extra-curricular activities. Parents described barriers to optimal ice hockey participation highlighting the social climate within organizations, excessive travel, and high costs as factors in their unwillingness to remain involved with particular sport organizations or program offerings. Future research directions as well as potential implications surrounding the use of consumer behavior theory in the study of sport parent behaviors are also discussed. Funding source: Social Sciences and Humanities Research Council (SSHRC).

Referees’ Experiences and Perceptions of Body Commentary While Officiating Adolescent Girls Involved in Sport

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Body image has meaningful implications for athletes’ psychological wellbeing. Within sport, body image is often perpetuated through body commentary (i.e., positive and negative comments related to one’s body) by sport stakeholders such as parents, coaches, and athletes. However, stakeholders rarely identify their own actions pertaining to body commentary and often shift the responsibility for conveying and perpetuating body image concerns on others. Therefore, understanding the context and prevalence of body commentary in sport is a challenging endeavor. To capture an unbiased account, we examine referees’ perspectives of body commentary specific to girls in sport. Thirteen referees with experience officiating adolescent girls involved in sport were purposefully sampled and participated in semi-structured interviews. Thematic analysis was used to analyze transcripts and four overarching themes were identified: (1) Susceptibility for all (i.e., athletes of all body types are susceptible to body commentary, including girls of higher and lower weight status); (2) Can’t separate weight and performance (i.e., weight comments are often closely tied with performance, whereby body commentary often reflects the narrative that higher-weight players are less skilled and capable during sport); (3) Authority to help, minimally (i.e., referees perceive some responsibility in reducing body commentary by penalizing athletes, parents and coaches who engage in body commentary, however, they acknowledge there is likely a lot of body commentary which goes undetected); (4) Referees experience body concerns too (i.e., women referees reported concerns about officiating uniforms not designed for the feminine body and pressure to manage appearance while working in sport). Overall, these results highlight that body commentary is pervasive among and directed to girls and women involved in sport, and change is needed at a systemic level to minimize body commentary and its negative effects on sport experiences.

Understanding Relationships Between Social Identity, Self-Conscious Emotions, and Sport Drop Out in Adolescent Girls

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Athletes who identify with their sport team are more emotionally invested in team outcomes and accomplishments and are more likely to engage and participate in their sport. Social identity relates to the self-concept, to the...
extent that social identity shapes the way individuals think about themselves. However, connections between social identity and the self-concept tied to emotions (i.e., self-conscious emotions) are not well understood. We hypothesized that levels of social identity with a sports team relate to self-conscious emotions and that social identity with a sports team is associated with likelihood to participate in sport one year later. Adolescent girls (N = 518), who participated on a sports team completed questionnaires assessing body related self-conscious emotions (shame, guilt, and pride) 1 year apart [Time 1 (T1) and Time 2 (T2)], social identity (T2) and sport participation status was measured one year later at Time 3 (T3).

While controlling for baseline levels of self-conscious emotions, the ingroup ties dimension of social identity was associated with levels of guilt (b = -.10, se = .03), and shame (b = -.10, se = .03) at T2, and ingroup affect was associated with levels of pride (b = .21, se = .04) at T2. Bivariate regression analysis indicated that guilt (b = -.60, se = .21) and ingroup affect (b = -.50, se = .18) at T2 was significantly related to levels of drop out one year later at T3. Girls with higher levels of guilt (+1 SD) had a 39% probability of dropping out of sport the following year. Comparatively, girls with lower levels of guilt (-1 SD) only had a 17% probability of dropping out of sport. Girls with lower levels of in-group affect (+1 SD) had a 43% probability of dropping out from sport, whereas girls with higher levels of ingroup affect (+1 SD) had only a 15% probability of dropping out of sport. Fostering positive feelings about one’s team may be an effective strategy to improve self-conscious emotions and might contribute to reductions in drop out from sport in adolescent girls.

**Effectiveness of the Fun for Wellness Online Behavioral Intervention to Promote Subjective Well-Being in Adults With Obesity**

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Fun For Wellness is a self-efficacy theory-based online behavioral intervention developed to promote growth in well-being and physical activity by providing capability-enhancing opportunities to participants. Evidence has been provided for the efficacy of Fun For Wellness to promote subjective well-being in adults in a relatively controlled setting. The objective of this study was to evaluate the effectiveness of Fun For Wellness to increase subjective well-being in adults with obesity in the United States of America in a relatively uncontrolled setting. The study design was a large-scale, prospective, double-blind, parallel group randomized controlled trial. Participants were recruited through an online panel recruitment company. Data collection via self-report occurred at three time points: baseline, 30 days and 60 days after baseline. Subjective well-being was measured with the I COPPE Scale. Participants (N = 667) who were assigned to the Fun For Wellness group (nFFW = 331) were provided with 30 days of 24 h access to the online intervention (i.e., from baseline to 30 days after baseline). Participants assigned to the usual care group (nUsual Care = 336) were asked to conduct their lives as usual. There was evidence for a positive indirect effect of Fun For Wellness on both occupational and psychological subjective well-being at 60 days after baseline through occupational and psychological well-being self-efficacy at 30 days after baseline, respectively. There was evidence for a positive direct effect of Fun For Wellness on both community (d = 0.33) and physical (d = 0.26) subjective well-being at 60 days after baseline. Results from this study provided some initial evidence for both the effectiveness (e.g., promoting community, occupational, physical, and psychological subjective well-being), and the ineffectiveness (e.g., failing to promote interpersonal, economic, and overall subjective well-being), of the Fun For Wellness intervention for increasing subjective well-being in adults with obesity in the United States of America. Funding source: The Erwin and Barbara Mautner Charitable Foundation through the Erwin and Barbara Mautner Endowed Chair in Community Well-Being at the University of Miami.

**The Acute Effect of Moderate-Intensity Aerobic Exercise on Resting State EEG Oscillations and Divergent Creativity Performance in Young Adults**

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Exercise has been previously shown to have an acute positive effect on cognition. However, the relationship between creativity, neuroelectric brain function, and acute exercise remains largely understudied. Using a within-subject crossover design, 20 participants (female = 11, age = 21.1 ± 2.07 years) completed a single bout of 20 minutes of moderate-intensity (65-75% maximum heart rate) aerobic exercise and a sitting control condition on separate days in counterbalanced order. Resting electroencephalogram (EEG) was measured prior to and following exercise and control conditions to measure cortical activation. Following the EEG assessment after each condition, the Compound Remote Associates Task (CRA) and the Guilford Alternate Uses Task (GAU) were completed to assess convergent and divergent creativity, respectively. Following exercise, a global increase in resting alpha band (7-12 Hz) power was observed compared to the control condition, with specific power increases observed in the frontal region (Fz). Specific increases were seen in upper alpha band (11-12 Hz) across midline electrodes (Fz, Cz, Pz). Exercise also resulted in an average 39.2% increase (p < 0.01) in divergent creativity scores compared to control condition, t(20) = 2.74, p = .006. There were no significant differences observed between exercise and control conditions for convergent creativity, F(2,20) = 0.877, p = .483. These findings suggest that a single bout of moderate-intensity aerobic exercise alters resting cortical activation and has selectively beneficial effects on divergent creativity.

**Associations Among Health-Related Quality of Life Markers and Life Satisfaction in Former Collegiate Women’s Soccer Athletes**

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Elite sport participation may potentially impact health-related quality of life (HRQOL) and life satisfaction among former collegiate athletes (Taylor & Ogilvie, 1994). Most studies thus far have examined HRQOL and life satisfaction in former male athletes. This study aimed to explore the relationships between HRQOL markers and life satisfaction in former collegiate women’s soccer athletes. We hypothesized that HRQOL markers would be uniquely associated with life satisfaction scores in former collegiate women’s soccer athletes. We hypothesized that the HRQOL markers would be uniquely associated with life satisfaction scores in former collegiate women’s soccer athletes. Participants (n=103; aged 43.5 ± 12.4 years) completed self-reported HRQOL (PRO-MIS-29 – depression, anxiety, and emotional support subscales) and life satisfaction (Satisfaction with Life Scale) assessments. Most participants started playing soccer in preteen years (39.8% before 6, 44.7% between 6
Mindfulness Disposition Moderates the Effects of Preseason and Competition Demands on Psychological Strain in Athletes

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Mindfulness disposition reflects the capacity for self-regulation of attentional and emotional processes to bring awareness to present-moment experiences. Athletes face a range of unique stressors in training and competition that may challenge these self-regulatory processes and thus pre-dispose athletes to increased risk of psychological strain. As such, mindfulness disposition may be a protective factor against psychological strain arising from the training and competition demands that athletes experience across preseason and in-season phases. To test this prediction, 27 male South Australian National Football League athletes ($M_{age} = 22.3 \pm 3.2$ years) completed the Mindful Attention Awareness Scale (MAAS) and the Athlete Psychological Strain Questionnaire (APSQ) prior to season commencement. The APSQ was again completed towards the end of the 14-week 2020 competitive season. None of the athletes reported formal mindfulness training. Pearson’s correlation coefficients were calculated between MAAS scores and APSQ total and self-regulation, performance, and external coping subscale scores. There were significant negative correlations between mindfulness and total strain at preseason, $r(25) = -.48$, $p < .05$, and season end, $r(25) = -.56$, $p < .01$. More specifically, MAAS scores demonstrated a significant negative correlation with the APSQ self-regulation subscale at preseason, $r(25) = -.71$, $p < .001$, while during the season a significant negative correlation was observed between mindfulness disposition and APSQ performance subscale, $r(25) = -.59$, $p < .01$. These findings support the notion that higher mindfulness disposition may serve as a protective factor against psychological strain in athletes. In preseason, mindfulness disposition may reduce psychological strain through greater self-regulation. During the season, mindfulness disposition may moderate psychological strain by reducing performance-related distress including worry about form and selection pressures. Funding source: Australian Government Research Training Program Scholarship; Norwood Football Club Performance Sports Collaboration Scholarship.

Physical Activity Motivation and Frequency of Activity Tracking Relate to Physical Activity

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Activity tracking devices have been widely adopted as a self-regulation strategy to monitor diverse aspects of physical activity (PA), and they may increase motivation towards PA. However, few studies describe the relationships among activity tracker use, PA motivation and PA. Our objectives were to investigate whether: (i) behavior regulations are associated with frequency of activity tracking device use; (ii) frequency of device use is associated with weekly MVPA; and (iii) whether behavior regulation profiles are associated with frequency of activity tracker use and higher PA levels. In this cross-sectional analysis of young adults from the NDIT study ($n=780$) age 31 years on average, we compared sociodemographic characteristics (i.e., age, sex, mother’s education), BMI, PA-related characteristics (i.e., total PA minutes per week, total minutes walking per week, meeting MVPA guidelines, activity tracking frequency) across behavior regulation profiles using ANOVA and chi-square tests. A two-way ANOVA was conducted to assess a behavior regulation profile X frequency of past-year activity tracking interaction on total PA minutes/week controlling for age, sex and BMI. Behavior regulation profile was associated with total PA minutes per week $F(3, 631) = 6.7$, $p < .001$. In post hoc testing, the “self-determined” profile scored the highest for total minutes of PA per week followed by the “low intrinsic” profile, the “controlled self-determined” and the “high external” profile. However, frequency of activity tracker use was not statistically significantly related to total PA minutes per week, and the interaction term for behavior regulation profile X activity tracking frequency was not significant. Findings suggest that behavior regulations may be associated with activity tracker use as well as with PA engagement in young adults. It may be important to consider behavior regulation profiles in interventions designed to influence activity tracker use and PA engagement.

Testing Theoretical Relationships Between Physical Activity and Mental Health in Adults With Disabilities

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Poor mental health is a common secondary health outcome for adults with disabilities. Despite the known psychological benefits of physical activity on mental health, this relationship is understudied among adults with disabilities. Potential factors that help explain the association have also not been studied. Drawing on theoretical tenets, the basic psychological needs of autonomy, competence, and relatedness have been identified in the indirect association between physical activity and mental health. This cross-sectional study (a) examined the direct relationship between physical activity and mental health in adults with disabilities, and (b) explored the indirect effects through autonomy, competence, and relatedness. Participants ($N=100$, Mage = 36.61 +/- 11.51 years, 54% women; disability type: 84% physical, 27% sensory, 6% developmental) completed an online survey to assess moderate-to-vigorous physical activity (MVPA), mental health, and the psychological needs. The PROCESS Macro was used to test the associations. Descriptively, significant ($p < .05$) associations between MVPA and mental health ($r_s = .34$), MVPA and autonomy, competence, and relatedness ($r_s = .24$ to .43), and the three basic psychological needs and mental health ($r_s = .61$ to .82) were found. The indirect effect of MVPA and mental health was significant through autonomy ($\beta = .05$, 95% CI = .0011 to .1199), competence ($\beta = .16$, 95% CI = .0838 to .2501) and relatedness ($\beta = .08$, 95% CI = .0169 to .1660). The results of this study highlight the direct relationship between physical activity and mental health in adults with varying disability types, as well as the indirect effects through autonomy, competence, and relatedness. Fostering autonomy (e.g., providing choice), competence (e.g., providing skill adaptations) or relatedness (e.g., social support, belonging) may be prioritized within physical activity programming for adults with disabilities to contribute to optimal improvements in mental health.

and 11, and 15.5% at 12 or older), and participants’ collegiate soccer careers ended 21.7 ± 12.7 years prior to study participation. Spearman’s correlations revealed weak but significant relationships between life satisfaction and anxiety ($r = -0.195$, $p = 0.05$), depression ($r = -0.340$, $p < 0.001$), and emotional support ($r = 0.327$, $p < 0.001$). After adjusting for covariates, multivariable regression analyses further demonstrated that depression ($\beta = -0.17$, $p = 0.043$) and emotional support ($\beta = 0.17$ $p = 0.018$) were negatively and positively associated with life satisfaction, respectively. Study findings support that HRQOL markers are related to life satisfaction in former female collegiate athletes. Future work should examine these factors prospectively to ascertain their adaptive and maladaptive impacts on athletes. Additionally, assessment of the interplay between HRQOL markers and their impacts on other psychosocial outcomes (e.g., stress) in this population is warranted. Clinicians should also consider these relationships when providing preventative and episodic care to former female collegiate athletes in an effort to optimize overall health.
Associations Among Dimensions of Friendship Quality and Sport Commitment

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Previous research shows positive friendship quality dimensions to be associated with greater commitment to sport (Weiss & Smith, 2002). However, no study has examined friendship quality with the updated sport commitment model, which conceives commitment to exist in enthusiastic (‘want to’) and constrained (‘have to’) forms (Scanlan et al., 2016). The primary purpose of this study was to examine sport friendship quality dimensions as predictors of enthusiastic and constrained commitment. A secondary purpose was to explore if peer acceptance and impression motivation (IM) predicted additional variance in sport commitment above and beyond friendship quality. University athletes (N = 198; M age = 20.0 years; 62% female) provided demographic information and completed established assessments of friendship quality, peer acceptance, impression motivation, and sport commitment constructs. Multivariate multiple regression analysis showed greater loyalty and intimacy, lesser conflict resolution, and greater conflict to predict more constrained commitment. Peer acceptance and impression motivation further contributed to the multivariate model, yielding a canonical function dominated by enthusiastic commitment and another by constrained commitment. Greater self-esteem enhancement and supportiveness, loyalty and intimacy, things in common, companionship and pleasant play, self-development IM, social identity development IM, and avoidance of negative consequences IM predicted greater enthusiastic commitment. Lesser things in common, conflict resolution, and peer acceptance, along with greater conflict and avoidance of damaging impressions IM predicted greater constrained commitment. Friendship quality contributed to sport commitment more meaningfully when considered alongside peer acceptance and impression motivation. This suggests that simultaneous examination of multiple peer constructs will best advance knowledge on how friends contribute to sport commitment, as friends are part of a broader social tapestry of peer relationships in sport.

Harmonious or Conflicted? A Qualitative Study of Father-Coach and Daughter Relationships in Youth Sport

Isabel Ormond, University of Alberta; Nicholas L. Holt, University of Alberta

Previous research has shown both positive (e.g., strengthening parent-child relationship) and negative (e.g., tension and conflict) factors associated with parent-coach and child relationships in youth sport. Canadian sport organisations have called for more research with parent-coaches in order to inform organisational policy, training, and practice. The purpose of this study was to examine perceptions of relationships between father-coaches and their daughters. A qualitative description methodology was used and this study was approached using a relativist ontology and subjectivist epistemology. Individual interviews were completed with 16 participants. The sample was comprised of eight father-coaches (M age = 49.8 years, SD = 5.7 years), and eight daughters (M age = 15.2 years, SD = 1.05 years). Interviews were transcribed verbatim and subjected to a dyadic analysis. Analysis produced two types father-coach and children dyads, which were labelled harmonious and conflicted. Four dyads were coded as harmonious and four dyads coded as conflicted. Certain factors differentiated between the harmonious and conflicted dyads, including the coaching approach, parent and coach role, treatment from the father-coach, treatment from teammates, treatment from other parents, the car ride home, quality time/bonding, and enjoyment. For example, father-coaches in the harmonious dyads adopted a relationship-oriented coaching approach and were consistent in their behaviors between home and sport settings. In the conflicted dyads, father-coaches adopted a more intense coaching approach and behaved differently in home versus sport settings. When compared to the harmonious dyads, father-coaches in the conflicted dyads were also much harder on their own daughters. Overall, these findings offer a contribution to the literature by moving beyond broad ideas that parent-coaching is associated with both positive and negative outcomes. The reported differentiating factors offer guidance that may inform training and educational opportunities specifically geared toward parent-coaches.

Testing Measurement Invariance in Physical Education and Exercise Science: An Example Using the Well-Being Self-Efficacy Scale

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In physical education and exercise science, it is common to examine latent mean differences between groups or to assess change across time. For instance, we may examine grade-level differences in perceived enjoyment of physical activity or how perceived enjoyment of physical activity changes across time. In both examples, latent means of perceived enjoyment are examined. However, before group differences or change can be confidently examined, measurement invariance should be tested. Measurement invariance tests the equivalence of a construct across groups or across time. If measurement invariance is supported, then differences in latent means can more confidently be attributed to individuals’ different scores or ratings on a construct. If measurement invariance is not supported, then differences in latent means might be due to underlying measurement issues. Though an important first step to confidently examine group differences and change across time, this technique is sometimes not used, or is used incorrectly. Incorrect use or underuse of measurement invariance can lead to erroneous conclusions. Additionally, terminology is not always consistent, leading to confusion among those employing this analysis method. To encourage the proper use of measurement invariance within the field, our aim is to provide a didactic review and illustration of measurement invariance. We review a methodological approach to measurement invariance and discuss the sequential steps (i.e., configural, weak, strong, and strict) used in this approach. We then provide an illustration with the well-being self-efficacy scale, using data from a large clinical trial (#1UL1TR000460) which examines well-being and physical activity. Results support configural ($\chi^2 (210) = 228.991, p = 0.18$), weak ($\chi^2 (224) = 246.801, p = 0.14$), strong ($\chi^2 (238) = 259.618, p = 0.16$), and strict ($\chi^2 (259) = 281.344, p = 0.16$) measurement invariance. Latent mean differences can be examined between the two groups.

Promoting and Protecting Mental Health Among Flourishing Canadian Men University Sport Coaches

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Mental health is an important resource that allows people to navigate stresses and normal challenges in life, function positively, and contribute to their communities. Due to the unique job stressors coaches face, it is important to understand how coaches who are mentally healthy (i.e., flourishing; Keyes, 2002) protect and promote their mental health. The purpose of this study was to investigate how flourishing Canadian university sport coaches protected and promoted their flourishing. In order
to identify flourishing coaches, the Mental Health Continuum-Short Form (Keyes, 2009) and Sport Mental Health Continuum-Short Form (Foster & Chow, 2019) were sent to approximately 100 Canadian university sport coaches. Fourteen coaches completed the surveys, and nine were flourishing. Of the nine flourishing respondents, seven men agreed to participate in individual semi-structured interviews. Participants were between 30 and 57 years old (M age = 45), and had between 8 and 21 years of university coaching experience (M years = 15). Data analysis followed recommendations for interpretative phenomenological analysis (Smith et al., 2009). Results suggested that these flourishing coaches acted in ways that were consistent with three personally-created principles to promote and protect their flourishing. The first principle was balance, which reflected managing sport and non-sport responsibilities (e.g., involving family in sport), and taking time for non-sport activities (e.g., health and fitness, visiting friends). The second principle was personal growth, which involved creating opportunities for learning (e.g., shadowing colleagues) and reflection. The third principle was making a difference, which included helping develop student-athletes’ personal competencies (e.g., self-esteem). These results suggest that supporting coaches to act in ways that are consistent with personally-meaningful principles can promote and protect their mental health. Practitioners may support coaches by helping them establish their own principles and subsequent supporting actions.

Building Successful Coach-Athlete Relationships Using Interpersonal Skills and Emotional Intelligence
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Coaches are often required to adapt to each situation and find the most effective ways of communicating with and motivating their athletes. In turn, researchers have suggested that effective coaching relies, in part, on coaches’ ability to display and utilize emotional intelligence, which consists of four skills: reading, using, understanding, and managing emotions (e.g., Chan & Mallet, 2011). However, few, if any, studies have explored how emotional intelligence influences the coach-athlete relationship. The purpose of this study was to explore how tennis coaches developed high-quality relationships through interpersonal skills and the use of emotional intelligence. Five elite tennis coaches were purposefully recruited based on the recommendation of Tennis Canada. Coaches engaged in one semi-structured interview, three story completion tasks, and one observed training session. Results revealed that coaches had the ability to accurately perceive their athletes’ emotions and identified contributing factors related to their emotions. For example, coaches valued trust in the coach-athlete relationship, specifically with regards to their desire for athletes to communicate if they were injured, tired, or felt stressed. They used this information to alter practices depending on the unique needs of their athletes (i.e., adjusting drill difficulty, goals of the practice, and communication). Coaches emphasized the importance of taking time to understand each athlete and respond to their ever-changing needs. Together, these results will help educate tennis coaches on how to create strong coach-athlete relationships, contributing to greater player satisfaction and performance. Funding source: Joseph-Armand Bombardier Canada Graduate Scholarship (SSHRC).

Improving Mental Health Through Exercise: University Students’ Perception of the UWorkItOut UWin Program
Melissa Pare, University of Windsor; Irene Muir, University of Windsor; Krista Munroe-Chandler, University of Windsor

University students are among the population of Canadians experiencing the highest prevalence of mental health issues (ACHA, 2016). There is empirical evidence that exercise-based interventions are effective in reducing anxiety and depression in university students (e.g., Huang et al., 2018; Muir et al., 2020). Specifically, the UWorkItOut UWin program is a six-week supervised exercise training and counselling intervention which has shown to decrease psychological distress in university students (Muir et al., 2020). Given qualitative research can facilitate the development and growth of future programs (Hagger & Smith, 2019), the current study aimed to qualitatively explore participants’ experiences within the UWorkItOut UWin program and the perceived outcomes. Participants included 58 low risk university students (39 females, 18 males, 1 gender variant) from various departments/faculties (e.g., Arts, Humanities and Social Science, Engineering and Law) who successfully completed the program between 2017 and 2019. Exit interviews were conducted in which open-ended questions were posed regarding critical aspects of the program (e.g., How effective was your exercise counsellor at guiding you through the activities?). Participants’ responses were then analyzed using thematic analysis (Braun & Clarke, 2019). The results are presented using a basic logic model which demonstrates the program inputs (e.g., qualified personnel), activities (e.g., exercise program and exercise counselling sessions), influential factors (e.g., client-centered approach and program structure), and outcomes (e.g., physical, psychological, behavior change, and coping) that contributed to the experiences in the UWorkItOut UWin program. Based on these results, recommendations for future exercise training and counselling interventions with a university student population will be presented. Funding source: University of Windsor.

Leisure-Time Physical Activity and Cognition at Midlife in Persons With Family History of Alzheimer’s Disease: Cross-Sectional Results of PAAD-2 Study
Kyoung Shin Park, University of North Carolina at Greensboro; Jennifer Emier, University of North Carolina at Greensboro; Christopher Wahlheim, University of North Carolina at Greensboro; Samantha DuBois, University of North Carolina at Greensboro; Jarod Vance, University of North Carolina at Greensboro; Md Towfiqul Alam, University of North Carolina at Greensboro; Hadassah Holder, University of North Carolina at Greensboro

A family history of Alzheimer’s disease (FH+) jeopardizes cognitive health and a sedentary lifestyle increases the risk of cognitive degeneration. For these reasons, physical activity (PA) may be particularly important at midlife in people with FH+. We aimed to determine how leisure-time PA is associated with performance in different domains of cognition at midlife with FH+. Individuals with FH+ (N = 50; Mage = 56.4 ± 6.1 years; 92% females) were dichotomized into active (N = 27, PA ≥ 2×/week) and sedentary (N = 23, PA < 2×/week) groups based on a self-report questionnaire. Participants’ performance on a series of cognitive tests was transformed into age-, education-, race/ethnicity-, and/or sex-stratified scores and compared between groups. Participants were free of cognitive impairment with all domains of cognition in normal ranges of population norms. Compared to the sedentary group, the active group showed significantly (p’s < .04) better performance on picture sequence memory [57.9±2.4 vs. 51.2±1.9, t(48) = 2.2], symbol-digit incidental learning [10.6±0.7 vs. 8.39±0.8, t(48) = 2], numeric memory span [46.7±4.7 vs. 28.7±4.2, t(48) = 2.3], auditory attention [48.7±5.7 vs. 32.5±5.3, t(48) = 2.1], Stroop inhibitory control [3.6±1 vs. 8.3±2.5, t(48) = 1.8], trail making set-shifting [71.5±3.9 vs. 56.2±5.2, t(48) = 2.4], working memory [55.6±1 vs. 51.5±1.6, t(48) = 2.1], planning [62.2±6.8 vs. 42.9±6.1, t(42) = 2.1], and spatial constructional reasoning [53.1±4.3 vs. 41.3±4.1, t(48) = 2.1]. However, performance on other domains (auditory verbal memory, visual constructional memory, mnemonic discrimination, verbal associative memory, story recall, flanker inhibitory control, spatial working memory, card sorting set-shifting, and matrix reasoning) did not differ between
groups (p’s > 0.05). Although not ubiquitous, our findings that leisure-time PA is predictive of enhanced performance in several cognitive domains in cognitively normal middle-aged people with FH+ implies potential benefits of exercise interventions for cognitive preservation in late life. Funding source: National Institutes of Health (R01AG058919).

**Normative Comparison of Cognitive Performance in Middle-Aged Persons With a Family History of Alzheimer’s Disease: Preliminary Results of PAAD-2 Study**

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A family history of Alzheimer’s disease (FH+) increases the risk of mild cognitive impairment (MCI) and dementia. Given the progressive nature of neurodegenerative disease, cognitive decline could begin at midlife with a FH+ before MCI is detected; yet how cognition is preserved at midlife with FH+ (to what extent and in which domain) remains unspecified. We explored how cognitive performance in middle-aged adults with FH+ differs from population norms. Individuals with FH+ (N = 52; Mage = 56.4 ± 6.1 years; 92.3% females) completed a comprehensive cognitive assessment. Their performance on episodic memory, working memory, attention, inhibitory control, set shifting, and planning were transformed into age-, education-, race/ethnicity-, and/or sex-stratified percentiles and compared to population norms. Participants were free from MCI and all domains of cognition were in the same interquartile range as population norms. Compared to the population mean (50%), significantly (p’s < 0.05) lower percentiles were found on auditory verbal memory [immediate, 41.8 ±1.8, t(51) = -4.6; delayed, 40.8±1.8, t(51) = -5.1], numeric memory span [38.2±3.3, t(51) = -3.6], inhibitory control [42.5±1.2, t(51) = -6.1], and auditory attention [40.6±4, t(51) = -2.4]. Other domains of cognition did not differ from (n.s.) or were significantly higher than the population mean: visual constructional memory [immediate, 59.4±4.7, t(51) = 2, n.s.; delayed, 55.6±5, t(51) = 1.1, n.s.], numeric working memory [51±4, t(51) = 0.3, n.s.], planning [51.5±4.7, t(46) = 0.33, n.s.], picture sequence memory [54±1.6, t(51) = 2.9, p = 0.006], working memory [53±1, t(51) = 3.6, p < 0.001], set shifting [card sorting, 65.8±3.8, t(51) = 4.2, p = 0.004; trail making, 63.8±3.3, t(51) = 4.2, p < 0.001], and visual attention [62.5±3.6, t(51) = 3.5, p < 0.001]. Our findings that some measures of memory may be slightly diminished while cognition is overall well preserved at midlife in people with FH+ suggest the potential importance of early intervention for cognitive preservation at late life. Funding source: National Institutes of Health (R01AG058919).

“Sport Parent” No Longer: Exploring the Process of Sport Parent Desocialization

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Extant research indicates that parent-to-child sport socialization processes have a significant impact on the child’s sport experience and competence beliefs (Babkes & Weiss, 1999) and also highlights the reciprocal and bidirectional nature of sport socialization between parents and their children (Dorsch, Smith, & McDonough, 2008; Lally & Kerr, 2008). Parents gain interest, change and engage in behaviors associated with sport due to their child’s sport participation (Weiss & Hayashi, 1995) and based on pervasive anecdotal evidence, often develop a “sport parent” identity, as well. Ending sport participation for athletes has been found to be a stressful experience that can lead to anxiety, depression, and difficulties coping, particularly for those with high levels of athletic identity (Wippert & Wippert, 2010). However, little empirical evidence exists with regard to understanding parents’ experiences when their children are no longer involved in sport. The purpose of this presentation is to discuss relevant theoretical constructs that may be used to better understand the processes and experiences that parents undergo when their child’s sport participation ends. Expectancy-Value Theory ( Eccles & Wigfield, 2002) provides a cogent theory within which to examine these experiences. The requisite transformation of parent identity, personal schema, values and expectations associated with cessation of their child’s sport participation may be significantly impacted by several factors that warrant focused study. Many of these factors have been found to impact athlete adjustment to sport desocialization including the cause of the retirement (e.g., injury, cuts due to tryout and recently, cancellation of seasons due to COVID-19), social support and multidimensional identity. Due to the increased prevalence of parents’ investment and identification with their child’s sport participation, better understanding of parental experiences and challenges upon their child’s end of sport participation is warranted for the well-being of all involved.

The Role of Self-Compassion in Body Comparison and Body Surveillance in College Women

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Objectification theory (Fredrickson & Roberts, 1997) posits that the tendency to view oneself as an object can manifest as a form of body consciousness, leading to behaviors of self-surveillance and body comparison. Self-compassion may be a potential resource for preventing or managing some of the negative consequences of this behavior. In order to further explore this relationship, this study examined whether self-compassion mediated the relationship between body comparison and body surveillance. Participants (n = 94; Mage = 19.82, SD = 1.336) included college students age 18-22 who identify as women. Women completed an online survey using Qualtrics, which included the Self-Compassion Scale (Neff, 2003), Objectified Body Consciousness Scale (McKinley & Hyde, 1996), and Body, Eating, and Exercise Comparison Orientation Measurement (Fitzsimmons-Craft, Bardone-Cone, & Harney, 2012). Results indicated that the relationship between body surveillance and body comparison was mediated by self-compassion. The standardized regression coefficient between self-compassion and body comparison was significant, as was between self-compassion and body surveillance. We tested the significance of the indirect effect using bootstrapping procedures, which was computed for each of 10,000 bootstrapped samples. There was a significant indirect effect of body surveillance on body comparison through self-compassion, ab = 0.09, BCa CI [0.03, 0.17]. The mediated model accounted for roughly 45% of the variance (R² = .45) in body comparison. Self-compassion may act as a protective mechanism against the relationship between body comparison and body surveillance. The results of this study add to the current body of knowledge on the relationship between self-compassion and body image issues in females and indicate that self-compassion may be a useful strategy for combatting the negative effects associated with body comparison and body surveillance.

Meaningful Play? School Recess Memories are Associated With Meaning and Purpose in Adulthood

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Researchers suggest that school recess contributes to children’s social and emotional development (e.g., Pellegrini et al., 2002). Yet, children experience recess differently, with inequity in both access and experiences

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likely playing a determining role in the benefits of recess. While associations between memories of physical education experiences and health behaviors as adults have been indicated (Cardinal et al., 2013), the long-term impacts of recess experiences are relatively unknown. The purpose of this study was to examine the relationships between memories of recess, physical activity (PA), and social-emotional well-being. Participants were 514 adults in the USA between the ages of 19 and 79 (M = 45.56; SD = 15.62; 50.8% female; 71.8% White), who completed questionnaires measuring memories of recess enjoyment, current PA engagement, current PA enjoyment, current social role satisfaction, and current levels of meaning and purpose. Structural equation modeling was conducted in MPlus v8.4 using weighted least square mean and variance adjusted estimator. The initial correlated latent-factor measurement model provided a good fit (χ² = 864.29 (424), p < .001, RMSEA = 0.045, 90% CI = 0.041–0.049, CFI = 0.986, TLI = 0.985). After hypothesized direct effects, indirect effects, and covariates were added to the model, model fit remained virtually unchanged. Structural equation modeling analysis showed memories of recess enjoyment were associated with current levels of meaning and purpose (β = .140, p < .05) and PA enjoyment (β = .209, p < .05). Further, PA enjoyment mediated the relationship between retrospective recess enjoyment and social role satisfaction (β = .076, p = .002); retrospective recess enjoyment and PA (β = .135, p < .001); and retrospective recess enjoyment and meaning and purpose (β = .057, p = .011). Recess experiences are associated with later markers of physical, social, and emotional health. Therefore, promoting positive recess experiences with a view to improve equity in access, together, may enhance child development and adult wellbeing.

Adolescent Friendship Quality and Motivation in Sport and Music Domains

Alison Phillips Reichter, University of Iowa; Maureen Weiss, University of Minnesota

Organized activities provide distinct experiences and opportunities for youth development. The domain-specific features of sport and music may offer insight to the influence of friendships on motivational outcomes. Based on competence motivation theory, the purpose of this study was to extend Phillips Reichter and Weiss (2019) by comparing sport and music participants on friendship qualities and their relationship to perceived competence, affect, and motivational orientation. Adolescent sport (n = 161) and music (n = 66) participants (ages 10-14) completed surveys to assess study constructs. A domain x gender MANOVA revealed that sport participants rated their best friend higher on four positive friendship qualities than music participants rated their best friend. Girls rated their best activity friend higher on all positive friendship qualities than boys. Canonical correlation analyses were run separately for sport and music.

For sport, two significant canonical functions emerged (Rc1 = .48; Rc2 = .39). For function 1, friendship conflict was the strongest contributor to the predictor variate, with self-esteem enhancement/supportiveness and conflict resolution relatively weaker. For criterion variables, intrinsic motivational orientation and performance anxiety were equal contributors to the multivariate relationship. For function 2, four dimensions of positive friendship quality contributed to the predictor set, with loyalty/intimacy and companionship contributing most strongly. For criterion variables, perceived competence was strongest, followed by enjoyment and intrinsic motivational orientation. For music, one canonical function emerged (Rc1 = .60) with self-esteem enhancement/supportiveness and loyalty/intimacy registering highest loadings for the predictor variate, and enjoyment the strongest contributor among criterion variables. Findings support competence motivation theory that social and motivational factors are strongly linked and suggest that friendship quality is differentially associated with motivational outcomes in sport and music domains.

Acceptability and Efficacy of a Remotely-Delivered Exercise is Medicine Physical Activity Health Coaching Intervention

Alison Phillips Reichter, University of Iowa; Kara M. Whitaker, University of Iowa; Erin L. Litton, University of Iowa; Elena Volfson, University of Iowa; Shelly Melton, University of Iowa; Ava Nelson, University of Iowa; Lucas J. Carr, University of Iowa

Regular physical activity (PA) provides many health benefits, but less than 25% of adults meet PA guidelines. The American College of Sports Medicine’s Exercise is Medicine (EIM) initiative was designed to integrate PA into primary care and connect patients with community health resources. Health coaching is a theory-based, client centered approach designed to help individuals make positive health behavior changes. Few EIM programs that utilize health coaching have been evaluated. This pilot study evaluated the acceptability and efficacy of a 10-week, EIM health coaching intervention on PA and psychosocial outcomes (self-efficacy, self-determined motivation, perceived benefits and barriers) among a sample of sedentary, overweight adults. Participants received a remotely-delivered intervention that included weekly phone/video meetings with a trained student health coach, a Fitbit activity monitor, and educational PA materials. PA was measured objectively with an activPAL3 micro for 5 days and acceptability and psychosocial outcomes were measured with an online questionnaire. Participants (N = 24, 83% female, M = 36 years) wore their Fitbit on 63% of intervention days and attended 84% of coaching sessions, indicating moderate to high engagement in the intervention. Participants indicated relatively high levels of satisfaction for health coaching and the Fitbit but lower levels for educational materials. Paired t-tests indicated completers (N = 21) showed non-significant decreases in daily steps (7,619 to 6,900, t = 1.10, p = .29) and daily MET-hours (33.4 to 32.0, t = 1.73, p = .10). Participants increased relative autonomous motivation for PA (23.3 to 45.6, t = 4.03, p = .001) and decreased perceived PA barriers (9.0 to 5.5, t = 3.76, p = .001) while maintaining a high level of PA self-efficacy (47.2 to 47.9, t = -.43, p = .67) and perceived PA benefits (26.5 to 26.6, t = -.09, p = .93). Findings provide preliminary evidence of participant acceptability of the intervention. Further refinement of educational materials and retesting for efficacy is warranted. Funding source: Fraternal Order of Eagles Diabetes Center – Robert Hansen Fund; Stead Family Award.

An Exploration of Undesired Coaching Practices From the Perspective of Wheelchair Basketball Athletes

Lara Pomerleau-Fontaine, McGill University; Gordon A. Bloom, McGill University; Danielle Alexander, McGill University

Wheelchair basketball is a fast-paced, competitive sport involving close cooperation between a team of athletes and their coaches. Over the past decade, researchers have highlighted the positive and preferred coaching experiences of coaches and athletes. However, the unwanted or undesired coaching behaviors of parasport athletes has received little attention in the parasport literature. This is troublesome when you consider the impact of undesired coaching practices on athletes’ well-being, including decreased confidence and satisfaction. Therefore, this study explored wheelchair basketball athletes’ perceptions of ineffective coaching practices. Six participants were interviewed, and the data was analyzed using a thematic analysis. Athletes identified undesired behaviors of their coaches that influenced their well-being, such as having a lack of knowledge and conviction, being over-controlling, as well as displaying favouritism. As a result of these behaviors, athletes described feeling a decreased sense of self-confidence, ambition, and interest in wheelchair basketball. Athletes also discussed their desire for...
coaches to address gender differences in their coaching practices and adapt behaviors to their athletes’ preferences, which some had failed to do. The results work to present a portrayal of unhealthy environments created by parasport coaches from the perspective of wheelchair basketball players. Our results shed light on ineffective coaching practices and how these behaviors have the potential to yield negative outcomes for the well-being and satisfaction of parasport athletes. Among our conclusions, we recommend for coaches to engage in formal coach education courses (e.g., in Canada: Coaching Athletes with Disabilities, Safe Sport Training) to enhance their knowledge and understanding of suitable coaching practices. Funding source: Social Science and Humanities Research Council (SSHRC) and Fonds de Recherche Société et Culture (FRQSC).

Adapting to New Dynamics: How Performance and Mental Health Were Impacted Across the Hospitality, Tourism and Sport Industries Due to COVID-19

Jared Porter, University of Tennessee; Sarah Nunez, University of Tennessee

Basic common aspirations such as safety and security were globally tested as the never-ending impact of COVID-19 forged through 2020. Constant change became the new norm and elicited dynamic actions of survival across various industries. Particularly, the intersecting fields of hospitality, tourism and sport experienced a dramatic hit in day to day operations resulting in weakened structural integrity. The present study examined perspectives from these professions; interviews provided an assessment regarding how the daily behaviors of employees and athletes were directly impacted by the spread of COVID-19. Additionally, insights regarding how the mental health of employees and athletes in the surveyed industries were analyzed. Data reveal that as COVID-19 became rampant, many employees and athletes reported they felt a disruption to their behavioral autonomy. This was a result of the criteria for one or more mental disorders at each time point. Across the four time points, more women met the criteria for generalized anxiety disorder compared to men (22.1-35.6% versus 5.7-13.7%, respectively, p’s < .05). A significantly greater percentage of women (9.1-12.4%) also met the criteria for EDS compared to men (0.2-7%) at all time points (p < .05). There were no major differences in depression, anxiety, or EDS between Olympians versus Paralympians, or between athletes who did or did not train at a Canadian Sport Centre. Given the cancellation of the Olympics/Paralympics and the challenges posed by the COVID-19 pandemic these findings provide insight into the MH of elite Canadian athletes over a very stressful year. At all 4 time points the prevalence of mental disorders was higher among Canadian athletes than among the general Canadian population. Results indicate that female athletes may be more susceptible to experiencing certain disorders than their male counterparts. Understanding the prevalence of athlete MH is important for being able to improve the MH of Canadian athletes; this information may be used to inform sport policies or periodized interventions designed to support athlete MH. Funding source: SSHRC Doctoral Fellowship; Sport Canada Sport Participation Research Initiative; University of Toronto FKPE SSHRC Institutional Grant.

Bidirectional Associations Between Body Surveillance and Physical Activity

MacLean Press, Western University; Jenna Gilchrist, University of Waterloo; Kelsey Sick, Western University; Eva Pila, Western University

Body surveillance is the behavioral manifestation of self-objectification and is associated with deleterious mental health consequences. Less commonly studied is the effect of body surveillance on physical activity behavior. Examining this association is important because habitual monitoring of bodily appearance may be linked to both the engagement and avoidance of physical activity behavior. Specifically, traditional physical activity contexts may function to both perpetuate a focus on one’s bodily appearance, as well as redirect one’s attention beyond appearance and towards functionality. The purpose of the present study was to examine the bidirectional associations between body surveillance and moderate-to-vigorous physical activity behavior. Using a longitudinal observational design, participants (N = 81; 60.5% women, Mage = 21, SD = 1.5 years) completed weekly surveys about body surveillance and physical activity behaviors over a period of 20 consecutive weeks. Multilevel modeling was employed to examine time-varying bidirectional associations between body surveillance and self-reported physical activity behavior across the 20-week period. The data supported a bidirectional association, whereby heightened body surveillance was concurrently linked to increased likelihood of engaging in physical activity, and engagement in physical activity concurrently predicted heightened body surveillance. In support of previous research, young adults are likely to engage in physical activity behavior as an appearance-management strategy – a motivational orientation that is associated with less adaptive psychological outcomes. The alternate direction was also supported, in that engaging in physical activity behavior may promote the adoption of an externalized perspective of the body, versus adopting an internal and process-based orientation towards one’s bodily function. The causal and mechanistic pathways that underlie the bidirectional body surveillance and physical activity relationship warrant further investigation.

A Mixed Methods Study Exploring Satisfaction of the Basic Psychological Needs at a Sport Camp for Youth Living With a Chronic Health Condition

Jenson Price, University of Ottawa; Jennifer Brunet, University of Ottawa; Johanna Dobransky, McGill University; Tanya Forneris, University of British Columbia Okanagan
Up to 15% of youth worldwide live with a chronic health condition (e.g., asthma, diabetes, haematological conditions). Sport camps can foster the wellbeing of youth with a chronic health condition as camps provide opportunities to build physical abilities and make new friends, while having youth participate in physical activity and sport. Although sport camps may motivate youth to remain involved in physical activity and sport beyond the camp, it remains unclear if they foster underlying mechanisms of change, such as the basic psychological needs (e.g., perceptions of competence, autonomy and relatedness), that can increase youth’s motivation for physical activity and sport. Therefore, the objective of this mixed-methods study was to explore the impact of a 2-week sport camp on basic psychological needs satisfaction among youth living with a chronic health condition. Data from 36 youth (M=10.2 years) diagnosed with a chronic health condition who attended a 2-week sport camp were analyzed. Data were collected via pre- and post-camp questionnaires, and semi-structured interviews post-camp with a subsample (n=20). Quantitative data were analyzed using repeated-measures multivariate analysis of variance with follow-up univariate analysis. Qualitative data were analyzed using thematic analysis. The quantitative results indicated a main effect for time (F(3,33)=167.90, p<.001, η2=.94), with perceptions of competence, autonomy, and relatedness significantly increasing pre- to post-camp (p<.001). The qualitative findings suggest that opportunities to build social relationships and develop communication skills, as well as the inclusion of variety and choice in activities contributed to youths’ basic psychological needs satisfaction, whereas an overemphasis on competition overshadowed positive experiences. Thus, sport camps may be a promising context for youth living with a chronic health condition. Those working to design and implement sport camps should take an intentional approach to foster basic psychological needs satisfaction through the camp experience.

Moving on From the Military: A Descriptive Study of Student Veterans’ Physical Activity

Erin Reifsteck, University of North Carolina Greensboro; Shelby Anderson, University of North Carolina Greensboro; Michael Hemphill, University of North Carolina Greensboro; DeAnne Brooks, University of North Carolina Greensboro; Gregory Daniels, University of North Carolina Greensboro

Military veterans are at increased risk for chronic health conditions due to a variety of factors, including reduced physical activity (PA) following separation from military service. The university setting is an appropriate context to implement PA interventions because many veterans pursue educational benefits for service members after they transition out of the military. As a first step toward developing a PA promotion framework to guide programming for student veterans (SVs) at our university, the purpose of this study was to describe SVs’ PA experiences relevant to their transition out of the military. SVs were invited through the university’s military-affiliated services office to complete an online survey and participate in focus group interviews about their military transition experience and PA engagement. Descriptive statistics for PA measures and frequency counts of coded responses to open-ended survey items were analyzed in conjunction with inductive analysis of focus group data. Results of the survey indicated that SVs (n = 70; 70% men, 67% White, Mage = 34.71) reported a median of 300 mins (M = 401.14, SD = 361.00) of moderate-to-vigorous PA per week; 31% indicated they were not currently regularly active based on exercise stage of change classification. Many SVs (57%) reported that they were less active now compared to during their military career for reasons such as lack of time due to other responsibilities now (n = 17), lack of motivation (n = 9), and lack of PA routine/structure (n = 7). Qualitative analysis of SV focus groups suggested that 1) PA participation decreased when transitioning from the military as structured PA opportunities diminished, 2) the incentive structure for PA participation shifted, and 3) they were not yet connected to a community of SVs to engage in new PA opportunities. These preliminary findings can inform future research into factors that promote regular PA in SVs and the development of targeted PA opportunities for SVs. Funding source: UNCG Office of Research and Engagement Regular Faculty Research Grant.

Physical Activity Levels and Exergaming Before and During the COVID-19 Pandemic: A Descriptive Longitudinal Analysis of Canadian Young Adults

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The effects of the COVID-19 pandemic on levels of physical activity (PA) among young adults are not yet fully understood. However, as gyms, parks, sports clubs and extracurricular activities are shut down, people are left with fewer resources to achieve optimal levels of health-enhancing PA. Alternatives such as exergaming (active video games) have been recommended as viable PA options. Our objectives were to estimate changes: (i) in levels of walking, and of moderate, vigorous and total PA pre-pandemically from 2017-20 up until January 2021; (ii) in exergaming levels, and (iii) if behavior regulation (motivation) predicted PA change. Data were drawn from the Nicotine Dependence in Teens study. Participants completed self-report questionnaires at ages 30 (2017-20 pre-pandemically) and 33 (2020-21, during the COVID-19 pandemic). Specifically, participants retained for analysis (n=632; 59% female) completed the International Physical Activity Questionnaire (to report frequency of vigorous PA, moderate PA, walking), exergaming frequency questions, and the Behavioral Regulation in Exercise Questionnaire. Residual change scores were estimated for each PA variable. Two-thirds (66-73% of the total sample) of participants experienced decreases in either one of the 4 types of PA. Weekly minutes of PA were significantly lower (median residualized change scores of -59, -69, -37, and -108 minutes for walking, moderate PA, vigorous PA, and total PA, respectively) during the COVID-19 timeframe. Women reported larger decreases for all four variables (p<0.05). Past year exergaming decreased from 29% to 14%. Behavior regulation measured in 2017-20 did not significantly predict PA changes during the COVID-19 period. Specific causes of the dramatic declines in PA and creative public health solutions must be identified to help young adults maintain an active living lifestyle during pandemics. Funding source: This work was supported by the Canadian Cancer Society [Grants 010271, 017435, and 704031].

Is Coping With Type 2 Diabetes Related to a History of Sport Participation?

Cody Rogers, University of Manitoba; Ben Schellenberg, University of Manitoba

Participating in organized sport has a number of positive physical, social, and psychological benefits. One such benefit is that playing sports may help participants learn different coping strategies, which they can rely on when coping with adversity outside of sport throughout their lives. This research tested if participation in organized sports during adolescence was associated with different forms of coping among people diagnosed with Type 2 diabetes (T2D). We also tested if coping, in turn, predicted quality of life (QOL). We conducted a retrospective study with adults living with T2D (N = 464) and found that hours spent playing organized sports as an adolescent predicted greater use of problem-focused coping strategies to manage their T2D. However, QOL was positively predicted by emotion-
focused coping strategies and inversely predicted by avoidance strategies. These findings suggest that people living with T2D who participated in organized sports during adolescence may rely on more problem-focused strategies to cope with managing their illness. However, we did not find any evidence of a direct or indirect relationship between sport participation and QOL. Future research exploring different aspects of sport, different contexts, and time intervals will help further our understanding the role of playing sport in coping with T2D. Funding source: Research Manitoba.

Experience and Management of Fear in Men’s World Cup Alpine Ski Racing

Morgan Rogers, University of Calgary; David Paskevich, University of Calgary

Alpine ski racers, specifically in the discipline of downhill, may experience fear competing in an environment that, due to ski speeds, weather conditions, and courses, is very high-risk. Fear management has been examined in high-risk recreational sports, such as BASE jumping, but has not been investigated in competitive sport. Therefore, the purpose of this study was to understand how Canadian men racing downhill skiing at the World Cup level experience and manage their fear. This study used an interpretive phenomenological analysis, in which interviews were conducted with five male members of the Canadian national ski team. Three themes emerged: contextual influences, preparation and process, and risk vs. reward. The results suggest that one’s experience of fear, and subsequent ability to manage it, is influenced by contextual factors (i.e., weather, course profile) and confidence. Athlete confidence may be influenced by the same contextual factors that influence fear, and an athlete’s preparation. Regarding preparation, there currently exists a discrepancy between the athletes’ approaches to training and racing, which may make it difficult to master fear management strategies. As a result of the discrepancy created between training and racing, there are several implications for how the national team environment and training is structured. Recommendations for how these findings can be applied to training are presented. Funding source: N/A.

A Season-Long Examination of Team Structure and its Implications for Subgroups in Individual Sport

Kelsey Saizew, Queen’s University; M. Blair Evans, Western University; Veronica Allan, York University; Luc Martin, Queen’s University

Although subgroups have been described as an inevitable occurrence in sport, different sport types are likely to be more susceptible to their development than others. The purpose of this study was to explore how sport structure predisposed a team to subgroup formation, impacted member interactions and team functioning, and influenced managerial strategies. A season-long qualitative case study was undertaken with a nationally-ranked Canadian intercollegiate track and field team. This sport has a unique and complex interdependence structure, wherein the team is inherently infused with subgroups (i.e., event groups) yet these smaller groups share a collective outcome. Perspectives from across the team were sought by purposefully sampling the head and event-specific coaches (n = 4) and athletes (n = 11) with varying levels of experience and status from different event groups (e.g., sprinters, jumpers). Two semi-structured interviews were conducted with each participant at the beginning and the end of the competitive season. The use of thematic analysis in tandem with exception analysis helped to uncover constraints that were inherent both within the sport of track and field and within this particular team. Specifically, our results demonstrated that certain constraints predisposed the team to subgroup formation (i.e., sport/event type, facility/schedule limitations, team size/change over time). Participants interpreted these constraints as structural divides that impacted teammate interaction, but could be overcome through team building activities, engaging the leadership core, and emphasizing quality communication. These findings underline how structure imposed by the design of sports—and in particular, individual sports that lack interdependence—impact teammate interactions, and how practitioners, coaches, and athletes can manage groups when facing such constraints. Theoretical and practical implications will be described, while also proposing potential future directions.

The Role of Relational Efficacy Beliefs in Athlete-to-Athlete Help for Mental Health Problems Among Division I Women’s Soccer Players

Kimberly Sanford, East Carolina University; Christine Habeeb, East Carolina University

Teammates are becoming primary help-givers in matters concerning mental health. Student-athletes have previously reported that they are 1.5 and 3 times as likely to seek help from a teammate than a coach or mental health professional, respectively (Bird et al., 2018). Unfortunately, little is known about factors impacting athlete-to-athlete help. Habeeb (2020) argued that research on help-seeking and help-giving fit well within the tripartite model of relational efficacy beliefs (Lent & Lopez, 2002). In this model self-efficacy (SE), other-efficacy (OE; belief in teammates’ abilities), and Relation-Inferred Self-Efficacy (RISE; belief teammates are confident in oneself) are theorized to predict athlete outcomes; but, this model has yet to be utilized for understanding helping behaviors. The purpose of this study was to examine how SE, OE, and RISE predict athlete help-seeking and help-giving relative to people in the sport context. Division I Women’s soccer players (n = 235) completed online surveys on help-seeking SE, OE, and RISE, and reported how likely they would personally seek help from or refer a teammate to a mental health professional, teammate, other athlete, athletic trainer, assistant coach, and head coach. Athletes were most likely to refer a teammate and personally seek help from a mental health professional or teammate, and least likely from a head coach. For help-seeking, SE negatively predicted (b = -.28, p = .026) and OE positively predicted (b = .45, p < .001) seeking help from teammates, while all three efficacy beliefs were trending as significant predictors of seeking help from a mental health professional. For help-giving, OE positively predicted (b = .52, p < .001) teammate referrals to teammates, and RISE positively predicted (b = .38, p = .005) teammate referrals to a mental health professional. The impact of relational efficacy beliefs on athlete helping behaviors provides a team-level framework for interventions aimed at athlete well-being, a contribution to team dynamics, mental health, and interpersonal relationship theories in sport. Funding source: Association for Applied Sport Psychology.

Physical Activity and Loneliness Among Adolescents With Disabilities: Examining the Quality of Physical Activity Experiences as a Possible Moderator

Nicholas Santino, York University; Kelly P. Arbour-Nicitopoulos, University of Toronto; Ritu Sharma, University of Toronto; Jeffrey D. Graham, Ontario Tech University; Rebecca L. Bassett-Gunter, York University

Adolescents with disabilities (AWD) often report higher loneliness levels than adolescents without disabilities, as they frequently encounter barriers to social participation. A negative relationship between physical activity (PA) and loneliness has been established outside of AWD populations, while few studies have examined this association among AWD. Research investigating the relationship between PA and loneliness has not systematically examined aspects of PA experiences that may influence this relationship. The objectives of this study were to examine: a) direct relationship between PA and loneliness among AWD, and b) quality of PA experiences as a possible moderator of the relationship between PA and loneliness. This study was a cross-sectional sub-analysis of data from a larger national study on the
movement behaviors of children and youth with disabilities (The National Physical Activity Measurement Study). Participants in this sub-analysis included 40 Canadian AWD (40% developmental, 20% physical, 5% sensory, and 30% a combination) with the mean age of 12.85 years. Participants completed a series of questionnaires either online or via telephone/video interview. This sub analysis specifically analyzed data from the International Physical Activity Questionnaire for Adolescents, the Measure of Experiential Aspects of Participation, and the Three-Item UCLA Loneliness scale. PA and loneliness were not significantly related at the bivariate level ($r = 0.10$, $p = 0.54$), but quality of PA experiences significantly moderated the relationship between PA and loneliness ($95\%$ CI $= 0.002 – 0.019$, $p = 0.02$). These results suggest that greater PA rates were significantly and negatively associated with loneliness among AWD who reported experiencing high quality PA experiences. This research can be used as evidence to inform mechanistic studies with causal data to provide more robust findings on the possible value of high-quality PA experiences to mitigate feelings of loneliness among AWD. Funding source: This work was supported by Canadian Tire’s Jumpstart Charities and the Social Sciences and Humanities Research Council.

### Exploring the Relationship Between the Collegiate Student-Athlete Experience and Well-Being

**David Schary, Winthrop University; Brian Souza, Framingham State University**

Student-athletes are a heterogenous population with differing commitment levels to their dual roles as students and athletes. Empirical evidence suggests that the perceived level of conflict between the roles affects a variety of outcomes, including general and sport-specific well-being (Lundqvist, 2011; O’Neil, Amorose, & Pierce, 2021). However, little is known about how the dual roles affect general and sport-specific well-being. This study explored student-athletes’ perceived challenges and resources in relation to well-being within a NCAA Division I university. Utilizing a qualitative research design to gather individualized and contextualized insight, 44 student-athletes (29 women, 15 men) from a eight different sports participated in semi-structured focus groups answering questions about their academic and athletic experiences that enhanced or inhibited their well-being. We analyzed the data using a directed content analysis approach (Hsieh & Shannon, 2005). Results indicated that perceived autonomy in the participants’ academic and athletic roles was a primary factor affecting their general and sport-specific well-being, specifically impacting multiple dimensions of psychological and social well-being. It was also difficult for participants to separate their roles as students and athletes, supporting the notion that the dual roles may be interactive and mutually reinforcing or debilitating (Adler & Adler, 1991; Miller & Kerr, 2002, 2003). We provide suggestions to help student-athletes lessen their role conflict and increase their well-being in academics and sports.

### Does Savouring Protect Passionate Athletes From Becoming Burnt Out?

**Benjamin Schellenberg, University of Manitoba; Jérémie Vernier-Filion, Université du Québec en Outaouais; Patrick Gaudreau, University of Ottawa**

Athletes can experience all types of positive events and can make the most of these good times by attempting to prolong or amplify their positive feelings – a response referred to as savouring. In this research, we tested if savouring can protect athletes from experiencing symptoms of burnout involving emotional and physical exhaustion, reduced sense of accomplishment, and sport devaluation. Moreover, in line with previous research on savouring and burnout, we tested if athletes with high levels of harmonious passion are most likely to savour positive experiences in sport. We conducted two studies to test these relationships. In Study 1 ($N = 499$) we conducted a cross-sectional study with recreational athletes and found that savouring in sport was positively associated with harmonious passion and negatively associated with obsessive passion. In addition, savouring predicted lower levels of each burnout dimension and played an indirect role in the relationship between both harmonious and obsessive passion and burnout. In Study 2 ($N = 298$), we replicated these effects with collegiate-level athletes prospectively at three time-points over the course of a competitive season. These results mean that athletes with high levels of harmonious passion are most likely to engage in savouring, and that savouring, in turn, may protect athletes from becoming burnt out. Research on savouring in sport is just beginning, and more research is needed to understand other potential benefits of savouring for athletes (e.g., well-being, performance) and other sport participants (e.g., coaches, parents, fans). Funding source: Social Sciences and Humanities Research Council of Canada.

### Withdrawn Behavior Influences Engagement in Vigorous and Moderate Physical Activity

**Daphne Schmid, Auburn University; Robert Blanton, Auburn University; Tatiana White, Auburn University; William Murrah, Auburn University; Kristina Keenly, Auburn University**

It is well-known that internalizing disorders, such as depression and anxiety disorder, improve with exercise and physical activity (PA) in clinical populations. However, what remains unknown is how subclinical traits, associated with internalizing and externalizing behaviors, are related to the individual pursuit of PA. The purpose of this study was to evaluate whether self-reported internalizing and/or externalizing behaviors are predictive of self-reported PA in young adults. The Adult Self Report Questionnaire (ASR) is a 126-item questionnaire that identifies problematic behavior by comparing self-reported psychological outcomes to normative data. In the current study, t-scores from the Internalizing and Externalizing scales were used to predict PA via the international physical activity questionnaire short form (IPAQ-SF). We hypothesized that both ASR-Internalizing and ASR-Externalizing would predict PA. Adults, ages 18 to 25 ($N = 966$; 519 women), completed the ASR and IPAQ-SF via Qualtrics. Linear regressions predicted vigorous, moderate, and walking (met/min/week) PA using the t-scores for ASR-Internalizing and ASR-Externalizing. The results demonstrated that ASR-Internalizing, but not ASR-Externalizing, predicted total, vigorous, and moderate PA. Walking was not predicted by ASR-Internalizing or ASR-Externalizing. Subsequent regressions revealed that, of the subscales within ASR-Internalizing, “withdrawn,” but not “anxious/depressed” or “somatic complaints,” contributed to the prediction of vigorous and moderate PA. Our findings demonstrate that vigorous and moderate PA decreased with increasing withdrawn behavior. This suggests that the individual pursuit of PA is influenced by perceived enjoyment of social interaction. Future studies may explore how PA promotion might be tailored to individuals based on ASR scores and behavioral presentations. Funding: NIH, BBRF, SSRI Funding source: NIH, BBRF, SSRI.

### Development and Initial Validation of the Geriatric Balance Self-Efficacy (GBSE) Scale: A New Scale for Nursing Home Residents

**Nadja Schott, University of Stuttgart**

Studies having investigated the psychometric qualities of fear of falling and falls-related self-efficacy scales in the nursing home population are scarce. A main limitation of most current scales is that they are based on answers to a questionnaire – i.e., use of short sentences to state situations – and may not reflect a person’s feelings during the actual performance of mobility-related situations. In addition, these scales were not developed for individuals living in nursing homes. The purpose of this study was to validate a falls-related...
self-efficacy scale dedicated to residents living in nursing homes, based on performance in real situations as well as pictures to put responses in a more complex environmental context. In this cross-sectional study, 38 residents (mean age: 80.8 years; 47% women) were enrolled. The GBSE scale was administered to all participants in conjunction with the Montreal Cognitive Assessment, the Well-Being Inventory for Gerontopsychiatry, the Timed-Up-and-Go-Test, gait speed, a balance test (standing on foam with eyes closed), and a questionnaire (demographics, activities). The psychometric properties (construct validity, internal consistency, and reliability) were explored using principal component analysis, Cronbach’s alpha, and intraclass correlation (ICC) tests. The 23-item tool with three dimensions assessing falls-related self-efficacy in vertical and horizontal locomotion and getting up/sitting down explained 67.7% of the total variance. The internal consistency of the overall scale was excellent (Cronbach’s alpha ≥ 0.91); test-retest reliabilities were excellent with ICCs ≥ 0.86. The GBSE was able to discriminate participants with severe functional impairments (area under the ROC curve > 0.91) and had significantly better discriminating performance than a single fear of falling question. This new tool may assist health care professionals to identify low and high falls-related self-efficacy in the geriatric population, making it a key reference point in providing appropriate interventions in nursing homes.

Role of Functional and Clinical Parameters in Predicting Aging Perception Among Older Adults

Nadja Schott, University of Stuttgart; Alessandro Minchella, University of Stuttgart

The multidimensional phenomenon of the awareness of having grown older might be a central predictive factor in experiencing successful aging (Diehl et al., 2010; Wurm et al., 2017). The aim of this study was to explore the role of functional and cognitive parameters, as well as body image in older adults’ aging perception. A cross-sectional design was used with 56 older aged participants (age 69.0 ± 5.76 years, 48.2% women). Data were collected included questions and functional tests to elicit demographic information, motor and cognitive performance (MoCA, Trail-Making-Test [TMT], Chair Rise, Timed-Up-and-Go, 6min-walk, arm curls), physical activity (German Physical Activity Questionnaire in the over-50 Population), body image (Body Image Dimensional Assessment [BIDA], Multidimensional Body-Self Relations Questionnaire [MBRSQ]) and Barker’s aging perception questionnaire (B-APQ). Exploratory multiple linear regression showed that B-APQ timeline-chronic was associated with TMT-B (adj. $R^2=.115$), B-APQ emotional representations with motor and cognitive performance as well as MBRSQ appearance and illness orientation (adj. $R^2=.054$), B-APQ consequences-positive with physical activity (sport), MBRSQ health and illness orientation (adj. $R^2=.360$), B-APQ negative control with motor and cognitive performance and falls (adj. $R^2=.371$), and B-APQ positive control with medication, education, and physical activity (sport) (adj. $R^2=.290$). Sex, life with a partner, and the dimensional assessment of body image did not significantly contribute to the variance of aging perception. Our findings suggest that subjective experience of aging is closely related to physical and cognitive factors as well as body-self relations. Researchers, health-care professionals, and elders may benefit from a better understanding of the impact of different perceptions of aging on health outcomes, which has also implications for intervention research and public health practices.

An Action Research Case Study to Examine Coaches’ Implementation of Sport-Based Trauma-Sensitive Practices in a Nationally-Run Community Program

Majidullah Shaikh, University of Ottawa; Melanie Bouchard, University of Ottawa; Tanya Formeris, The University of British Columbia

Trauma-sensitive practices involve leveraging protective factors (e.g., supportive relationships, sense of safety, opportunities to build skills) to promote healthy development in children’s activities. These practices allow coaches to be responsive to the unique needs of trauma-exposed children, be better equipped to mitigate trauma-related harm, and promote resilience-building. Little research has looked at how coaches apply trauma-sensitive practices in a community sport setting. An action research case study was conducted to examine coaches’ use of sport-based trauma-sensitive practices in multiple sites of a nationally-run community program. Coaches (N = 14 [7 women, 7 men], $M_{age} = 25.86 ± 6.16$ years) from six sites running trauma-sensitive sport programs participated in this study (4/6 sites led by trained trauma-sensitive coaches). Coaches were observed as they facilitated a program session, and pre- and post-session focus group interviews were conducted to explore coaches’ perceptions of their goals, design, and delivery of program sessions, and to provide them feedback to improve their practices. Data were captured through audio-video recordings, detailed field notes, and program quality assessments on the Promising Practices Ratings System. All data were interpreted using a deductive-inductive thematic analysis to understand patterns in coaches’ practices. The results showed: (a) evidence of supportive relationships with adults and peers across all observed sessions, (b) coaches experienced challenges in managing children’s dysregulated behaviors and sought to learn more strategies for intervening with these children, and (c) programs led by trained coaches were stronger than untrained coaches in maintaining appropriate structure, maximizing engagement, and providing opportunities for cognitive growth (i.e., discussing life skills). Implications are discussed related to the successes and challenges of delivering trauma-sensitive practices in this community sport setting, the value of training in coaches’ facilitation of high-quality sport programs. Funding source: PHAC.

An Exploration of the Stress Mindset in College Student-Athletes, Former Student-Athletes, and Non-Athletes

Amber Shipperd, Texas A&M University – Kingsville; Creighton Avery, Texas A&M University – Kingsville; Sarah Gomez, Texas A&M University – Kingsville; Kelly Renner, Franklin University

One’s beliefs about the nature of stress (e.g., stress mindset) play a large role in the extent to which one experiences the detrimental or beneficial outcomes of stress. Stress mindset has been explored in college students, but not yet student-athletes. Sport can serve as a buffer to the negative impacts of stress for some student-athletes, however, pressures associated with sport participation increase stress in other student-athletes. Therefore, a comparison between stress mindset in non-athletes, current college student-athletes, and those who retired or terminated their sport participation is warranted. The purpose of Study 1 was to examine potential differences in stress mindset between non-athletes, student-athletes, and former athletes. We hypothesized current student-athletes would report the highest stress mindset scores. A total of 298 students (n = 87 current athletes; n = 26 former athletes; n = 185 non-athletes) completed a demographic questionnaire and the Stress Mindset Measure (SMM) via an online survey. No significant differences were observed between groups’ stress mindset scores ($H(2) = 1.815, p > .05$). However, current student-athletes reported having lower stress mindset scores than the former athletes and 23% of the current student-athletes identified their sport as their primary source of stress, suggesting burnout may be a contributing factor. Therefore, Study 2 explored the relationship between stress mindset and burnout in current college student-athletes. We hypothesized that athletes with lower stress mindset scores would report experiencing increased burnout symptoms. College student-athletes (N = 118) completed the SMM and Athlete Burnout Questionnaire. Results of the Spearman rank order correlation revealed a significant moderate relationship between stress mindset and burnout ($r_s = - .402, p < .001$), indicating those
with a lower stress mindset score reported experiencing increased burnout symptoms. More studies are needed to further examine this link between stress mindset and burnout. Funding: McNair Scholars Program. Funding source: McNair Scholars Program.

Experiencing the Impact of the Rio 2016 Paralympic Games on Explicit Perceptions of Paralympians and Individuals With Disabilities

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Individuals with physical disabilities (PD) experience negative explicit stereotypes and stigma in society. However, athletes with PD benefit from more positive stereotypes, with physical activity (PA) participation mitigating aspects of stigma associated with disability. One of the goals of the Paralympic movement is to improve social attitudes towards individuals with PD through exposure to parasports. However, it remains unclear whether perceptions change as a result of the Paralympics. Thus, the present study examined changes in explicit perceptions of Paralympians and individuals with PD over the course of the Rio 2016 Paralympics. It was hypothesized that explicit perceptions of individuals with PD would improve over the course of the Paralympics; however, perceptions of Paralympians were expected to improve to a greater extent. Adults without PD (N = 119, M_age = 22.89 ± 5.13 years) completed the warmth and competence subscales of the Stereotype Content Model questionnaire to assess explicit perceptions of Paralympians and individuals with PD at three time-points: two weeks before, two weeks after, and three months following the Rio 2016 Paralympics. Repeated measure ANOVAs with Bonferroni adjustment indicated that explicit perceptions of warmth decreased over time for both Paralympians and individuals with PD (p < 0.005). In addition, Paralympians were consistently rated as significantly more competent and warmer than individuals with PD (p < 0.001) at each time point. These findings suggest that perceptions of individuals with PD did not improve over the course of the Paralympic games, and that public exposure to such may have more value for Paralympians than the larger disability community. Further research is needed to determine how the Paralympic Games can optimally support people with disabilities by generally decreasing stigma and improving social attitudes. Funding: Social Sciences & Humanities Research Council of Canada Funding source: Social Sciences & Humanities Research Council of Canada.


Kelsey Sick, Western University; Catherine M. Sabiston, University of Toronto; Aryel Maharaj, National Eating Disorder Information Centre; Tamia Cooper-Evelyn, Western University; Eva Pila, Western University

Preoccupation and concerns about body weight, shape, size, and function have been shown to contribute to the significant gender disparity in sport participation which disfavours girls. To adequately address this gender gap and support girls in sustained participation in sport, the development of sport-specific interventions is critical to the effective prevention of body image concerns and disordered eating prevention in adolescence. In partnership with the National Eating Disorder Information Centre (NEDIC; Canada), the overarching aim of this research was to develop an accessible, evidence-based and stakeholder-informed body image program for girls in organized sport. In phase 1 of the program development, a systematic scoping review was conducted to evaluate the efficacy and effectiveness of current sport-specific body image and disordered eating interventions. A data extraction framework was used to chart information from 22 identified resources including critical content, features, and components of the interventions. Integrating the results from the scoping review, focus groups were organized with 59 key stakeholders involved in adolescent sports (i.e., coaches, athletes, governing bodies). Stakeholders confirmed the dire need for an evidence-based program, with most noting the scarcity of body image resources currently available to their sport organization. Stakeholder feedback indicated the program should be coach-facilitated and a standardized body image training module should be made available and a requirement of the current national coaching certification and safe sport training. Stakeholders further stressed the importance of achieving “buy-in” at all organizational levels and provided thoughtful direction with regard to how the program might overcome sociocultural attitudes and ideas that limit systematic change. The synthesis of this knowledge will shape the development and dissemination of the program, and the partnership between academia and industry contributes to the development of equitable sport participation opportunities for Canadian girls. Funding source: SSHRC Partnership Engage Grant, Mitacs Accelerate Fellowship.

Exercise Barriers, Facilitators, and Motivators of Cancer Survivors in a Rural Canadian Community

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Only a small portion of cancer survivors currently meet exercise guidelines despite the overwhelming evidence of its benefit. While exercise barriers and facilitators have been explored for survivors living in urban settings, there is a lack of information on the barriers, facilitators, and motivators to exercise for survivors living in rural communities. It is important to understand the specific needs of these communities in order to develop effective programs that are accessible for rural cancer survivors. The purpose of this study was to assess the exercise-related needs of community members in a rural community in Ontario, Canada. A Needs Assessment Survey was mailed to 449 cancer survivors who had a primary address in the rural community. Survey questions were analyzed using descriptive statistics and sub-analysis was conducted using chi-squared tests. The majority of respondents (n=72, mean age=65 years) were Caucasian and diagnosed with breast cancer. All but nine reported at least one other chronic condition. While the majority of respondents felt it was beneficial to exercise, only 36% reported meeting current aerobic exercise guidelines. Reported barriers during and following treatment (%/%, respectively) included physical side effects (65%/35%), unawareness of available exercise programs (13%/22%), distance to exercise programs (13%/13%), and time (13%/13%). Desired exercise facilitators included information from a qualified exercise professional (45.8%), access to a gym (33.3%), and access to exercise equipment (26.4%). More than half of respondents reported increasing overall fitness level (52.8%) and preventing recurrence (51.4%) as motivators to exercise. Those interested in joining a community-based exercise program demonstrated significantly higher levels of exercise motivation (p = 0.05 for all variables) and were more likely to believe that exercise was beneficial for their health (p < 0.001). The present findings can be used to create accessible and appropriate exercise services for cancer survivors living in this rural community. Funding source: Northern Ontario School of Medicine.
What You Say, Not What You Do: Examining Relationships Between Measures of Self-Control, Academic, and Alcohol Behaviors Among Student-Athletes

Jessie Stapleton, University of North Florida; Michael Nolan, Missouri Baptist University

Research suggests that student-athletes consume more alcohol and engage in riskier alcohol behaviors than their nonathlete peers, a notable pattern given the well-documented inverse relationship between academic achievement and alcohol consumption (AC) among college students. One factor shown to facilitate desirable behaviors and inhibit undesirable behaviors is self-control. Although self-report measures of self-control have been shown to predict both grade point average (GPA) and AC among college students, research has not examined the relationships between objective measures of self-control, GPA, and AC among student-athletes. The purpose of this study was to examine the relationships between self-reported self-control, objective self-control, GPA, and AC among student-athletes. Forty-seven male student-athletes (Mage = 20.78 ± 1.38) completed self-report (Self-Control Scale) and objective (isometric plank until failure) measures of self-control. They also provided GPA data and completed an NIAAA Alcohol Quantity and Frequency Questionnaire. Pearson correlations were conducted between both measures of self-control, GPA, and AC. Self-reported self-control was significantly positively related to GPA (r = .37, p = .03) and significantly negatively related to all measures of alcohol consumption (rs = -.47 to -.63, p < .01). Objective self-control was not significantly related with GPA (r = .28, p = .09) or any measure of AC (rs = -.04 to -.08, p > .05). Notably, objective self-control was also not significantly related to self-reported self-control (r = .22, p = .18). These results indicate self-reported self-control but not objective self-control is linked with student-athlete GPA and AC. While there is currently no standard for objectively measuring self-control, the plank test may not be a suitable measure among student-athletes due to extraneous physical training. Until a standard method of objectively measuring self-control exists, self-report measures of self-control should continue to be used in predicting GPA and AC among student-athletes.

Relative Age Affects Among Draftees: An Analysis of the Ontario Hockey League Priority Selection and Under-18 Drafts

Kristen Swiatoschik, University of Windsor; Laura Chittle, University of Windsor; Jess Dixon, University of Windsor; Sean Horton, University of Windsor

Athletes born in the months immediately after a cut-off date often benefit from selection advantages known as relative age effects (RAEs; Barnsley et al., 1985). In 2017, the Ontario Hockey League (OHL) added an additional draft for hockey players under 18 years of age who were not drafted in the Priority Selection Draft the previous year. The purpose of this study was to compare the birth distributions of athletes selected in the OHL Priority Selection (n = 1,203) and U18 (n = 259) drafts against the larger populations from which they were derived. We sought to determine if the addition of the U18 draft, which gives players an extra year to develop, would reduce RAEs. Birthdate information for athletes drafted in the Priority Selection (n = 1,203) and U18 drafts (n = 259) compared to Canadian birth rates, providing evidence of RAEs. Similarly, RAEs were found among players in the Priority Selection draft (p < .001) when compared against OHF birthrates, but not for those players in the U18 draft (p = .455). Finally, the birth distribution of players in the Priority Selection draft were significantly different from those in the U18 draft (p < .001), with the RAE trend being less pronounced among U18 players. Our findings suggest RAEs remain a prominent issue in the OHL.

Mental Health Literacy and Confidence in a Sample of Student Athletic Therapists

Laura Tennant, Brock University; Philip Sullivan, Brock University

Athletes, particularly student-athletes, may be a high risk population with respect to mental health. Student athletic therapists are one of the groups to which these athletes may be comfortable disclosing concerns. The current study investigated the relationship between mental health literacy (MHL) and confidence in acting upon mental health issues within a sample of intercollegiate student therapists. Females had higher Beliefs-oriented MHL than males, people with a personal history of mental illness has higher Knowledge-oriented MHL than those without, and Knowledge- and Resource-oriented MHL significantly predict confidence in assisting someone with mental health issues. These results suggest that the multidimensional construct of MHL may be an important antecedent factor in competencies in acting on mental health issues. There are several implications of this, particularly when working with a high-risk population of student-athletes.

Understanding the Relationship Between Physical Activity and Self-Esteem With Sex, Race, and Ethnicity as Moderators: A Pilot Study

Delaney Thibodeau, University of North Carolina Greensboro; Jennifer Emier, University of North Carolina Greensboro

Physical activity appears to benefit self-esteem in research with older and middle-aged adults. However, the literature exploring the relationship between physical activity and self-esteem lacks samples of young adults as well as individuals from racially and ethnically diverse groups. It is key to address these gaps in the research given that physical activity differs across race and ethnicity which is important to consider in relation to effectively promoting physically active behavior. The purpose of this study was to test the relationship between time spent engaging in moderate-to-vigorous physical activity (MVPA) during a seven-day period and reported global and physical self-esteem among a diverse sample of participants aged 18 to 25 years. It was hypothesized that (1) more time in MVPA would be related to higher self-esteem and (2) that this relationship would vary depending on the participants’ sex, racial, and/or ethnic identification. Participants completed online surveys to provide demographic information, describe MVPA behavior over the last week, and complete measures of global self-esteem, physical self-worth, and its sub-domains. Participants (n = 98, 41.8% male, 37.8% white, Mage = 21.74) reported an average of 66.84 (SD = 47.20) MVPA minutes per day. MVPA significantly predicted higher scores of the sports competence and physical condition sub-domains of physical self-worth. Race significantly predicted the physical condition sub-domain with whites reporting higher levels than non-whites. Additionally, sex significantly predicted MVPA such that males reported higher levels of MVPA than females. Limitations of this study include a relatively small sample size and the self-report nature of the data. However, the effect sizes for the interactions were small and the lack of moderating effects of sex, race, and ethnicity on the relationship between MVPA and self-esteem may be important. If future studies show this to be a reliable finding, this might suggest a focus on increases in self-esteem as a means to promote physical activity by college-aged samples.
I’m on to you, or Am I? Quantifying the Temporal Component of Detecting an Opponent’s Behavior in Dynamic Situations

Joseph L. Thomas, University of Utah; David P. Broadbent, Brunel University London; N. Viktor Gredin, Karlberg BK; A. Mark Williams, University of Utah

When examining anticipation in sport, an important question is how do athletes acquire and utilize information pertaining to an opponent’s preferred action tendencies to facilitate performance? Although researchers have attempted to understand the effects of providing a-priori contextual information on anticipation, few have focused on how expert athletes acquire this knowledge through repetitive exposure to an opponent and how quickly these adaptations occur. We examined the relationship between the volume of exposure to an opponent and the ability to utilize that opponent’s action tendencies to anticipate in dynamic 2 x 2 scenarios in soccer. Altogether, 14 skilled and 12 less skilled players predicted an opponent’s final action after being sequentially exposed to greater volumes of the opponent’s typical behaviors. The experiment was presented in two phases. In Phase 1, the opponent demonstrated a strong preference to pass or dribble, and then this preference was reversed in Phase 2, replicating the fluidity commonly expected at the professional level. Both phases included exposure blocks providing independent observation of the opponent’s actions and test blocks that tested their ability to predict the final action. ANOVA revealed that skilled players were significantly better at anticipating the opponent’s actions than their less skilled counterparts in both phases (p < .001) signaling a heightened ability to detect the opponent’s initial action preference, and further maintain performance once the action preference had changed. The less skilled group demonstrated a significant improvement in the Phase 1 (p = .023), but failed to improve once the action tendency had changed in Phase 2 (p = .11). The skilled players felt more confident in their responses (p = .04), less rushed during the tasks (p = .03), and considered their performance more successful than the less skilled group (p = .03). Findings highlight the ability of skilled soccer players continuously update their perceptions of an opponent’s tendencies to improve anticipation.

Exploring the Connection Between Physical Activity Participation and Reported Pain Level Among Individuals With MS

Jennifer Thornton-Brooks, Appalachian State University; Kimberly Faszczewski, Appalachian State University; Sara Powell, Missouri State University; Paige Bramblett, Appalachian State University

Multiple sclerosis (MS) is an incurable, chronic, degenerative, neurological disorder that often results in loss of physical and cognitive functioning. Pain is a common symptom in those with MS. Pain control is critical in disease management, and physical activity (PA) can reduce pain and fatigue, regenerate neural tissue, and improve overall quality of life. Unfortunately, individuals with MS rarely meet recommendations for PA. Therefore, it is important to understand the relationship between pain and PA participation to develop programs to increase PA levels in those living with MS. The present study investigated self-reported pain of individuals with MS participating in PA-based MS fundraising events. Survey data were collected from 47 individuals living with MS (49.2 +/- 10.09 years; 7 male, 40 female) who participated and/or volunteered in a PA-based charity fundraiser event to benefit MS. Participants reported generally low levels of pain on a 1-10 scale (2.67 +/- 2.19 in daily life; 3.02 +/- 2.23 during exercise). Results indicated no significant correlation between PA levels and amount of pain in daily life (r = .116; p = .443), pain during exercise (r = .005; p = .976), and pain impacts on activities of daily living (r = .219; p = .262); however, in open-ended responses 25.1% of the sample said pain affected exercise ability, and resulted in fatigue, muscle spasticity, and weakness. These results suggest that individuals with MS that are physically active report low pain levels, although even in active individuals with MS, pain may still play a limited role in PA participation. Future research is needed to determine the role PA plays in pain management for those living with MS and whether PA can lower pain levels. Further, this information may be useful for the creation of specific interventions to increase PA in MS populations with pain as a consideration. Funding source: N/A.

The Effects of Mental Fatigue and Attentional Focus on Co-Activation During Isometric Endurance Exercise

Daniel Trafford, McMaster University; Ashley Flemington, McMaster University; Steven R. Bray, McMaster University

Mental fatigue has negative effects on isometric endurance exercise performance. This effect is accompanied by increased agonist muscle activation in the absence of increased force production. One potential mechanism causing increased agonist activation is co-activation of antagonist muscles. Interestingly, research in the area of attentional focus also documents greater antagonist co-activation and faster time to failure on isometric endurance tasks when attention is focused internally vs. externally. However, these effects have not been studied in combination. In the present study, a 2 (higher vs. lower mental fatigue) x 2 (internal vs. external attentional focus) factorial design was used to examine the combined effects of mental fatigue and attentional focus on muscle co-activation during an isometric endurance wall-sit task. Higher mental fatigue combined with an internal attentional focus was expected to result in greater muscle co-activation during the wall-sit task compared to the other groups. Participants (N = 74) performed two endurance trials separated by a combination of mental fatigue (higher/lower) and attentional focus (internal/external) manipulations. Muscle activation (EMG amplitude) of the rectus femoris and biceps femoris muscles were recorded and manipulated to create a co-activation index for each trial and Trial 1 was subtracted from Trial 2 to create a difference score. Results of 2 x 2 ANOVA co-activation index scores showed no main effects for mental fatigue (p = 0.849, n² = 0.001) or attentional focus (p = 0.896, n² < 0.001). Contrary to the hypothesis, there was no mental fatigue x attentional focus interaction effect (p = 0.675, n² = 0.003). The mental fatigue/ internal focus group did not show increased muscle co-activation compared to the other groups (p = 0.737, n² = 0.018), but rather a non-significant decrease in co-activation. Limitations of the present work and future directions will be discussed. Funding source: SSHRC.

Modifying the Self-Compassion Scale to the Context of Negative Body Image

Sarah Ullrich-French, Washington State University; Anne Cox, Washington State University

Self-compassion is a style of responding to oneself in times of pain and suffering. Self-compassion is typically measured as a general tendency for how one normally responds using the Self-Compassion Scale (SCS; Neff, 2003). However, the variability of self-compassion across different situations or contexts is not known. A contextualized adaptation to the SCS could provide a stronger understanding of how one responds to suffering in a specific situation/context by providing a standard frame of reference, is more likely to be more predictive of context outcomes, and reduces intra-individual variance (Baird & Lucas, 2011). How a contextualized assessment of self-compassion compares to a generalized assessment using parallel measures is unknown. The Body Self-Compassion Scale (BSCS; Altman et al., 2020) combines theoretical frameworks of body image and self-compassion, addressing the multidimensional nature of body image...
but is not parallel to the SCS. Therefore, the purpose of this study was to explore a modified SCS adapted for the context of responding to the experience of negative body image. In an online survey, 468 participants completed the SCS, BSCS and then were asked to write about a specific time when they had a negative body image experience, rated how they felt thinking about that experience and how important the event was to them to prime negative body image. Participants then completed a modified SCS. Item wording was retained as closely as possible to the original SCS after removing the wording at the beginning of each trait item such as “When I’m feeling down”, and modifying the instructions (“Rate how much you agree with the following ways to respond when you are having a bad body image day or are feeling particularly bad about your body”). There were moderate correlations between the Body Context SCS and the original SCS \(r = .55\) and the BSCS \(r = .66\). Further exploration of the factor structure of the Body Context SCS is needed. Preliminary results show overlapping, yet distinct variance among these three measures.

**A Conceptualization of Wellbeing in High-Performance Swimmers**

Katie S. Uzzell, Swansea University; Camilla J. Knight, Swansea University; Denise M. Hill, Swansea University

Research in the field of high-performance sport has become increasingly focused on athlete wellbeing, in part due to the suggestion that high levels of wellbeing may not only protect against negative psychological outcomes (i.e., mental illness), but is also linked to multiple positive psychological and performance outcomes. However, within the extant literature, there is a lack of clarity regarding how wellbeing should be defined and conceptualized. Thus, the present study aimed to conceptualize wellbeing within the context of high-performance swimming. Using an interpretive description methodology, 21 interviews were conducted with 8 swimmers, 5 coaches, 5 practitioners, and 3 parents. Data were analyzed using thematic analysis and the findings indicated that, within the context of high-performance swimming, wellbeing was conceptualized as an individual phenomenon, underpinned by personal beliefs about what comprises wellbeing. Further, changes in wellbeing were characterized by a range of affective, cognitive, and behavioral indicators that were specific to the individual. Finally, multiple personal, social, and environmental factors were highlighted as having the potential to affect wellbeing, although their impact was subject to individual variation. These findings emphasize the subjective nature of wellbeing, in terms of how it is understood, experienced, and recognized within high-performance swimming. These results also highlight the importance of coaches and practitioners getting to know each swimmer in order to be able to best support their wellbeing. Funding source: This study was funded by a Knowledge Economy Skills Scholarships (KESS), which is a pan-Wales higher level skills initiative led by Bangor University on behalf of the HE sector in Wales. It is part funded by the Welsh Government’s European Social Fund (ESF) convergence programme for West Wales and the Valleys.

**Actively Matched: Daily Social Support and Exercise Engagement in Dyads**

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Exercise is a safe, feasible, and beneficial strategy that improves breast cancer survivors’ (BCS) physical, emotional, and social health. Yet, up to 90% of BCS are not meeting the recommended physical activity guidelines. Given that females commonly report a lack of social support as a persistent barrier to participating in exercise, promoting exercise through partnerships may be an effective strategy to increase participation. The purpose of this study was to explore the naturally occurring social support and exercise engagement in a sample of female BCS. Purposeful sampling of females who were engaging in less than 150 minutes of moderate-to-vigorous physical activity per week was used. Survivors \((N = 46 ; \text{Mage} = 42.4 \pm 7.6 \text{ years})\) were matched with a partner and provided with a Fitbit activity tracker. Their naturally occurring connections and exercise behavior were measured using daily surveys and the activity tracker for 21 days. Descriptive statistics of main study variables were calculated. BCS connected with their partners an average of 12 of the 21 days \((SD = 5.0, \text{range} = 4-21 \text{ days})\) and exercised at a moderate-to-vigorous intensity for an average of 256 minutes per week \((SD = 154)\). The percentage of days with and without exercise and social support among BCS were: connected with their partner and did not exercise \((9.2\%)\), did not connect nor exercise \((13.7\%)\), did not connect but exercised \((28.3\%)\), and connected with their partner and exercised \((48.9\%)\). Survivors primarily connected with their partners through text messages \((57.6\%)\) and emails \((31.4\%)\); while they rarely connected through videoconferencing \((1.4\%)\) and phone calls \((2.0\%). BCS felt that all of their exercise support needs were met on 8 of the 21 days \((SD = 6.3; \text{range} = 0-21 \text{ days})\). These findings contextualize the experience of having an exercise partner in a natural setting without intervention. Importantly, BCS exceeded physical activity guidelines. This exploratory study provides valuable insight that can help to inform the development of partner-based interventions for BCS. Funding source: This research was funded by a Canadian Cancer Society Research Institute Innovation to Impact Grant.

**More than Just a Relative Age Effect: Need Satisfaction and Sports Motivation Predict the Selection of Youth Soccer Players in a Competitive Team**

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Identifying and developing talent is one of the fundamental quests of sport sciences. Throughout their development, youth athletes will have to endure several selection camps in order to be a part of the most competitive organizations/teams. Yet, little is known about the psychological processes that distinguish the athletes who successfully get selected into such organizations/teams from those who fail to do so. In this study, we tested the role of motivational factors (i.e., need satisfaction and sports motivation) as predictors of selection into competitive youth soccer teams, over and above the relative age effect. Using a six-month prospective design, 67 youth elite soccer players (female, \(n = 31\); male, \(n = 36\); \(M_{\text{age}} = 12.29; SD_{\text{age}} = 0.65\) ) were followed throughout the selection camp. Results of Structural Equation Modeling showed that the satisfaction of basic psychological needs at the beginning of the selection camp was positively related to autonomous sports motivation \(β = .379, 95\%CI = .101 \text{ to } .657, p < .01\). In turn, autonomous sports motivation was related to team selection \(β = .418, 95\%CI = .117 \text{ to } .719, p < .01\). Results of indirect effect provided support for the mediating role of autonomous motivation in the relationship between need satisfaction and selection into the competitive teams \(β = .159, 95\%CI = .027 \text{ to } .462, p < .05\). Additional analyses revealed that those effects remained significant while controlling for the relative age of players. These findings suggest that motivational processes are important factors to consider for talent identification and development of expertise in the context of competitive youth athletes. Funding source: This research was supported by a Sport Canada Sport Participation Research Initiative grant from the Social Sciences and Humanities Research Council of Canada \((862-2009-7)\) and a teaching release from the Faculty of Social Sciences awarded to the second author.
The Influence of a Free Adult Outdoor Fitness Program on Leisure-Time Physical Activity Using the Trans-Contextual Model of Motivation

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The November Project™ (NP) is a non-profit organization that hosts no-cost outdoor group workouts in 52 cities around the world. NP has the goal of increasing adult participation in the workouts, but also providing the social network and motivation to participate in physical activity experiences beyond NP. Our purpose was to use the Trans-Contextual Model of Motivation (TCM) as a theoretical basis to examine transfer of autonomous motivation for physical activity (PA) from NP workouts to other forms of leisure-time physical activity participation. Using a prospective research design, NP participants (N = 612) recruited via NP social media pages, completed two online questionnaires (Q1 & Q2) through Qualtrics software. In Q1 participants responded to items tapping their perceptions of autonomy support from NP leaders and autonomy motivation during NP workouts. Participants completed Q2 one month later comprised of items measuring autonomy support from significant others, autonomous motivation, theory of planned PA behavior and actual behavior within other leisure-time contexts. A single-indicator structural equation model revealed a good fit of the TCM proposal model with the data. Perceived autonomy support from NP leaders and peers predicted autonomous motivation in the NP context. Controlled motivation in NP context predicted controlled motivation in other leisure-time contexts (β = .619, p < .001) but autonomous motivation in NP had a small effect on leisure-time autonomous motivation. Importantly, perceived autonomy support from significant others predicted autonomous motivation, PA intention and behavior indirectly (total indirect effect β = .111, p < .001) within other leisure-time PA contexts. Autonomy support provided by NP leaders fosters participants’ autonomous motivation for PA. NP controlled motivation predicts controlled motivation for PA participation in other leisure-time contexts. Perceived autonomy support provided by significant others in other leisure time contexts is linked to PA intention and participation in those contexts.

“If Shaped My Future in Ways I Wasn’t Prepared for—in the Best Way Possible”: Volunteers’ Experiences in an Adaptive Sports and Recreation Program

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Adaptive sports participation has been shown to have many positive benefits for adults with disabilities such as fostering positive relationships, increasing physical activity, and improving quality of life. However, a common barrier to implementing successful adaptive programs is a lack of knowledgeable and well-trained volunteer program staff, who understand both accessibility and disability relative to sport. Research has shown positive benefits for volunteers in therapeutic programs, yet a more comprehensive understanding of volunteer benefits and experiences in adaptive sports programs is needed. The purpose of this study was to retrospectively examine experiences of able-bodied volunteers in an adaptive sports program. The sample consisted of 107 able-bodied alumni (Mage = 24.18 ± 1.67) who had spent anywhere between 26.5 to 345.5 hours volunteering for the Adaptive Sport and Recreation Club at Michigan State University. Participants completed an online survey with open-ended questions to explore their experiences as volunteers. Data was analyzed using qualitative content analysis, and eight main themes emerged: 1) volunteer motivation, 2) program design, 3) diversity, equity, and inclusion, 4) relationship building, 5) personal growth, 6) professional growth, 7) challenges, and 8) transformative experience. Results demonstrate that despite variation in participants’ initial motives for volunteering, involvement in an adaptive sports program was transformative and, for some, life changing. Able-bodied volunteers experienced a wide range of benefits such as improved interpersonal skills and relationships, career preparation, as well as deeper understanding and awareness of disability and inclusion in sport. These results support the utility of well-run adaptive sports programs on college campuses that benefit athletes, volunteers, and the greater community. Practical recommendations are provided for volunteer-based adaptive sport programs leaders.

Effects of Mindfulness Yoga on Mental Health in Parents of Children With Autism Spectrum Disorder

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Autism Spectrum Disorder (ASD) affects 1 in 54 children in the United States and is characterized by social communication impairments and restricted repetitive behaviors. Many children with ASD also experience pervasive stereotypic behaviors including self-injurious and elopement tendencies. Collectively, these behaviors not only have developmental implications for the child, but also result in health consequences for the parents, a population that is often overlooked and underserved. Parents or caregivers of children with ASD report higher rates of stress, depression, and anxiety than parents of children with typical development. Therefore, the purpose of this study was to assess the impact of a mindfulness yoga program on stress, anxiety, and depression among parents of children with ASD. A total of 27 parents participated and were randomized into either MYTime (mindfulness yoga practice, n=14) or the control group (business as usual, n=13). A registered yoga teacher (RYT) led a weekly, 1-hour MYTime class. The 36-week intervention was shortened to 12-weeks due to the COVID-19 pandemic which resulted in discontinuation for the safety of the population. The Perceived Stress Scale (PSS) and the Depression, Anxiety, and Stress Scale (DASS) were the primary outcomes examined for this analysis and were completed by the parents in each group pre- and post-intervention. Pre-intervention scores between groups were similar (p >.05). Consistent with the literature, this sample demonstrated higher levels of stress (PSS M=17.27, SD=7.4) compared to an established normative sample (PSS M=13.7, SD=6.6). Mindfulness yoga did not provide significant differences in mental health compared to a control group (PSS: t(25) = -1.16, p = .257; DASS: t(24) = -0.75, p = .462). The lack of significant differences may suggest the dosage implemented in this study was not enough to change the complex and persistent mental health patterns for parents of children with ASD. Future research should execute a more robust intervention, including higher frequency, duration, and goal setting. Funding source: LightUp – 501c3 status non-profit.

School Based Yoga Interventions for Children and Youth With Autism Spectrum Disorder: A Scoping Review

Chandler Wenzl, Wayne State University; Deborah Charbonneau, Wayne State University; Leah Ketcheson, Wayne State University

Children with Autism Spectrum Disorder (ASD) experience pervasive delays, as a result participation in burdensome and expensive treatment are often required. Yoga interventions have emerged as a viable supplement to traditional intervention efforts as it is relatively low cost and easy to administer in a number of community-based settings including school systems. The objective of this study was to conduct a scoping review to identify and chart the existing research on yoga interventions for children.
and youth with autism spectrum disorder (ASD) in school-based settings. A comprehensive literature search was guided by the Joanna Briggs Institute framework for scoping reviews and searches were conducted in five electronic databases to locate relevant peer-reviewed articles in English, published between 1999-2019. Study characteristics were extracted using PRISMA-ScR Group guidelines for the Preferred Reporting Items for Scoping Reviews. Out of the 37 articles identified, a total of seven studies met inclusion criteria for analysis. The final review included seven articles, published over a 20-year period, involving 242 number of participants. All seven studies reported some type of behavioral or physiological improvement in children and youth with ASD. While the primary outcome variable cited was a reduction in core deficits, changes were also noted in abdominal functioning, sleep, and improvements in activities of daily living. The current study summarizes a small but growing trend in research examining yoga in school environments to reduce core deficits and promote positive behaviors in children with ASD. While several common components among successful yoga interventions were identified, additional research is warranted to facilitate the replication of exploratory studies with more rigorous study designs.

Unpacking the Meanings Elite Athletes Give to Their Recovery From Training: Absorbing and Preparing, Relaxing and Attacking
Stuart G. Wilson, University of Ottawa; Bradley W. Young, University of Ottawa

Improving sport performance requires volumes of challenging training, in turn requiring adequate recovery (Kellmann et al., 2018). Despite its importance, recovery research has been relatively limited in scope, often operationalized from perspectives external to the athletes experiencing recovery, leaving a narrow understanding of what constitutes effective recovery. This study aimed to better understand what recovery from training means to elite endurance athletes. Participants were 10 actively competing athletes (ages 25-31; 6 men, 4 women; 7 sports) who had each represented Canada at multiple World Championships and/or Olympics. Each athlete participated in two semi-structured interviews, seven days apart, between which they kept a brief activity journal with notes on stress and recovery, used to enhance further discussion. Using inductive thematic analysis (Braun & Clarke, 2016), we interpreted that effective recovery meant: (1) “absorbing and preparing”, where recovery was both adapting to prior training, and optimizing subsequent training; (2) “the other 22 hours” of a day, where recovery was a cumulative process integrated—deliberately or not—in everything outside of training; (3) “taking a break”, which involved detaching from demands, but also seeking other energizing activities/situations; (4) “whatever works”, which covered the broad, multidimensional range of potential activities (‘whatever’), but reflected effectiveness as specific to the individual, context, and demands experienced (‘works’); and (5) “consistency”, whereby effective recovery was based in routine, while being adaptable to on-going self-monitoring. These findings align with dominant conceptualizations of recovery (Kellmann et al., 2018), and adjacent concepts such as rest (Eccles & Kazmier, 2019), detachment (e.g., Balk et al., 2017), and burnout (Smith, 1986). However, they also extend these conceptualizations by emphasizing that recovery is a nuanced, psychophysiological process which can integrate the pursuit of performance and of well-being as mutually beneficial.

Working Out While Staying In: Exercise and Physical Activity During the COVID-19 Pandemic
Danielle Wong, University of Northern Colorado; Alexandra Rodriguez, University of Wisconsin-Milwaukee; Megan Babkes Stellino, University of Northern Colorado; Christy Greenleaf, University of Wisconsin-Milwaukee

Since the first reported COVID-19 case in the United States (CDC, 2021), there have been drastic measures to change the means by which individuals engage in exercise and physical activity (PA) (Dwyer et al., 2020). Conceptions of Theory of Perceived Control suggest that individuals partake in PA and exercise when they are efficacious (Skinner, 1996); and the Theory of Planned Behavior (Ajzen, 1985) highlights how attitudes and subjective norms contribute to one’s intentions to subsequently engage in exercise. As guiding frameworks, these theories were used to explore how the pandemic changed individuals’ attitudes, behaviors, and perceptions of control toward exercise and PA. The pandemic posed considerable barriers that prevented individuals from actual engagement in typical PA and exercise (Lesser & Nienhuis, 2020), as well as changed exercisers’ intentions (Kaushal et al., 2020). The purpose of this study was to explore individuals’ experiences of, and attitudes and motivation towards, PA and exercise during the pandemic. As part of a larger online survey of parents and college students across the USA (N = 340, M_age = 32.15 years), participants responded to a series of open-ended questions including, “In what ways have COVID-19 restrictions impacted your motivation to be physically active?” Researchers engaged in thematic coding to analyze the qualitative responses (Braun, 2012) and maintained scientific rigor through the first and second authors’ separate development of initial thematic codes followed by cross-referencing their respective codes. Themes from the data analyses revealed that individuals either dramatically adjusted or rigidly maintained their PA and exercise regiments due to COVID-19 health mandates. Sudden shifts in perceptions, attitudes, and levels of motivation for PA and exercise in relation to perceived opportunity and access at the individual and family levels were also highlighted. These findings shed insight on how predictors of, and individuals’ actual, motivation for PA and exercise were impacted by the perceived pandemic restrictions. Funding source: University of Northern Colorado.

Parents’ ‘Self-Check’ on Morality in Elite Youth Hockey
Danielle Wong, University of Northern Colorado; Zachary McCarver, University of Northern Colorado; Megan Babkes Stellino, University of Northern Colorado

Parents have a profound effect on youth moral development through the behaviors they model and attribute value to among the myriad of interactions in youth sport (Bandura, 1991). Parents who express praise and support, as opposed to pressure behaviors and attitudes, have been more effective in translating moral values to their children (Danion et al., 2017). Yet, the means of transmission that affect the translation of morality to youth, particularly in competitive sport contexts, are unknown given the proposed processes of influence across interpersonal interactions and intrapsychic mechanisms (Walker, 2004). The purpose of this study was to examine parents’ conceptions and perceptions of morality from the interactions, relationships, and experiences among key stakeholders within the youth ice hockey culture. Through phenomenology, in-depth interviews with parents of elite male youth hockey players (N = 8 [n = 4 mothers/fathers], M_age = 53.13 years) were conducted in two phases over a five month period. Inductive data analyses (Phase 1; n = 4 interviews) followed by confirmatory deductive data analyses (Phase 2; n = 4 interviews) revealed a higher order theme of Intent, with sub-themes of Cost and Culture, and lower order themes of Finances, Family, Development, Communication, and Power & Authority from parents’ descriptions of morality in the elite youth ice hockey culture. Results indicated that parents contemplate representations of morality and highlighted nuanced challenges parents have to deliberate while supporting their children’s continued participation. Parents simultaneously grappled with situational circumstances that provoked their questioning of the morale of specific behaviors witnessed and engaged in elite youth hockey. Implications of...
the present study confirm the pervasive attempts of hockey culture to control, silence, and de-humanize participants (Burry & Fiset, 2020) and highlight the dynamic nature of relative consciousness among parents to derive various interpretations of morality in elite youth ice hockey.

All in the Family: An Exploration of Family Functioning in Travel Ice Hockey

Emily Wright, Michigan State University

Robust research exists regarding parent influence on youth experiences in sport. However, currently, there is limited understanding of the family as a collective system, specifically related to their functioning in sport. The purpose of this study was to understand family functioning in travel ice hockey and explore how the travel ice hockey context impacts family functioning. The Circumplex model of marital and family systems (Olson, 2000) was used to guide this study and is comprised of three dimensions considered essential for understanding family functioning: cohesion, flexibility, and communication. A retrospective, cross-sectional, mixed methods design was employed by implementing a participant selection model within a multiple case study approach. The participant selection model was implemented to collect quantitative data from 35 mothers and fathers of travel ice hockey players between the ages of 8-18 years old regarding their family’s level of functioning. Results from the quantitative data were then used to purposefully select four families with maximally different levels of family functioning for follow-up, in-depth interviews. Thematic analysis was used to analyze data within and across families according to the dimensions of the Circumplex model. Findings highlighted the way in which cohesion, flexibility, and communication informed family functioning in travel ice hockey and shed light on the importance of studying families from a systems-level perspective. For example, families described flexibility, or the ability to adapt to change when necessary, as a critical aspect of managing the travel ice hockey experience (e.g., league expectations, schedule changes, finances). Moreover, families perceived greater cohesion when travel ice hockey was viewed collectively as a “shared interest” among members. Overall, findings provide researchers and practitioners with a better understanding of the nuanced complexities of family functioning in travel ice hockey, which may be valuable for assisting families to navigate this experience in the future. Funding source: Michigan State University College of Education.

Effects of Workplace Stress, Perceived Stress, and Burnout on Colleag-ue Coach Mental Health Outcomes

Simon Wright, Elon University; Eric Hall, Elon University; Lauren Walker, Elon University

Given the continuously changing job demands of coaches, coach burnout continues to be an important area of study. Coaching literature highlights the role occupational stressors play in the development and management of burnout (e.g., Lee & Chelladurai, 2018; Madigan et al., 2019). However, Olusoga et al. (2019), in their burnout scoping review, highlighted the potential need for the field to differentiate feelings of burnout from those of other sub-clinical mental health indicators (e.g., anxiety, depression). As such, this study sought to examine the relationship between workplace stress, perceived stress, coach burnout, coach well-being, and sub-clinical health issues (anxiety, stress, depression). One hundred forty-four NCAA collegiate coaches from North Carolina completed online questionnaires measuring the proposed variables. Structural equation modeling was used to test the proposed hypothesis that burnout would serve as a partial mediator between workplace and perceived stress and mental health indicators (e.g., depression, anxiety, stress, and well-being). Workplace stress and perceived stress were positively associated with both burnout subscales. Additionally, perceived stress alone exhibited a positive association with depression, anxiety, and stress and a negative association with well-being. While there was a positive significant relationship between disengagement and depression in the model and a negative significant relationship between disengagement and well-being, most relationships between the two burnout subscales and mental health outcomes were negligible. As such, it can be concluded that while workplace and perceived life stressors may impact feelings of burnout and mental health indicators directly, burnout does not appear to exhibit a strong effect on perceptions of mental health and well-being. As such, in line Olusoga et al. (2019), it may be worth considering whether burnout should be considered another type of clinical mental health issue instead of as a direct contributor to coach mental health.

“We’re Stronger as a Family”: Family Experiences and Relationships in an Adapted Physical Activity Camp

Jessica L. Youngblood, University of Calgary; Meghan H. McDonough, University of Calgary; Carolyn A. Emery, University of Calgary; Elizabeth G. Condiffe, University of Calgary; David Legg, Mount Royal University

Recreational and leisure physical activities are important for children and adolescents with disabilities who tend to be less active than typically developing children. Moreover, families caring for a child with a disability face higher levels of stress and isolation, and barriers to participate in physical activity may cause strain on family relationships. The objective of this study was to examine family members’ perspectives on the ways in which participation in an adapted summer camp for families with a child with a disability affect family relationships. A collective case study was conducted with five families who participated in a week-long summer camp where children and adolescents with disabilities could participate in physical activities with their parents and siblings. A focus group was conducted with each family (n = 5 mothers, n = 5 children or adolescents with a disability, n = 3 siblings). Data were analyzed using reflexive thematic analysis. Family relationships were affected in five ways (1) dedicated family time away from daily stressors increased family bonding, (2) change in family members’ understanding of one another, (3) family members appreciating the opportunity to have a common experience with the child with a disability, (4) increased independence of child with a disability impacted family interactions, and (5) increased sibling responsibilities to support child with a disability. Three aspects of the camp experience were important for facilitating these effects on family interactions: enjoyment being around other families with a child with a disability, increase in family activities outside of the camp environment, and increased confidence from participating in the camp. These findings can be used to inform future programs by creating a better understanding regarding family experiences as they relate to adapted physical activity. The authors would like to thank the Vi Riddell Pediatric Rehabilitation Research Program (Alberta Children’s Hospital Foundation) for funding for this project. Funding source: Vi Riddell Pediatric Rehabilitation Research Program (Alberta Children’s Hospital Foundation).

Cross-Sectional Associations Between Total Physical Activity, Purposeful Exercise, Exercise Frequency, and Life Satisfaction

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Life satisfaction is positively associated with positive health outcomes, including mental and physical health. Prior research indicates that physical activity is related to life satisfaction. This exploratory study was designed to assess the strength of association between physical activity and life satisfaction. More specifically, it was designed to separately examine associations between life satisfaction and (a) frequency of cardiorespiratory exercise, (b) total minutes of purposeful cardiorespiratory exercise,
Moderator Effects of Socio-Demographics on Social Support and Physical Activity in Older Adults

Chantelle Zimmer, University of Calgary; Meghan McDonough, University of Calgary

Older adults at increased risk of social isolation tend to accumulate less physical activity (PA) than the general older adult population. Previous research indicates social support is positively associated with PA behavior among older adults. It is unknown, however, which forms of support enable PA among this subpopulation. The present study examined the degree to which the associations between various forms of social support and PA were moderated by socio-demographic indicators of groups at increased risk of social isolation. Self-report data from the Canadian Longitudinal Study on Aging was used to examine associations among 21,491 adults aged 65 and older. Multiple regression was performed with nine forms of social support as predictor variables, PA as the outcome variable, eight socio-demographics as moderator variables, while controlling for other demographics and health factors. The model was significant ($R^2=.21, p<.05$) and yielded four moderator effects. Having a spouse/partner was significantly and negatively associated with PA for women ($b=-9.18, SE=2.29$). However, more frequent social participation was positively associated with PA for both older adults living alone ($b=3.64, SE=1.44$) and not living alone ($b=9.43, SE=1.12$), though greater perceived tangible support was significantly and negatively associated with PA for those not living alone ($b=-15.1, SE=.05$). Further, more frequent use of online communication was negatively associated with PA for older adults with low income ($b=-3.81, SE=1.88$). Main effects were observed for two additional forms of support – social network size ($b=.04, SE=.01$) and frequency of social contact ($b=2.89, SE=.91$) – which had a positive association with PA. Several forms of social support reflecting the presence of other people in older adults’ lives, their interactions with others, and available support were significantly associated with PA. The strength and direction of these associations varied though based on the sex, living arrangement, and income of older adults. Funding source: Canadian Institutes of Health Research, Brenda Strafford Centre on Aging, O’Brien Institute for Public Health.

Social Support Amongst Older Adults in Group Physical Activity Programs

Chantelle Zimmer, University of Calgary; Meghan McDonough, University of Calgary; Jennifer Hewson, University of Calgary; Ann Toohey, University of Calgary; Cari Din, University of Calgary; Peter Crocker, University of British Columbia

Group physical activity (PA) programs can provide psychosocial benefits to older adults, including social support, which is positively associated with PA. Understanding which forms of social support sustain older adults’ engagement in these programs, and how to cultivate these, is important for informing PA interventions. The purpose of this study was to (a) understand the social support needs and challenges of older adults participating in group PA programs and (b) identify social support functions and behaviors that enable their sustained engagement. Using interpretive description methodology, 16 observation sessions were conducted with 295 older adults (≥ 55 years) attending PA programs across four regional recreation facilities, and eight focus groups with 38 older adults. The data were inductively analyzed. Forming relationships with other program participants was integral to receiving help when needed and trusting others’ intentions to help. Relationships in the programs developed when participants had positive perceptions of the program atmosphere and identified with other participants. These relationships were more likely to become intimate in smaller-sized programs. The relationships formed proffered forms of social support that sustained program engagement, including: organizational and instrumental assistance (e.g., rides to classes); perceptual assistance that reinforced success (e.g., modelling successful PA); comfort and reassurance when engagement was challenged (e.g., empathizing and making light of difficult situations); and emotional and informational support to pursue additional PA opportunities (e.g., discussing additional programs and opportunities). The results provide insight into ways that relationships can be fostered to address older adults’ social support needs and point toward a range of specific support behaviors that enable sustained engagement. Creating atmospheres that nurture such relationships should be considered in the design and delivery of PA programs for this population. Funding source: Social Sciences and Humanities Research Council.