



NASPEM
NORTH AMERICAN SOCIETY
FOR PEDIATRIC EXERCISE MEDICINE

Giving Kids a Chance Through Exercise

The 2024 NASPEM Biennial Conference

**AUGUST 7-10
LOUISVILLE, KY**



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NASPEM

NORTH AMERICAN SOCIETY FOR PEDIATRIC EXERCISE MEDICINE

29 July 2024

Dear Conference Participants,

On behalf of the Board of Directors, **welcome** to the 2024 North American Society for Pediatric Exercise Medicine (NASPEM) biennial meeting: Giving Kids a Chance Through Exercise!

I am delighted you are attending our scientific meeting, and I am confident you will find the program enjoyable and the meeting scientifically and socially invigorating. We have some of the leading experts in our field joining us and are thrilled to have a wide variety of keynote speakers this year. In total, we will have five featured speakers: Dr. Temitope Erinosh, Dr. Peter Katzmarzyk, Dr. Eun-Young Lee, Dr. Kristen Dieffenbach, and Dr. David White.

Courtesy of Human Kinetics, we will continue the **Dr. Tom Rowland series** with Dr. David White and Dr. Webb Smith speaking on clinical aspects of obesity in youth. We are thankful to have Dr. Bareket Falk presenting the **Oded Bar-Or Memorial Lecture** this year: Growth and muscle function: Implications for performance and training. Dr. Naomi Gauthier will be the presenter of our inaugural **Dr. Frank Zaldivar Exercise is Medicine Memorial Lecture**, and we will have a dynamic panel discussion in our first **Dr. Bruce Alpert Clinical Practice Series**. When you add in the rest of the free communication and poster sessions, you can see that we have a fantastic scientific agenda set for this week.

I would be remiss if I did not mention our strong relationship with our flagship journal, Pediatric Exercise Science (PES). A link to the presentation of the **PES 2023 Paper of the Year** is available on our website. The authors and title are: **J. Kraav, R. Tamme, L. Remmel, E. Mäestu, M. Zagura, J. Jürimäe, & V. Tillmann; Arterial structure in 18-year-old males is dependent on physical activity at 12 years and cumulative cardiorespiratory fitness from puberty to late adolescence.**

We have added a few new pieces to NASPEM this year. In addition to our annual Marco Cabrera Award, we also awarded six Student Travel awards and one Early Career Research Award this year. Please look for the award winners as noted on their presentations at the conference.

I would like to extend an enormous thank you to many people for their assistance throughout the planning and execution of this meeting. NASPEM's Scientific Committee played a big role in determining the direction of this conference, and the additional clinical focus for the sessions. I also want to thank Dawn Coe and Becki Battista for their immense efforts in organization and chasing down all of the pieces we need for a good conference. They both have done extensive work on the scientific program, and Becki has created a fantastic series of social events for us. Thanks also to Kimbo Yee for keeping our website updated, all of our data organized, and working with our social media committee to keep the updates updated all around.

Students – don't forget to attend the student breakfast on Thursday morning – this is a chance for you, our future leaders, to get to know each other and bond. And if you haven't yet done it, make sure and join the student WhatsApp chat to find out all the things student-related: [NASPEM 2024 Students](#)

Thank you to **Mindful Meeting Pros, GoTo Louisville**, and **AC Hotel** for their support and bountiful information and accommodation for our stay in Louisville. Thank you also to our generous sponsors, **Human Kinetics, PERC UC Irvine** (Pediatric Exercise and Genomics Research Center at the University of California-Irvine), and **Michigan State University Department of Kinesiology**. I also want to acknowledge all session moderators and the behind-the-scenes efforts from abstract reviewers to student awards judges.

Last, but by no means least, I would like to thank all of you for attending, participating, and supporting NASPEM. Your participation is what makes the NASPEM meetings so memorable and creates the networks and friendships that will last long into the future.

Enjoy the meeting!

Best Regards,



2024 NASPEM CONFERENCE COMMITTEES AND BOARD MEMBERS

CONFERENCE ORGANIZING COMMITTEE

Shlomit Radom-Aizik, Ph.D., University of California-Irvine
Rebecca Battista, Ph.D., Appalachian State University
Dawn Coe, Ph.D., The University of Tennessee, Knoxville
Bareket Falk, Ph.D., Brock University
Sarah Moore, Ph.D., Dalhousie University
Paolo Pianosi, M.D. University of Minnesota
Shannon Siegel, Ph.D., University of San Francisco
Webb Smith, Ph.D., University of Tennessee Health Science Center

ABSTRACT REVIEW COMMITTEE

Sarah Moore, Ph.D., Chairperson, Dalhousie University
Shannon Siegel, Ph.D., University of San Francisco

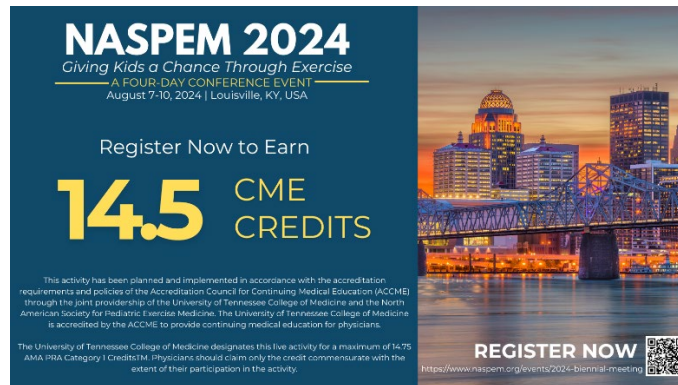
NASPEM BOARD OF DIRECTORS

President	Shannon Siegel, Ph.D., University of San Francisco
Past President	Dawn Coe, Ph.D., The University of Tennessee, Knoxville
President-Elect	Rebecca Battista, Ph.D., Appalachian State University
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CONFERENCE OBJECTIVES

Upon completion of the Conference, participants will be able to:

1. Discuss the impact of physical activity and sedentary behaviors on children's health.
2. Determine the effects of the environment on physical activity in youth.
3. Assess the impact of coaching practices and strategies on youth sports participants.
4. Discuss the nutrition and activity practices in community-based preschools on healthy behaviors in preschool youth.
5. Discuss the impact of growth on muscle function and performance in youth.
6. Evaluate strategies to bridge the gap among researchers, clinicians and practitioners using translational science in youth classified as clinical populations (obese and other clinical diagnoses).



CERTIFYING STATEMENT

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the University of Tennessee College of Medicine and North American Society for Pediatric Exercise Medicine. The University of Tennessee College of Medicine is accredited by the ACCME to provide continuing medical education for physicians.

EDUCATION CREDITS

The University of Tennessee College of Medicine designates this live activity for a maximum of *13 AMA PRA Category 1 Credit(s)™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

PAs, NPs and Nurses: Physician Assistants, Nurse Practitioners and Nurses may use these credit hours toward certification renewal. This credit is acceptable by the American Academy of Physician's Assistants (AAPA), American Nurses Credentialing Association (ANCC) and American Academy of Nurse Practitioners (AANP).

Allied Health Professionals: Professional associations may choose to convert the hours earned to contact hours. Please contact your certifying board to ensure these credit hours will be accepted.



2024 NASPEM BIENNIAL MEETING

WEDNESDAY, AUGUST 7, 2024

12:00 – 4:00 PM	REGISTRATION
2:00 – 4:00 PM	NASPEM BOARD OF DIRECTORS MEETING
5:00 – 9:00 PM	ANGEL’S ENVY, 500 E. MAIN STREET LOUISVILLE TOURISM BOARD DR. RACHEL KEITH GREEN HEART LOUISVILLE INTRODUCED BY DR. SHANNON SIEGEL

THURSDAY, AUGUST 8, 2024

7:00 – 8:00 AM	CONTINENTAL BREAKFAST & REGISTRATION
8:15 – 8:30 AM	WELCOME, DR. SHANNON SIEGEL, NASPEM PRESIDENT
8:30 – 9:20 AM	<i>ODED BAR-OR MEMORIAL LECTURE</i> “GROWTH AND MUSCLE FUNCTION: IMPLICATIONS TO PERFORMANCE AND TRAINING” DR, BAREKET FALK INTRODUCED BY DR. BRIAN TIMMONS
9:20 – 10:35 AM	FREE COMMUNICATION ORAL SESSION 1 (6 PRESENTERS)
10:35 – 10:45 AM	REFRESHMENT BREAK
10:45 – 12:00 PM	FREE COMMUNICATION, POSTER SESSION 1 (12 PRESENTERS)
12:00 – 1:00 PM	<i>DR. TOM ROWLAND SERIES</i> “TREATMENT FOR YOUTH WITH SEVERE OBESITY: THE ROLE OF CLINICAL EXERCISE MEDICINE IN ANTI-OBESITY MEDICATIONS AND BARIATRIC SURGERY” DR. DAVID WHITE AND DR. WEBB SMITH INTRODUCED BY DR. BAREKET FALK

1:00 – 2:00 PM	LUNCH
2:00 – 3:00 PM	FEATURED SPEAKER DR, TEMITOPE ERINOSHO “NUTRITION AND PHYSICAL ACTIVITY PROMOTION IN CHILD CARE SETTINGS: BUILDING BLOCKS FOR A HEALTHY START” INTRODUCED BY DR. REBECCA BATTISTA
3:00 – 3:15 PM	REFRESHMENT BREAK
3:15 – 4:30 PM	FREE COMMUNICATION, ORAL SESSION 2 (6 PRESENTERS)
6:00 PM	DINNER EVENT WEST 6 TH BREWING - NULU, 817 E. MARKET ST

FRIDAY, AUGUST 9, 2024

7:00 – 8:00 AM	CONTINENTAL BREAKFAST
8:15 – 9:15 AM	FEATURED SPEAKER “MAKING THE GRADE: PHYSICAL ACTIVITY, SEDENTARY BEHAVIOR AND CHILDREN’S HEALTH” DR. PETER KATZMARZYK INTRODUCED BY DR. SHANNON SIEGEL
9:15 – 10:30 AM	FREE COMMUNICATION, ORAL SESSION 3 (5 PRESENTERS)
10:30 – 10:45 AM	REFRESHMENT BREAK
10:45 – 12:00 PM	FREE COMMUNICATION, POSTER SESSION 2 (10 PRESENTERS)
12:00 – 1:00 PM	FEATURED SPEAKER “NAVIGATING PEDIATRIC HEALTH AMID CLIMATE CHALLENGES: THE POTENTIAL ROLE OF PHYSICAL ACTIVITY” DR, EUN-YOUNG LEE INTRODUCED BY DR. SARAH MOORE
1:00 – 2:00 PM	LUNCH
2:00 – 3:00 PM	FEATURED SPEAKER DR. KRISTEN DIEFFENBACH “THE IMPACT AND IMPORTANCE OF VOLUNTEER COUCHES IN YOUTH SPORT” INTRODUCED BY DR. KARIN PFEIFFER
	REFRESHMENT BREAK

3:00 – 4:00 PM	“BENCHWARMERS TO BENCHPRESSERS: USING BENCHMARKS TO GUIDE YOUTH ENGAGEMENT IN PHYSICAL ACTIVITY” DR. REBECCA BATTISTA, DR. DAWN COE, DR. SHLOMIT AIZIK, SANDY KNECHT
4:00 – 5:00 PM	BUSINESS MEETING <i>PEDIATRIC EXERCISE SCIENCE</i> “PAPER OF THE YEAR”
6:00 PM	DINNER EVENT KENTUCKY DERBY MUSEUM, 704 CENTRAL AVENUE

SATURDAY, AUGUST 10TH, 2024

7:00 – 8:00 AM	CONTINENTAL BREAKFAST & REGISTRATION
8:15 – 9:00 AM	<i>DR. FRANK ZALDIVAR EXERCISE AS MEDICINE MEMORIAL LECTURE</i> DR. NAOMI GAUTHIER “THEY WANT TO PLAY TOO: APPLYING EXERCISE SCIENCE TO CHILDREN AND YOUTH WITH CHRONIC HEALTH CONDITIONS” INTRODUCTION BY DR. SHLOMIT RADOM-AIZIK
9:00 – 9:45 AM	FEATURED SPEAKER “FRAILITY: AN EVOLVING PARADIGM FOR YOUTH WITH CHRONIC DISEASE” DR. DAVID WHITE INTRODUCED BY DR. PAOLO PIANOSI
9:45 – 11:00 AM	FREE COMMUNICATION, ORAL SESSION 4 (6 PRESENTERS)
11:00 – 11:15 AM	REFRESHMENT BREAK
11:15 – 12:30 PM	<i>“DR. BRUCE ALPERT CLINICAL PRACTICE SERIES”</i> PANEL DISCUSSION FEATURING PERSPECTIVES ON PULMONOLOGY AND CARDIOLOGY DR. WEBB SMITH [CHAIR] DR. WILLIAM HARDIE, PULMONOLOGIST (15 MIN) DR. ADAM POWELL, CARDIOLOGIST (15 MIN)
12:30 – 1:00 PM	STUDENT AWARDS PWP 2025

NASPEM 2026
IN MEMORIAM
BOARD OF DIRECTORS ELECTION RESULTS
PASSING THE GAVEL
ADJOURNMENT

1:00 PM

BOXED LUNCH

6:00 PM

GROUP EVENT | LOUISVILLE BATS BASEBALL GAME
GAME TIME 7:15PM
LOUISVILLE BATS VERSUS CHARLOTTE KNIGHTS,
LOUISVILLE SLUGGER FIELD, 401 EAST MAIN STREET

Opening Event



Dr. Rachel Keith is an Associate Professor of Medicine in the Department of Medicine and Division of Environmental Medicine.

Dr. Keith plays a vital role in Medical Evaluation of the Green Heart Louisville initiative and Director of the HEAL Study. Dr. Keith's research focuses on cardiovascular disease and diabetes.

She also has funding related to regulation, attitudes toward, and injury associated with tobacco use. This work contributes to Dr. Keith's translational research of cardiovascular disease, diabetes and obesity.



Dr. Rachel Keith

UNIVERSITY OF
LOUISVILLE

CHRISTINA LEE BROWN
ENVIROME INSTITUTE



**Wednesday August 7th
5:00-9:00PM**



**Special thanks to
Austin Seeley
[Destination Services
Manager, Louisville Tourism,
for all of his assistance in
planning the conference.**

Invited Speakers



Dr. Temitope Erinoshu
Indiana University

Temitope Erinoshu, Ph.D. is an Associate Professor in the Department of Applied Health Science at Indiana University Bloomington. Dr. Erinoshu's research focuses on obesity prevention in under-served children and families through interventions that promote healthy eating and physical activity behaviors. Dr. Erinoshu has been the recipient of numerous grants with funding from agencies such as the National Institutes of Health, the National Cancer Institute, and the Robert Wood Johnson Foundation.

Dr. Peter Katzmarzyk

Pennington Biomedical Research Center



Dr. Peter Katzmarzyk is an is an Marie Edana Corcoran Endowed Chair in Pediatric Obesity and Diabetes, the Associate Executive Director of Population and Public Health Sciences and Professor of Physical Activity and Obesity Epidemiology at PBRC. Dr. Katzmarzyk's research focuses on on pediatrics and ethnic health disparities. Dr. Katzmarzyk is actively engaged in global health studies in in physical activity and obesity studies within developing countries. He also recently served on the 2018 U.S. Physical Activity Guidelines Advisory Committee for the U.S. Department of Health and Human Services and the World Health Organization Guideline Development Group for the WHO 2020 Guidelines on Physical Activity and Sedentary Behavior in Youth, Adults and Older Adults.

Invited Speakers



Dr. Eun-Young Lee
Kingston University

Dr. Lee is an Assistant Professor in Kinesiology and Health and Gender Studies at Queen's University. As an emerging scholar and the lead of the In Situ Critical Population Health Research Group, Lee's research aims to provide solutions to varying environmental and social issues (e.g., climate change, structural racism, gender issues) while bridging social theories (e.g., intersectionality) and quantitative methodology to promote population health. Bio from the CHEO Website.

Dr. Kristen Dieffenbach
West Virginia University



Kristen is the executive director of the United States Center for Coaching Excellence, a Fellow in the Association of Applied Sport Psychology, and a professor and the director of the Center for Applied Coaching and Sport Sciences at West Virginia University. She has been an AASP Certified Mental Performance Consultant and educational consultant for athletes, coaches, and teams for over 20 years working with developmental through Olympic level athletes, coaches, and organizations. The emphasis of her work focuses on evidence informed solutions to real world challenges and supporting quality coaching through coaching education and creating coach development systems. Her research interests focus on coaching and professionalism, ethical and moral decision making in coaching, youth sport coach system support, and within sport career transitions such as the shift from athlete to coach and the coaching career changes.



Dr. Tom Rowland Lecture Series



A FORUM EXPLORING NEW CHALLENGES FACING PEDIATRIC EXERCISE SCIENCE



Dr. Webb Smith

Webb A Smith, PhD, ACSM-CEP is a Clinical Exercise Physiologist in the Health Lifestyle Clinic and the Heart Institute at Le Bonheur Children's Hospital and an Associate Professor in Department of Pediatrics, College of Medicine at the University of Tennessee Health Science Center. I specialize in clinical exercise physiology and exercise prescription and have broad experience with exercise as part of medical care in children with complex medical diagnosis. My clinical research interest include heart failure and transplant, pediatric obesity, health related physical fitness, and exercise prescription. He currently have grant funding from the Center for Disease Control (CDC), Children's Foundation of Memphis, and the Children's Foundation Research Institute. His work has been previously funded by the National Institutes of Health (NIH), and Department of Veteran Affairs (VA) and resulted in over 35 peer reviewed publications and close to 100 presentations.

David White, PhD, is a Clinical Exercise Physiologist and researcher in the Ward Family Heart Center at Children's Mercy Kansas City and Associate Professor in the University of Missouri, Kansas City School of Medicine. Dr. White is also an active member of the Center for Children's Healthy Lifestyles & Nutrition - a collaboration between Kansas University Medical Center and Children's Mercy Kansas City. He is a Fellow of the American College of Sports Medicine (ACSM) and an ACSM certified Clinical Exercise Physiologist.



Dr. David White

Dr. White has two primary clinical and research interests: 1) exercise testing, exercise intervention, and physical activity behaviors in children and adolescents with pediatric and congenital heart disease; and 2) the effects of exercise for adolescents with severe obesity receiving metabolic/bariatric surgery and/or prescribed anti-obesity medications. He is on the executive committee for the Global Coalition for Fitness and Congenital Heart Disease (GLOCO) and is a member of the ACSM's Task Force on Youth Fitness.



Dr. Oded Bar-Or Memorial Lecture



We are thrilled to announce this year's Oded Bar-Or Memorial Lecture winner is Dr. Bareket Falk!

Bareket Falk is a pediatric exercise physiologist, with a wide interest in children's responses to exercise and the physiological effects that physical training may have on healthy children, as well as on children with chronic diseases. Her current work focuses on the effect of growth, maturation and physical activity on muscle function and on bone development. Bareket Falk has previously served as the director of the Centre for Bone and Muscle Health and the Editor-in-Chief of the journal *Pediatric Exercise Science*. [From Brock University website].

Dr. Falk's presentation title for this year's memorial lecture is

**“GROWTH AND MUSCLE FUNCTION:
IMPLICATIONS TO PERFORMANCE AND TRAINING”**



Dr. Frank Zaldivar Exercise as Medicine Memorial Lecture



FRANCISCO ZALDIVAR, JR., PH.D. MAY 21, 1962, TO NOVEMBER 10, 2023

To celebrate his amazing work, achievements, and impactful career, PERC established the Dr. Frank Zaldivar Memorial Lectureship, as an integral part of the North American Society for Pediatric Exercise Medicine (NASPEM) Biennial Meeting. NASPEM is the premier international research and clinical organization focused on exercise and health in children and adolescents. The lectures will center around two pivotal areas of Dr. Zaldivar's expertise: the intersection of exercise and immunology in cancer and the outreach of exercise as medicine within the community.

UCI Irvine PERC Dr. Frank Zaldivar Memorial Lectureship/Scholarship which supports novel advances and state of the art communications in exercise as medicine for a wide variety of learners at national conferences

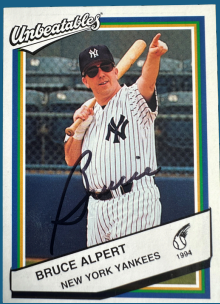


[HTTPS://FUNDRAISE.GIVESMART.COM/VF/ZALDIVAR](https://fundraise.givesmart.com/vf/zaldivar)

This Year's Inaugural Frank Zaldivar Memorial Lecture speaker is Dr. Naomi Gauthier

Dr. Naomi Gauthier is an Assistant Professor of Pediatrics at Harvard Medical School. Dr. Gauthier's research interest center around the range and plasticity of exercise physiology in congenital and pediatric acquired heart disease and the response to treatment via exercise therapeutics. Additionally, she is interested in the relationship between exercise delivery, resiliency, and positive health in terms of cardiopulmonary fitness, patient reported outcomes, and longitudinal surgical outcomes. [Taken from Boston Children's Hospital website.]





The Inaugural Dr. Bruce Alpert Clinical Practice Series



Over a couple...a few...ok, many MANY years, Dr. Bruce Alpert has been a NASPEM mainstay and one of the key figures that has conducted transformative research and has helped guide and sustain our organization.

Dr. Alpert is a pediatric cardiologist. Prior to retirement, he was a Professor of Pediatrics, Chief of the Division of Cardiology, and the Plough Foundation Professor of Pediatrics Chair of Excellence at the University of Tennessee Health Science Center. His research focus was on blood pressure assessment and hypertension development. He was well-funded and published as an active researcher.

This Clinical Practice Series was created to honor the impact that Dr. Alpert has had and continues to have on NASPEM members and the organization as a whole.

Dr. Adam Powell and Dr. William Hardie will be presenting the *Inaugural Dr. Bruce Alpert Clinical Practice Series*.



Dr. William Hardie
Cincinnati Children's
Hospital



Dr. Adam Powell
Cincinnati Children's
Hospital

Award Winners



Marco Cabrera Student Research Awards

Matthew Chapelski, University of Saskatchewan

McKenna Faragher, Brock University

Leah Taylor, Western University

Early Career Researcher

Kim Clevenger, Ph.D. Utah State University

Student Travel Awards

Simran Bhamra, Dalhousie University

Dimetrius Brandon, UT, Knoxville

Rebecca Elwood, Utah State University

Leili Hadayeghi, McMaster University

Elyse Letts, McMaster University

Ty Sideroff, University of British Columbia

Social Events Lineup



Thursday, August 8th

**WEST
SIXTH
NŪIŪ**



Friday, August 9th



CHURCHILL DOWNS

Saturday, August 10th



FREE COMMUNICATION ABSTRACTS

ORAL AND POSTER PRESENTATION

Non-Invasive Cardiac Output Measurement During Exercise in Patients with Pectus Excavatum

Pianosi PT, Buerkle M

Minnesota Masonic Children's Hospital, Minneapolis, MN, USA

Background: Many patients with pectus excavatum usually report subjective improvement in exercise tolerance after surgical correction. This has been attributed to impaired R atrial filling due to the sternum impinging on, and displacing, the heart. Cardiopulmonary function after Nuss repair has been investigated, with nebulous results, at least in part because stroke volume (SV) – the parameter allegedly impaired in pectus, is difficult to measure.

Methods: We used open circuit C₂H₂ breathing to measure pulmonary blood flow during incremental exercise (James protocol) to voluntary exhaustion in 2 patients tested prior to surgical correction. This equals RV output and thus cardiac output (Q) in absence of shunts, and open circuit method allows measurement up to peak exercise. Subjects were 2 adolescent males: 1 aged 17, Ht 185 cm, Wt 64.9 kg; the other aged 17, Ht 178.5 cm, Wt 58.6 kg. BSA was calculated to compute stroke volume index (SVI). **Results:** This preliminary report demonstrates feasibility, as well as divergent patterns of SV recruitment during exercise. Subject 1 achieved peakVO₂ of 2.10 L/min (35.8 mL/kg/min) and peakO₂pulse of 12.7 mL/beat. Subject 2 achieved peakVO₂ of 1.90 L/min (29.3 mL/kg/min) and peakO₂pulse of 10.5 mL/beat. Both subjects had normal Q -V O₂ relationship: $5.03 \cdot VO_2 + 2.67$ and $6.43 \cdot VO_2 + 1.09$ L/min per L/min. Subject 1 demonstrated a steady rise in SV right up to peak work whereas subject 2 showed a drop in SV at peak work. The former subject achieved a normal peak SVI (51 mL/m²) whereas the latter subject achieved a peak SVI of 37.4 mL/m² but it dipped to 31.6 mL/m² at peak work. **Conclusions:** This report demonstrates feasibility of accurate, non-invasive measurement of cardiac output during exercise in youth; and highlights the different trajectories of SV recruitment during incremental exercise in adolescents with pectus excavatum.

Physiological Characterization of Physical Deconditioning by Cardiopulmonary Exercise Testing (CPET) in Healthy Nonobese Adolescents: What are the Specific Parameters?

Tsuda T

Nemours Cardiac Center, Nemours Children's Health, Wilmington, DE, USA

Background: Poor exercise performance due to physical deconditioning (PD) is prevalent among contemporary adolescents. However, physiological definition of PD is poorly understood. **Methods:** Peak and submaximal CPET parameters obtained by cycle ergometer were analyzed retrospectively in normal nonobese adolescents. Heart rate (HR), % systolic blood pressure (SBP) increase, oxygen consumption (VO₂), work rate (WR), oxygen pulse (OP), and minute ventilation (VE) were measured at the peak exercise. Submaximal slope parameters including [VO₂/kg]/HR, HR/[WR/kg], VO₂/WR, and VE/VCO₂ were examined. Males and female adolescents were divided into 3 groups by %predicted max VO₂ (%PmaxVO₂); < 80% (Poor), 80 to 100% (Normal), and > 100% (Superior). **Results:** Total 71 males and 62 females were enrolled (ages 14.9 ± 1.9 and 15.1 ± 1.4 years, respectively). Peak HR and %SBP increase were comparable in all 6 groups. Peak pVO₂/kg and peak WR/kg were lowest in the Poor groups and highest in the Superior groups in both sexes, suggesting a poor muscle condition in PD. Superior groups showed significantly higher ventilatory anaerobic threshold (VAT)/kg than Normal or Poor groups in both sexes. Poor groups showed significantly lower peak OP and [VO₂/kg]/HR slope (decreased stroke volume or SV surrogate) and higher HR/[WR/kg] slope (increased HR-dependency) during submaximal exercise than Normal or Superior groups in both sexes, suggesting limited SV reserve in PD. Poor groups revealed significantly lower VO₂/WR slope (reduced oxygen uptake by work) than the Superior groups in both sexes, suggesting decreased peripheral oxygen utilization. VE/VCO₂ slope was increased only in Poor male group, indicating inefficient ventilation contributing to male PD. **Conclusions:** Poor muscle condition (impaired power production and decreased VO₂ generation by exercise) and low SV reserve characterized PD in nonobese adolescents. Reduced ventilatory efficiency was only noted in Poor males.

What Are the Characteristics of Autistic Children Who Have Been Included in Published Movement-Based Intervention Studies? Implications for Research and Practice

Wilson LM, Beckman EM, Tweedy SM, Cairney J

School of Human Movement and Nutrition Sciences, University of Queensland, Brisbane, Australia

Background: The response of autistic children (AC) to movement-based intervention (MBI) is regulated by child age, sex, autism severity, and presence of intellectual disability. Accordingly, a motor skill program that is effective in 3-6-year-old autistic boys with low support needs (LSN) may not be effective in 13-18-year-old autistic girls with high support needs (HSN) and intellectual disability (ID). Therefore, the aims of this study were to collate research evaluating MBI for AC and appraise the extent to which participants included are representative of AC of both sexes across the autism spectrum. Implications for research and clinical practice are discussed. **Methods:** Six databases were systematically searched, and participant characteristics extracted to determine the proportion of: male vs female; early childhood vs middle childhood vs adolescence; LSN vs HSN AC; with vs without ID. Participation prevalence ratio (PPR) was calculated to assess representativeness according to the following formula: [% of category in MBI] / [% of category in autism population]. Results were interpreted as: underrepresented = $PPR < 0.8$; grossly underrepresented = $PPR < 0.4$. **Results:** Participants were 4796 AC (age mean = 8.7 (± 2.6), males = 74.3%) in 204 MBI's. Those underrepresented in MBI's were: adolescents and young children ($PPR = 0.01$; 0.6 respectively); HSN AC ($PPR = 0.2-0.3$); and AC with ID ($PPR = 0.6-0.75$). **Conclusions:** AC in adolescence and those with HSN, across all age groups, were grossly underrepresented. AC in early childhood and with intellectual disability were underrepresented. Consequently, evidence underpinning practice for MBI's in these populations is likely to be indirect and weak. Research neglect of these sub-populations may be addressed through wider use of single case experimental designs which provide greater scope for flexibility and individualisation than group-based designs, used by >70% MBI's. Development of valid, reliable motor assessment tools for AC with severe communication difficulties is also required.

Poor Exercise Performance in Childhood Cancer Survivors: Are They Just Physically Deconditioned or Having Some Subclinical Cardiac Abnormalities?

Tsuda T, Davidow K, D'Aloisio G, Quillen J

Nemours Cardiac Center, Nemours Children's Health, Wilmington, DE, USA

Introduction: Childhood cancer survivors (CCS) frequently show poor exercise performance, but the underlying pathophysiology is poorly understood. Peak and submaximal parameters of cardiopulmonary exercise testing (CPET) were studied to characterize the underlying mechanisms.

Methods: Poor exercise performers, defined as < 80% of predicted maximum oxygen consumption (VO₂/kg), were enrolled, including 40 CCS (20 males, 20 females) and 32 age-matched normal controls (15 males, 17 females). Anthropometric measurements and peak and submaximal CPET parameters were compared between CCS and controls with poor exercise capacity.

Results: Ages were similar in all groups (CCS 15.5 ± 3.0, Control 15.1 ± 1.9 years). Anthropometric measurements (weight, height, and body mass index) were comparable. There was no significant difference in peak VO₂ (ml/kg/min), peak oxygen pulse, peak respiratory exchange ratio, or anaerobic threshold (ml/kg/min) between CCS and controls. Peak work rate (WR)(watts/kg) was significantly lower in CCS compared with that in controls in both sexes (male 1.96 ± 0.45 vs. 2.35 ± 0.42; p = 0.01 and female 1.59 ± 0.35 vs. 1.95 ± 0.24; p = 0.001), suggesting reduced muscle strength in CCS. In males, both resting and peak heart rate (HR) were significantly higher, and a slope of [VO₂/kg]/HR was significantly lower in CCS than in controls (0.26 ± 0.08 vs. 0.32 ± 0.10; p = 0.03), suggesting limited stroke volume reserve (SVR) in male CCS. In female, HR- dependency expressed by a slope of HR/[WR/kg] was significantly higher in CCS than in controls (49.1 ± 12.7 vs. 41.0 ± 8.9; p = 0.04), also indicating impaired SVR. A slope of VO₂/WR, a marker for physical deconditioning, was comparable between CCS and controls in both sexes.

Conclusions: The poor exercise performance in CCS is characterized by decreased muscle strength and impaired SVR for both males and females. The degree of physical deconditioning is probably similar between CCS and controls.

Age and Sex Effects on Post-Activation Potentiation in the Knee Extensors

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Introduction: Post-activation potentiation (PAP) is the enhancement of evoked-twitch characteristics (e.g., peak torque and rate of torque development) in skeletal muscle following a volitional conditioning contraction (CC). We have previously shown that knee extensor PAP is greater in men compared with boys after a brief (5s) maximal CC. In adults, the optimal CC duration for PAP is ~10s in the dorsiflexors. Thus, the purpose of this study was to examine: 1) whether male child-adult differences in PAP also exist among females; and 2) the optimal CC duration (5-30s) for PAP of the knee extensor muscles in girls and women.

Methods: Eleven girls (9.4±1.4 years) and 13 women (23.4±2.7 years) participated in this study. Maximal isometric evoked-twitch characteristics (peak torque and rate of torque development) were recorded in the knee extensors before and after 4 maximal isometric CCs of different durations (5s, 10s, 20s, and 30s). PAP was calculated as the percent-change in evoked-twitch characteristics after each CC. The results were compared to our previously published PAP data in males following a 5s CC (23 boys ages 10.5±1.3 years and 20 men ages 23.1±3.3 years). **Results:** Women had significantly greater twitch torque PAP compared with girls after both the 5s and 10s CCs (22% and 30% greater PAP, respectively, $p<0.05$). Among women, 5s and 10s CCs led to the greatest twitch torque and rate of torque development PAP, while the 30s CC lead to the lowest PAP. There were no differences in PAP between CC durations in the girls. After a 5s CC, males had greater PAP than females ($p<0.01$), and adults had greater PAP than children ($p<0.05$), with no age-by-sex interactions.

Conclusions: After brief CCs (5-10s), adults appear to have greater PAP in the knee extensors compared with children. The optimal CC duration for PAP in women is ~5-10s, while in girls, CC durations between 5-30s do not affect levels of PAP. This may be due to enhanced fatigue resistance in children.

Bone Accrual Trajectories from 8 to 40 years of age: A SITAR Nonlinear Growth Model

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Background: We have previously in the Pediatric Bone Mineral Accrual Study (PBMAS) that shown that physical activity influences peak bone mass (PBM), which occurs by the end of the second or early in the third decade of life. However, little is known about bone accrual after PBM. Appropriate modelling of repeated measures improves understanding of the nonlinear development of bone. The aims of this study were to develop trajectories of bone accrual (areal Bone Mineral Density (aBMD)) aligned to occurrence of PBM and to identify changes in aBMD post PBM. **Methods:** 251 children aged 8-15 years underwent up to fifteen annual DXA scans (Hologic QDR-2000, array mode; lumbar spine (LS), total hip (TH), femoral neck (FN), total body (TB)). Super Imposition by Translation and Rotation (SITAR) models were fitted, aligning bone parameters with chronological age and age from PBM. All analyses were performed in R version 4.0.2 (R Project for Statistical Computing) and RStudio integrated development environment version 1.3.1 (RStudio Team). **Results:** Models showed that aBMD velocities occurred at -4 to -6 years from attainment of PBM for LS, TH, FN, and TB, respectively. At fifteen years post PBM, at the LS and TB, aBMD had increased 3-10% for males and 4-12% for females. At the TH and FN, males showed a 5% decrease in aBMD, while females showed a 2% decrease in TH aBMD and 8% decreases in FN aBMD. **Conclusions:** These models graphical illustrate the nonlinear development of BMC across the lifespan and show sex differences in both velocities and trajectories. They show peak accrual in adolescence, plateauing in emerging adulthood and the start of bone loss 10 years post PMB. Bone loss was observed earliest in the hip region. Future studies should explore the role of sex-specific, body composition and lifestyle factors, such as physical activity, associated with bone change across the lifespan, especially at the hip region.

“Not allowed”: Stories about Risky Play from Caregivers of Children with Physical Disabilities

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Introduction: Risky play enables children to improve their physical and psychosocial health. Unfortunately, children with physical disabilities (CWPD) face increased barriers to engaging in risky play. The purpose of this study was to explore how caregivers of CWPD’s perceived their child’s engagement in risky play, how they defined or characterized risky play for CWPD, and what factors they thought influenced their child’s risky play.

Methods: This study is part of a larger national project (Canadian Disability Participation Project; cdpp.ca) on the risky play experiences of children with disabilities. Our study used a qualitative description design and social constructivist worldview. The International Classification of Functioning and Socioecological Model supported the study’s theoretical framework. We recruited caregivers of CWPD to participate in one-on-one semi-structured interviews. Interviews were transcribed verbatim. Data were analyzed using reflexive thematic analysis. **Results:** We interviewed twelve caregivers of CWPD (aged 7 to 14 years; 6 boys, 5 girls, 1 non-binary child). Children lived with cerebral palsy, Rett syndrome, lower extremity amputation, ataxia telangiectasia, and other mobility-limiting conditions. Our analysis generated five themes: 1) disability can make anything risky, 2) we can’t define risky play without social risks, 3) “not allowed” to participate in risky play, 4) additional pressures caregivers face to supporting risky play, and (5) not just access but belonging. **Conclusions:** Caregiver stories provided important insight into risky play for CWPD. Caregivers supported their child’s engagement in risky play and often brainstormed strategies to overcome physical and social barriers their child faced when participating in risky play. Caregivers suggested expanding categories of risky play, stating there were unique aspects of risky play for CWPD. Future work should consider ways to improve pathways to inclusive risky play for CWPD.

Does Weight Status Influence the Relationship Between Physical Activity Self-Efficacy and Physical Activity Behavior in 4th-6th Grade Students?

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Background: In the U.S. about 1 in 5 children have overweight/obesity, and this prevalence increases as youth age. Declining levels of physical activity (PA) have been associated with overweight/obesity risk, and less than 25% of children are meeting PA guidelines. Self-efficacy is an established correlate of PA behavior, but its association with weight status (normal vs overweight/obese) and the combined influence on PA behavior in elementary aged children is not conclusive. The purpose of this study was to examine the relationship between PA self-efficacy and PA behavior in 4th-6th grade children based on weight status. **Methods:** Participants were 299, 4th through 6th grade students (mage 10.3 ± 1.0 years; 49% females). Self-efficacy for PA was assessed using a 15-item survey designed for children and adolescents. PA was assessed using the Physical Activity Questionnaire - Child version (PAQ-C). Height and weight were assessed by trained staff, and weight status was determined by BMI-for-age and sex percentiles determined by the CDC (normal weight: <85%; overweight/obese: $\geq 85\%$). Descriptive statistics, t-tests, and multiple linear regression were used to analyze the data. **Results:** There were no significant differences in PA levels or PA Self-efficacy between male and female or between normal weight and overweight/obese students. Regression analyses showed that PA self-efficacy was the only significant predictor of PA level ($F(6, 298)=5.55$; $p < .001$), accounting for 10% of the variance of PA in 4th - 6th grade students. There was no significant interaction between weight status or sex and PA self-efficacy. **Conclusions:** PA self-efficacy was the sole predictor of PA behavior in 4th - 6th grade students. Weight status did not influence self-efficacy, PA levels, or their relationship in this population, which is contrary to some but in line with other investigations. Regardless, focusing on PA self-efficacy may be beneficial to promote increased PA.

An Acceptability and Feasibility Investigation of a Community-Based Motor Program for Autistic Children with Moderate and High Support Needs

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Background: General motor impairments are ubiquitous in autism spectrum disorder and are positively correlated with autism severity. Despite this link autistic children with moderate and high support needs (MHS) are often excluded from motor intervention research. This study assessed the feasibility and acceptability of a 13-week community-based motor program for autistic children with MHS. **Methods:** In this exploratory single arm within-subject study, 10 autistic children with MHS, ages 4-10 years, completed a community-based motor program delivered in a one-on-one format by physical therapists. Descriptive analyses were used to examine individual changes in motor skills, PA, and behavioral outcomes, and thematic analysis evaluated post-intervention semi-structured parent interviews. **Results:** High program attendance and retention were demonstrated, and physical therapists reported child engagement and enjoyment were high. Identified themes revealed parents perceived unexpected substantial positive impacts including improvements in social, motor, and behavioral outcomes. They highly valued both the program and the therapeutic relationships fostered within it. Although parents of the children with the higher support needs reported the most substantial improvements, these children were unable to score on motor assessments due to difficulties following instructions and off-task behaviors. Moreover, only four participants wore an accelerometer-based PA monitor due to sensory sensitivities. **Conclusions:** This community-based motor program was considered feasible and acceptable by the children's parents, and qualitative findings provided valuable insights into clinical practice for children with MHS. However, recruitment challenges and assessment tools being unfeasible for children with higher support needs led to low participant numbers. Future evaluations should explore alternative assessment measures and study designs, given the challenges associated with studying such a heterogenous and complex group.

Putting the OT in Movement: Exploring the Role of the Canadian 24h-Movement Guidelines for the Early Years in Early Intervention Occupational Therapy

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Background: Research suggests children with disabilities are less likely than peers without disabilities to meet the Canadian 24-Hour Movement Guidelines for the Early Years. Healthcare professionals are pivotal in disseminating these guidelines and supporting movement behaviours. Occupational Therapists (OTs) are particularly suited to implement the guidelines due to their focus on promoting engagement in occupations such as play and sleep. Despite the alignment, there is an underutilization of the guidelines by OTs. This research explored this gap and determined measures to address it. **Methods:** This study captured perspectives of Canadian OTs working with preschoolers (ages 3-4) with disabilities. The Clinician Guideline Determinants Questionnaire assessed internal and external guideline factors shaping implementation behaviour (n = 28). In-depth interviews were conducted to assess perspectives on the guidelines (n = 11). This dissertation research was situated in the knowledge-to-action framework, which facilitates the use of evidence-based interventions in clinical settings. **Results:** Overall, OTs' agreed with the content of the guidelines. Participants felt they had skills, knowledge, and external support to use the recommendations but were less likely to agree with having training, implementation tools, and self-efficacy to use the guidelines. Participants identified the need for training on the resource and an implementation tool with a person-focused approach tailored to paediatric OTs. **Conclusions:** This study was the first to explore OTs' perspectives and use of the guidelines. By supporting OTs in tailoring the recommendations to each child, there is an opportunity to increase the engagement of children with disabilities in physical activity and sleep while decreasing sedentary behaviours. Training to address task-self efficacy to use the guidelines and contextualize movement and a new guideline implementation resource for OTs should be developed.

One Hour of Uninterrupted Sitting Impairs Superficial Femoral Artery Flow Mediated Dilation in Adults but not in Prepubertal Children or Adolescents

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Introduction: Previous research has shown a significant decline in superficial femoral artery (SFA) vascular function (flow mediated dilation; FMD) from 3 hours of uninterrupted sitting in pre-pubertal girls. However, the sedentary bout duration of a child or adolescent is typically between 0.5-1.0 hour. This study investigated whether a significant decline in SFA vascular function occurs within 1 hour of uninterrupted sitting, and whether there was a difference between prepubertal children, adolescents and adults. **Methods:** 11 prepubertal (1 female, 9.9 ± 1.6 y, all Tanner stage 1), 7 adolescent (1 male; 13.8 ± 1.3 y, Tanner stages 2-5) and 24 adult (11 female; 24 ± 3 y) participants visited the laboratory once as part of an ongoing study where FMD of the right SFA was assessed via duplex ultrasound immediately before and after 1 hour of uninterrupted sitting. A linear mixed model was used with FMD (%) as the dependent variable, fixed effects of time (pre vs. post sit) and group (prepubertal, adolescent vs. adult), and a random effect of participant. **Results:** There was no main effect of time (post sit $P=0.73$), group (adolescent $P=0.53$; adult $P=0.06$), or interaction between post sit and adolescents ($P=0.16$). However, there was a significant interaction between post sit and the adults ($P=0.033$). Post hoc comparisons revealed a significant decrease in SFA FMD from pre sit (estimated marginal mean 2.56% (2.13-2.99%; 95% confidence level) to post sit (1.61% (1.20-2.02%); $P=0.014$). A sensitivity analysis was performed with arterial baseline diameter included as a time varying covariate and did not change the results. **Conclusions:** Unlike adults, 1 hour of uninterrupted sitting did not elicit a significant decline in lower limb vascular function in children and adolescents. However, more data are required to confirm this observation in a larger sample of prepubertal children and adolescents, and to investigate potential sex differences. Funding: Marco Cabrera Award & NSERC.

Inflammatory Cytokines and Regulators following High-Intensity Interval Running and Cycling in Adolescents

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Background: High-intensity interval exercise (HIIE) has been linked to positive responses of the immune system and derived neurotrophic factor (BDNF) by upregulating and inhibiting anti-inflammatory (e.g., muscle-derived IL6 and IL10) and pro-inflammatory cytokines (e.g., TNF α), respectively. Although part of this effect is regulated by adipokines, such as leptin and adiponectin, no studies have examined the effects of different modes of HIIE on all these markers in adolescents. Purpose: To compare the response of cytokines, adipokines and BDNF to high-intensity interval running (HIIR) versus cycling (HIIC) in female adolescents. **Methods:** Eleven adolescent females at post-peak height velocity, aged 15 to 19 years, performed two trials (HIIR and HIIC) in random order. Each participant performed a progressive incremental test for each mode of exercise to determine the >90% max workload for the trials. The trials consisted of 8 bouts of 1 min of running or cycling with 1 min of rest in between. Blood samples were collected pre-exercise, 5 and 60 min post-exercise. IL6, IL10, TNF α , adiponectin, leptin and BDNF were measured in serum. **Results:** There were no significant mode-by-time interactions found for the measured markers. Exercise-induced increases (time effect) from pre to 5 min post-exercise were observed in IL6 ($p=0.004$, $\eta^2=0.272$), IL10 ($p=0.004$, $\eta^2=0.319$), TNF α ($p<0.001$, $\eta^2=0.462$) and BDNF ($p<0.001$, $\eta^2=0.400$). A significant reduction in leptin was observed only between 5 min and 60 min post-exercise (time effect, $p=0.013$, $\eta^2=0.196$). Significant correlations were observed between changes in TNF α and IL-6 ($r=0.460$, $p=0.031$), IL-10 ($r=0.702$, $p<0.001$), and BDNF ($r=0.444$, $p=0.038$). No correlation was found with the adipokines. **Conclusions:** In female adolescents, high-intensity interval exercise induces interdependent changes in cytokines and BDNF, along with an independent leptin response, and no effect of exercise mode (i.e., running versus cycling).

New and Enhanced Outdoor Learning Spaces in Nova Scotia, Canada: A Mixed Methods Environmental Scan

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Introduction: Children's health and learning are enhanced when they learn outdoors. In 2021, \$7M (\$25,000/school) was invested to create/enhance outdoor learning spaces in elementary schools in Nova Scotia (NS), Canada. The purpose of this study was to explore how funding was utilized, what types of outdoor learning environments were created/enhanced, how equity, diversity, inclusion, reconciliation, and accessibility (EDIRA) were considered in the design, and the perceived health and learning benefits arising from new/enhanced outdoor learning spaces. **Methods:** An online survey was sent to all elementary schools (~290) in NS. The survey included closed and open-ended questions about school demographics, state of funding/implementation, design considerations and usage, and perceived health and learning benefits of the new/enhanced spaces. Respondents were also encouraged to attach photos of the spaces. Quantitative and qualitative data were analyzed descriptively or through content analysis, respectively.

Results: Respondents (n=94) from all NS school regions completed the survey, and 72% reported that their schools utilized the funding and 65% had, or were in progress of, creating/enhancing their outdoor learning spaces. Outdoor seating with a white/blackboard was the most common design. Outdoor learning spaces were used for learning, play and/or gatherings. Related to EDIRA, the designs considered Mi'kmaq (Indigenous) or African Nova Scotian ways of knowing and learning (e.g., connectedness to the lands, circular seating), or accessibility in 26%, 20%, and 43% of designs, respectively. Respondents perceived that the new/enhanced outdoor learning spaces increased student engagement, movement, and exposure to nature. **Conclusions:** Findings highlight how NS schools created or enhanced outdoor learning spaces. Initial evidence suggests that the new/enhanced outdoor learning spaces considered EDIRA in their designs and had a positive impact on student health and well-being.

Influence of Direct Observation Epoch Length on the Context of Young Children's Play

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Introduction: The Observational System for Recording Physical Activity in Children – Preschool (OSRAC-P) is used to contextualize children's physical activity and involves a 5s observation followed by 25s recording window. We aimed to compare the use of observe/record cycles (original OSRAC-P) to coding each 5s interval, which is relevant due to the growing use of video observation. Second, we aimed to assess if longer epochs (15, 30s) were comparable to shorter epochs (5s). **Methods:** Participants (n=10; 3-6y) were video-recorded for 30-min of free-play. Behavior was coded using a modified OSRAC-P every 5, 15, and 30s. Recording intervals (i.e., 25s of every 30s) were removed to replicate the original OSRAC-P. Pearson's r correlation coefficients and repeated measures ANOVA compared percent of time spent in behaviors between the original OSRAC-P vs including each interval and across epoch lengths ($p < 0.05$ with Bonferroni correction for multiple comparisons). **Results:** Original OSRAC-P was strongly related to coding each interval ($r = 0.95-0.97$), there were no differences for group composition, context, or activity type, but some differences for percent of time spent in one (of 22) location. Percent of time spent in each behavior was strongly correlated between epoch lengths (5s vs 15s: $r = 0.90$; 5s vs 30s: $r = 0.81$). Activity intensities Limbs (39.1 vs 25.7 and 23.6%) and Fast (12.1 vs 19.5 and 21.3%), and activity types Run (9.8 vs 13.5 and 16.5%) and Stand (26.8 vs 15.5 and 15.0%) were different for 5s compared to 15s or 30s, Group composition Interacting Group Adult (1.0 vs 0.5 and 3.8%) was different for 15s vs 5s or 30s. Contexts were not different across epoch lengths and differences by location were minimal (0.4-1.0%). **Conclusions:** Use of a observe-record cycle was comparable to coding every 5s interval. Researchers may be able to save time by retaining the record interval even when using video observation. However, use of epochs longer than 5s is not recommended.

A Consensus Method for Estimating Total Physical Activity in Toddlers Using Hip-Worn Accelerometers

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Introduction: Several methods are available for estimating time toddlers spend in total (light-to-vigorous) physical activity from accelerometer data. There is no agreement as to which method should be used, and inconsistency in methods used limits inter-study comparability. Prior research in adults shows that some methods overestimate physical activity, while others underestimate, but taking the simple mean of estimates improves prediction accuracy. We assess whether such a “consensus method” results in a more accurate physical activity estimates in toddlers compared to use of individual methods. **Methods:** Participants (n=31; 13 girls; 25.5 ± 6.0 months) wore an ActiGraph wGT3X-BT accelerometer on their hip for four, 30-minute indoor and outdoor free-play periods. Percent of time spent in total physical activity was calculated using the criterion of direct observation (per 30-s interval) and for ten individual cut-point methods for either vertical axis or vector magnitude counts with epochs ranging from 5- to 60-seconds. The consensus estimate, calculated as the mean across all individual cut-point estimates, was compared to direct observation using equivalence testing and Pearson’s r correlation coefficients. **Results:** Correlations with direct observation were 0.31-0.71 for individual cut-points and 0.61 for the consensus method. Correlations amongst individual cut-points were 0.55-0.99, while between consensus and individual cut-points were 0.77-0.98. No individual or consensus method was statistically equivalent to direct observation (27.5% of time spent in total physical activity), with 80% of individual cut-points (14.7-74.2%) overestimating total physical activity. Consensus had better bias (20.5%) than seven individual cut-points (24.8-46.7%) but worse bias than three individual cut-points (2.9-12.7%). **Conclusions:** Better methods are required for estimating toddler total physical activity given the consistent over-estimation observed using existing cut-points.

Associations and Gender Differences between Physical Activity and Glycemic Control in Children and Youth with Type One Diabetes

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Background: More than 125,000 individuals under the age of 20 are diagnosed with Type One Diabetes (T1D) every year. Despite physical activity (PA) levels being shown to be related to better glycemic control (GC) in children and youth with T1D, research suggests that they are insufficiently active, which may in part be due to fear over PA induced hypoglycemia.

Objectives: To investigate the association between PA and GC in children and youth with T1D, and to explore if any such associations differ by gender.

Methods: Children and youth (5-19yrs) in the Interior of British Columbia, Canada, wore a Fitbit Charge 5 continuously for 28-days to assess physical activity (steps/d). Median steps/d per person were calculated for days with >600 min wear time with a 14-day minimum. Participants provided a data file (5 min epoch) of their continuous glucose monitor (CGM) data for the same period. Percent 'time in range' (TIR) was calculated using clinical glucose targets of 3.9-10.0mmol/L. Statistical analyses were performed in R ($p<0.05$).

Results: Twenty-nine participants were included in analyses (45% Girls; age 12.8 ± 3.9 yrs; 86% on insulin pump). Median steps/d were 10,674 (IQR: 7,125-14,350) with 31% of the sample achieving 12,500 steps/d. Mean TIR was $55\pm 32\%$, with 14% of the sample meeting >70% TIR. Steps/d was positively related to greater coefficients of variability ($p<0.001$, $B=0.34$), and time below range (TBR) ($p<0.001$, $B=0.21$). Boys were significantly more active than girls (13,087 vs 8,970 steps/d, $p<0.001$), while girls spent significantly more TIR (52% vs 58%, $p<0.001$). Generalized additive models estimated boys' steps/d to be linearly associated with greater TIR, while girls GC variation increased with PA and did not have linear increases in TIR. **Conclusions:** Children and youth in our sample were relatively active, and greater PA was related to more TIR as well as more TBR. Gender was a significant factor in both PA participation as well as in GC related to PA.

Reliability of Quadriceps and Hamstring Mineral-Free Lean Measures in Children Using Dual Energy X-ray Absorptiometry (DXA) Scans

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Introduction: Advances in DXA scanning technology provides limitless uniquely created regions of interest (ROI). Due to the additional subjectivity of creating these ROI, minimal variability within and between investigators is desirable. This study determined the intra-and intertester reliability of quadriceps (QUADS) and hamstring (HAMS) mineral-free lean (MFL) measures using DXA scans. **Methods:** Total body DXA scans from 11 children were acquired with the subjects lying on their right and left sides with the measured leg extended and the contralateral leg bent to remove it from the analyses field of view. Unique MFL ROI were created using the custom analyses DXA software and determined by manually tracing the middle of the femur and the borders of the soft tissue as the medial and lateral boundaries, and the base of the gluteal fold and the knee joint serving as the proximal and distal borders. Measures included MFL masses (g) of the left and right QUADS and HAMS and were determined twice by two investigators (Invest 1 and Invest 2). Group mean differences and explained variance were determined with significance $p < 0.05$. **Results:** Intratester reliability for Invest 1 right (793.5 ± 287 vs 792.1 ± 283.2 ; $r^2 = 0.98$) and left (734.6 ± 228 vs 746.4 ± 245.6 ; $r^2 = 0.97$) QUADS, and right (762.5 ± 286.2 vs 768.8 ± 281.6 ; $r^2 = 0.98$) and left (744 ± 276.9 vs 739 ± 261.6 ; $r^2 = 0.99$) HAMS; Invest 2 right (769.8 ± 279 vs 771.8 ± 281.5 ; $r^2 = 0.99$) and left (687.8 ± 215.1 vs 689.8 ± 214.3 ; $r^2 = 0.99$) QUADS and right (779.5 ± 297.6 vs 775.4 ± 297.5 ; $r^2 = 0.99$) and left (766 ± 274.1 vs 766 ± 272 ; $r^2 = 0.99$) HAMS resulted in no significant group mean differences and significant explained variance. Intertester reliability resulted in a significant mean difference for the left QUAD (740.5 ± 236.1 vs 688.8 ± 214.7 ; $r^2 = 0.97$) only. **Conclusions:** MFL of the thighs can be reliably measured and may be useful in showing strength relationships and used to evaluate the effectiveness of rehabilitative strategies.

Influence of Epoch on Machine Learning Models to Detect Physical Activity and Sedentary Time from a Hip-Worn Accelerometer in Toddlers

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Background: Toddlers' movement patterns are characterized by short bursts of activity across all planes of motion and pose a challenge to traditional methods of accelerometer cut-point-based activity detection. Choice of epoch can significantly impact cut-point-based activity outcomes in older children, however it's not clear if this is also true for toddlers using newer detection methods. Therefore, the objective of this study was to test different epochs on novel machine learning (ML) models to detect physical activity (PA) and sedentary time (SED) in toddlers. **Methods:** Toddlers (n=111; 21 ± 7 mos of age; 51% female) attended 2 semi-structured play sessions while wearing an ActiGraph (w-GT3X-BT) accelerometer on the right hip. Video recordings (ground truth) of sessions were annotated second-by-second as: SED, total PA (TPA), and non-volitional movement (NVM). We trained gradient boosted tree ML models (python v3.9.6; scikit-learn v1.2.2; XGBoost v2.0.0) at 1s, 3s, 5s, 15s, 30s, and 60s epochs using 40 raw accelerometer features and the ground truth annotations (highest mode for larger epochs) with a 60% train/20% cross-validate/20% test split. Model performance was assessed with an F1 score (the harmonized mean of recall and precision), overall accuracy, and confusion matrices. **Results:** Models performed as follows (epoch: % accuracy, % F1): 1s:91,85; 3s:92,87; 5s:92,87; 15s:92,87; 30s:92,87; 60s:91,85. **Conclusions:** Epoch had minimal impact on ML model accuracy and the models all exhibited high accuracy without appearing to overfit the data. While 3s, 5s, 15s, and 30s models have equivalent F1 scores and accuracy, confusion matrices show that the 3s and 5s models have a more comparable distribution of accuracies across NVM, SED, and TPA classes. This suggests that 3s and 5s epochs may be best at capturing short, sporadic toddler movement, while also distinguishing NVM from more rhythmic movements that are characteristic of adult movement patterns.

Beyond Haller Index: Echocardiography and Cardiopulmonary Markers in Pediatric Pectus Excavatum

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Background: The severity of pectus excavatum (PEX) as measured by Haller index (HI) does not always correlate with symptoms or cardiopulmonary exercise testing (CPET) indices. Transthoracic echocardiograms (TTE) are generally reported as normal. The aim of this study was to find a reproducible TTE marker as an indicator of right ventricular compression and compare it to severity of PEX and CPET indices. **Methods:** Children 10-18 years with an institution-based protocol for preoperative PEX assessment with TTE, chest computed tomography (CT) for HI, and CPET from 2015-2021 were divided into two groups, mild/moderate PEX (HI 2-3.5) and severe PEX (HI > 3.5). Tricuspid valve annulus size (TVAS) was compared between the groups and with other CPET and TTE indices. **Results:** Of the 124, 82 (66.1%) had severe PEX and 42 (33.9%) had mild/moderate PEX. The mean TVAS z-scores in the mild/moderate PEX group was -1.98(SD 0.51) and -2.24 (SD 0.71) in the severe PEX group (p 0.046). There was a negative correlation between the TVAS z-score and the severity of PEX but this was not statistically significant (r = -0.154, p = 0.087). There was no significant difference in peak oxygen uptake (peak VO₂) or left ventricular ejection fraction between the severity groups. However, the TVAS z-score positively correlated with peak VO₂ (median 43 ml/kg/min, r = 0.023, p = 0.01), peak VO₂ percent predicted (median 86%, r = 0.19, p = 0.04), and O₂ pulse (median 12.7 ml/beat, r = 0.20, p = 0.025), and negatively correlated with VE/VCO₂ (median 29, r = -0.23, p = 0.01). **Conclusions:** The severity of PEX by HI does not factor in the location of cardiac compression and may not always reflect the degree of cardiac limitation. The Tricuspid valve annulus size is a good TTE indicator of cardiopulmonary compromise from PEX. A TVAS z score <-2 is a good predictor of cardiac compromise in pediatric PEX. This may provide additional functional parameters in the decision-making process for corrective surgery.

Differences in Self-Efficacy for Meeting Nutrition Guidelines by Weight Status and Sex

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Background: The prevalence of obesity among children and adolescents is increasing in developed countries. Self-efficacy is confidence in one's ability to complete a particular task, which plays a vital role in behavioral change to reduce obesity. Self-efficacy has been shown as a predictor of success in treatments related to physical activity and eating behaviors that improve diet quality, which can be the basis for developing weight control strategies. Previous studies have shown mixed results in terms of sex and race differences in nutrition self-efficacy, and few have examined self-efficacy for meeting nutrition guidelines. **Objective:** This study is designed to examine whether there are significant differences in self-efficacy for meeting nutrition guidelines by weight status and sex.

Methods: This study involved 342 children from low-income families living in Flint, Michigan, aged 9 to 11 years old (4th through 6th graders) from 13 schools. Participants completed a self-report, 5-point survey designed to address nutritional self-efficacy for meeting guidelines, which included intake of servings of fruits, vegetables, dairies, whole grains, and lean meats/beans/meat substitutes per day. Descriptive statistics and MANOVA were used for analysis. **Results:** There were no differences in self-efficacy for meeting nutrition guidelines by weight status between normal weight and overweight/obese children, $F(5,334) = 0.926, P > 0.05$. Similarly, there was not a significant effect by sex, $F(5,334) = 1.34, P > 0.05$. **Conclusions:** In this diverse sample, there were no differences in self-efficacy for meeting nutrition guidelines by weight status or sex. Previous literature has shown similar findings in less diverse samples. However, self-efficacy for meeting guidelines has not been commonly examined. Future work could examine the role of weight status in overall nutrition self-efficacy or self-efficacy for meeting guidelines is necessary to determine salient obesity correlates.

Physical Fitness Evaluation in HIV-Diagnosed Children and Adolescents: A Scoping Review

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Background: Physical fitness has been widely used to investigate adverse effects of HIV infection/ART use in children and adolescents. The aim of this scoping review was to map the literature to identify gaps in knowledge regarding methods/protocols and cut points applied to this investigation.

Methods: A scoping review was conducted through ten major databases with blocks of terms related to children and adolescents, physical fitness components and HIV infection. **Results:** The search resulted in 7545 studies. After duplicate removal, titles/abstracts reading and full text assessment, 246 studies were included. The most investigated physical fitness component was body composition (n=244), followed by muscular strength/endurance (n=23), cardiorespiratory fitness (n=15) and flexibility (n=4). The reference values most applied to classify body composition were WHO growth curves and nationals' surveys (n=149), followed by internal cut-points (n=30) and cut-points developed with small populations (n=16). Cardiorespiratory fitness was classified through cut-points from three different physical fitness assessment batteries as well as cut-points developed with small populations. Muscular strength/endurance and flexibility were classified through cut-points from five different physical fitness assessment batteries. **Conclusions:** The lack of studies that researched muscular strength/endurance, cardiorespiratory fitness, and flexibility was evidenced, as well as studies that investigated methods usability and reference values.

Development and Testing of the Observational System for Recording Physical Activity in Children – Toddlers

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Background: Direct observation tools developed for preschoolers have been used to describe toddler physical activity (PA); however, authors have concluded that these tools are not inclusive to toddler-specific behavior. No direct observation system exists that can be used to assess both PA levels and the childcare environment in toddlers. Objective: The purpose of this study was to develop the Observational System for Recording Physical Activity in Children - Toddlers (OSRAC-T) and assess the interrater reliability of the newly developed tool. **Methods:** This tool is an extension of the Observational System for Recording Physical Activity in Children – Preschool. Tool content was established through identifying similar research, consulting with experts, and conducting informal observations. Reliability was assessed in a sample of toddlers (12 – 36 months) that attended one of three childcare centers. Video data were recorded and analyzed later using a focal child, time sampling system (5-second observation, 25-second recording). Interrater reliability was assessed in 39% of observations. **Results:** Thirty-one toddlers were included in the study (25.5 ± 6.0 months). The final instrument included nine categories that described physical activity level and type, social and environmental context, and support relevant to toddlers. Observers completed 124 observation sessions resulting in 7,757 30-second observation intervals. Interval-by-interval agreement was moderate to high (59.0 – 95.3%) for all categories and kappa values were moderate (0.46-0.69). **Conclusions:** The OSRAC-T is a reliable observation system to assess the PA behaviors of toddlers. This instrument can be used to measure behaviors relevant to toddlers to better inform early childcare center design, or to inform future intervention studies. This tool could also be used to assess correlates or relationships between PA behavior and health outcomes in toddlers.

Physical Activity and Screen Time as Correlates of Quality of Life among Latino Adolescents

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Background: Latinas/Hispanics are more likely to be inactive and sedentary compared to their male counterparts. Physical activity (PA) and quality of life (QoL) are positively related, while screen time (ST) and QoL are negatively related in adolescents. Little is known whether these relationships differ by sex. Existing literature on the relationship between PA, ST, and QoL among Latino/Hispanic youth has been focused on children. The purpose of this study was to test sex differences in the relationships between PA, ST, and QoL among Latino/Hispanic adolescents. **Methods:** GOAL project (R33 HL144896) baseline data on 86 Latino/Hispanic adolescents was used. Adolescents reported the leisure ST (hours/day) and days/week that they met the PA guidelines (60 min/day). They completed the pediatric QoL inventory, which consist of 4 subscales and a total score. To test the relationships between PA and ST and QoL, Pearson correlation analyses were conducted. For any significant correlation, a linear regression analysis was conducted in which QoL was the dependent variable. Sex was included as an independent variable and PA/ST were included as covariates. A significance level of 0.05 was used. **Results:** There was a significant relationship between total QoL score and PA ($r=0.27$, $P=0.02$); physical QoL and PA ($r=0.30$, $P=0.01$); and school QoL and ST ($r=-0.24$, $P=0.04$). The only sex ($\beta=0.13$) difference was observed in the relationship between physical QoL and PA ($\beta=0.21$) ($R^2=0.09$, $P=0.03$) not favoring females. **Conclusions:** It was expected that physical QoL would be related to PA because the physical QoL subscale refers to physical tasks such as running. Since Latina/Hispanic adolescents are less likely to be physically active compared to their male counterparts, it is logical to observe sex differences in the relationship between physical QoL and PA. Although expected, future research should use PA device-based measures to better understand these relationships.

“A lifeline to belonging”: Caregiver Perspectives on the Benefits of an Adapted Physical Activity Program for Children with Disabilities

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Introduction: Inclusive adapted physical activity and parasport programs provide opportunities for children with disabilities to improve their physical and psychosocial health. Easter Seals offers adapted physical activity and parasport opportunities through “Take PART” (Physically Accessible Recreation Today). Children engage in introductory wheelchair basketball, sledge hockey, powerchair soccer, therapeutic riding, and adapted dance. In 2021, the program was modified to more intentionally foster quality participation (i.e., autonomy, engagement, challenge, mastery, belongingness, meaning). **Methods:** This program evaluation aimed to assess child experiences in the program, through the perspectives of caregivers. This study utilized exploratory sequential mixed methods to explore program effectiveness, participant satisfaction, and solicit suggestions for program improvement. We first collected quantitative data through a caregiver survey. We designed a follow-up interview guide based on key findings from the survey. We then collected qualitative data through semi-structured interviews with caregivers. We summarized survey data using descriptive statistics and interview data using reflexive thematic analysis. **Results:** Twenty and twelve caregivers completed the survey and follow-up interview, respectively. The surveys indicated high levels of participant satisfaction, highlighting the positive impact on child physical (e.g., improved endurance, strength, coordination, sport-specific skills) and psychosocial (e.g., improved self-esteem, social skills, sense of community, joy) health. Five themes were generated from follow-up interviews: 1) leaps and bounds of caregiver support, 2) meaningful participation, 3) mastery of skills, 4) thriving alongside peers, and 5) hopes for future. **Conclusions:** This program evaluation illustrated the importance of thoughtfully designed adapted physical activity and parasport programs for children with disabilities and their families.

How do Racialized Youth Experience Active Transportation in Halifax, Nova Scotia, Canada?

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Background: Racialized youth experience barriers to and inequities in physical activity (PA). Youth who engage in active transportation (AT) tend to have higher levels of PA; however, fewer racialized youth are walking and cycling in their communities. Recent community-based integrated mobility or AT plans in Nova Scotia illustrate the need for equity considerations, but there has been limited implementation to date. Thus, this study explored the AT experiences of racialized youth in Nova Scotia, from both youth and caregiver perspectives. **Methods:** This study used a hermeneutic phenomenological design (framed by critical race theory and the socioecological model). Dyads or triads (Nova Scotian youth and their sibling ages 8-15 years and their caregivers) were recruited to participate in semi-structured interviews. Respondents were asked about their PA participation, AT barriers and enablers, and strategies to improve walking and cycling amongst racialized youth in the province. Youth and caregiver interviews were conducted separately, transcribed verbatim, and analyzed using dyadic analysis supported by the adapted framework method.

Results: We included 8 families. Youth identified as boys (n=5; ages 9-14 years) and girls (n=5; ages 8-15 years). Caregivers included 5 mothers, 2 fathers, and 1 grandmother; 6 of 8 were newcomers. Respondents identified as African Nova Scotian, Black, or South Asian. Our analysis generated 3 themes: 1) neglected or forgotten African Nova Scotian communities, 2) newcomers need more support to engage fully in their communities, and 3) a family approach is necessary to build the health equity of racialized and newcomer families. **Conclusions:** While families were hopeful and wanted to engage more in their communities, they perceived current AT plans and initiatives to overlook racialized and newcomer families. Future integrated mobility or AT plans must address racial disparities to improve PA and health equity of racialized youth.

Exploring 24-hour Movement Behaviours Among Canadian Children with Disabilities in the Early Years

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Background: Meeting the 24-hour movement behaviour guidelines (hereafter 'guidelines') is positively associated with healthy growth and development. In Canada, it is recommended that children aged 3-4 years engage daily in 180 minutes of physical activity (PA); 60 minutes of which are moderate-to-vigorous PA (MVPA), less than 1 hour of screen time and 10-13 hours of sleep. Despite the importance of meeting guidelines, there is currently a paucity of research examining movement behaviours among children in the early years, with very few studies on movement behaviours among children with disabilities in this age group. The purpose of this study was to describe 24-hour movement behaviours among young children with disabilities and to determine guideline adherence. **Methods:** This study was a cross-sectional sub-analysis of 31 Canadian 4-year-old children with a disability (65% boys, 55% developmental disability) who were part of the National Physical Activity Measurement (NPAM) study. Parent-reported PA, screen time and sleep behaviours were collected via an online survey. Descriptive statistics were used to describe children's movement behaviours and guideline achievement. **Results:** On average, children engaged in 108 minutes (SD=89.9) of total PA and 40 minutes (SD=47.0) of MVPA per day. Children engaged in an average of 3.5 hours (SD=2.4) of screen time per day and slept an average of 10.6 hours (SD=1.0) per night. Overall, 23.1%, 6.9% and 79.3% of children met the guidelines for PA, screen time and sleep, respectively. One child (4.3%) met all three guidelines. **Conclusions:** This study was one of the first to explore 24-hour movement behaviours in the early years among children with disabilities. Few children were reported to be meeting PA and screen time guidelines. These findings highlight the need to further examine movement behaviour guidelines and possible reasons for not meeting guidelines in this population.

Relationship Between Mental Health and Adiposity in Children from an Urban, Low Socioeconomic Community

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Background: The Strengths and Difficulties Questionnaire (SDQ) is a common measure of psychological well-being in youth. A wide range of psychological variables has been associated with obesity in youth, yet examinations using the SDQ are only beginning to emerge in obesity research. This study examines the relationship between mental health using SDQ metrics and indicators of obesity in children. **Methods:** Children (n=329) from four elementary schools located in an urban community were assessed. Mental health was assessed using all five subscales of the SDQ (emotional problems, conduct problems, hyperactivity/inattention, peer problems, and prosocial behavior). Body mass index (BMI), percent body fat, and waist circumference (WC) were assessed according to standardized procedures. Regression analysis was used to examine the influence of mental health on obesity, controlling for age, in both boys and girls. **Results:** In models estimating BMI, hyperactivity/inattention SDQ scores and age were significant predictors ($\beta=0.19$ and 0.20 , respectively, $p<0.05$) in girls, but emotional problems and peer problems ($\beta=-0.19$ and 0.25 , respectively, $p<0.05$) were significant in boys. In models estimating percent body fat, hyperactivity/inattention SDQ scores was a significant predictor ($\beta=0.16$, $p<0.05$) in girls, but peer problems ($\beta=0.24$ and $p<0.05$) was significant in boys. In models estimating WC, hyperactivity/inattention SDQ scores and age were significant predictors ($\beta=-0.20$ and 0.30 , respectively, $p<0.05$) in girls, but only age ($\beta=0.34$, $p<0.05$) was significant in boys. **Conclusions:** Age was a significant predictor in most of the models. Different mental health components emerged as relevant contributors to greater adiposity in girls compared to boys (hyperactivity/inattention vs. emotional problems and peer problems, respectively). Practitioners working with children should consider sex differences in mental health variables and their impact on adiposity during development.

Impact of Expert Guidelines on Cardiovascular Evaluation of Competitive Athletes during the COVID-19 Pandemic

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Background: At the start of the Coronavirus diseases 2019 (COVID-19) pandemic, there was confusion amongst collegiate teams with regards to comprehensive cardiovascular testing (CCT) of athletes with COVID-19 infection due to the concerns of myocarditis. The financial and resource disparity between teams across the country made CCT for myocarditis impractical. In May 2020, experts provided a consensus clinical framework for resumption of sport. We sought to evaluate the guideline impact during the pandemic.

Methods: The guidelines recommended no testing for asymptomatic infections and basic cardiovascular testing (BCT) with troponin levels (hsTn), electrocardiogram (EKG) and echocardiogram (Echo) for mild symptoms. If BCT was positive or there were severe symptoms, CCT with cardiac magnetic resonance imaging (CMRI), rhythm monitoring (Holter) and stress testing (GXT) was recommended. We compared the testing cost of our published cohort of 137 athletes with a model of CCT for myocarditis versus strict guidelines adherence. With wide variability in testing costs based on location/payer mixes, the national averages were used to test the impact: hsTn \$45, EKG \$30, Echo \$325, CMRI \$1750, Holter \$233 and GXT \$550. **Results:** In the cohort of 137 athletes evaluated from July 9, 2020, to October 21, 2020, 25 were asymptomatic and 112 had mild or moderate symptoms. If the guidelines had been ignored and CCT for myocarditis was performed in all 137 athletes, it would have cost \$401,821. If testing was done strictly by the guidelines, the cost would have been \$57,465, an 85.70% decrease. We performed BCT in all athletes but reserved CCT to 5 athletes that had abnormal BCT. This was still a significant reduction in cost by 83.21% (\$67,465). **Conclusions:** These guidelines provided an equitable framework for all athletes during the pandemic and specifically bridged the gap between collegiate athletes across institutions by potentially saving time, resources and costs of testing.

Data Gaps Across Physical Activity Indicators for Equity-Denied Groups: Findings from the 2024 ParticipACTION Report Card on Physical Activity for Children & Youth

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Background: Physical activity (PA) is imperative for children's health and wellbeing. Yet, children from equity-denied groups (e.g., children with disabilities, 2SLGBTQI+ children) face barriers to PA participation, typically resulting in lower PA. The ParticipACTION Report Card on Physical Activity for Children & Youth (hereafter 'Report Card') represents the largest synthesis of available evidence to grade children's movement behaviours across 14 PA-related indicators, including 8 indicators of daily behaviours (e.g., Overall Physical Activity, Sedentary Behaviours, Sleep). It was recently recommended to take an integrated approach to PA Report Cards and thus efforts were made to source data from equity-denied groups in Canada for the 2024 Report Card. The purpose of this study was to describe the data gaps for daily behaviours related to equity-denied groups identified from this year's release. **Methods:** Grades were assigned by an expert panel using the best available evidence from 2022-2024. Grades were not assigned for equity-denied groups, but narrative syntheses were performed to elicit key insights. A matrix was created to highlight the number of data sources available for each indicator across 9 equity-denied groups. **Results:** Data sources available for individual behaviours of equity-denied groups ranged from 0 to 5. The only group with data sources for the 8 individual-level indicators was girls. Children from rural areas had the least available data. Most indicators relied on a single data source across equity-denied groups and 6 equity-denied groups had no available data for 2 or more indicators. **Conclusions:** Findings from this study demonstrate the need for more robust data among children from equity-denied groups. PA surveillance studies of underrepresented children provide a future opportunity for researchers to bolster our understanding of PA behaviours so that PA reporting can be more inclusive of all children living in Canada. Funding: PHAC and Saputo.

Associations Between Guided Active Play Sport-based Physical Activity and Reporting of Fundamental Movement Skills During Early Childhood

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Background: During early childhood relationships among fundamental motor skills (FMS) and physical activity (PA) outputs are indeterminant, weak or moderate. These differences may be explained by a) the variety of physical activities used in quantifying PA and b) the inappropriate use of linear analysis for categorical variables (FMS subtypes). This study investigated associations between classifications of FMS (locomotor-LOC; object control-OC) with classifications of guided active play (GAP) PA outputs from cooperative games (COOP and sport-related PA (SPORT-R)). **Methods:** Children (6.3 ± 0.8 years) recruited from a summer camp participated in weekly GAP format using COOP and SPORT-R activities (soccer, football (American), track and field, and basketball). Accelerometry determined PA vectors were used to estimate energy expenditure (EE) and percent time at moderate-vigorous PA (%MVPA). Height, body mass, leg power (LP), grip strength (STR), estimated aerobic power (AP) and FMS (TGMD-2) were measured. Chi-Square (X^2) and cross-tabulation (CT) analysis was performed between FMS, with PA outputs and HRF. **Results:** Associations between OC classification using grouped individual raw scores (GRPIND) with COOP PA outputs for EE ($X^2=24.68$; 4, $p<0.05$) and %MVPA ($X^2=16.85$; 4, $p<0.05$) were significant. CT analysis for GAP PA outputs from COOP showed more children from H OC group in the H EE (74%) and H %MVPA (67%) groups ($p<0.05$) compared to L OC from H EE (2.4%) and H %MVPA (11.9%) ($p<0.05$). Associations between OC groups with all SPORT-R PA showed more children in H EE (range soccer 66.7% to basketball 78.6%) and H %MVPA (range basketball 64.3% to football 73.8%) compared to L EE and L %MVPA ($p<0.05$). Associations occurred for LOC with LP ($X^2=19.21$; 4, $p<0.05$) and STR ($X^2=15.34$; 4, $p<0.05$). **Conclusions:** Results confirm that the promotion of GAP-based sport-related physical activities enhances the proficiency of grouped and/or individual FMS raw scores during early childhood.

Hand Grip Strength and Single Arm Hang Changes over Multiple Youth Ninja Competition Seasons

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Background: Youth Ninja training and competitions emphasize gripping, hanging, and swinging from a variety of implements (bars, rings, balls, cylinders, stars, ropes, etc.). As the youth competitors age, maintaining this grip and hanging ability while adding weight through the maturation process would logically allow them to maintain high performance and enjoyment of the sport. Currently, there is little research on changes over time in youth participants. Therefore, the purpose of this study was to test maximal hand grip strength and single arm hang duration over multiple youth ninja competition seasons. **Methods:** Data were collected in week 12 of each 13-week competition season, separated by one year. After a brief warmup, height, weight, hand grip strength in the overhead position for dominant (HGO-D) and non-dominant hands (HGO-ND), and single arm hang duration (ARM-D and ARM-ND) were measured, and ratio of hand grip (kg) to body weight (kg) (HGO-D/BW and HGO-ND/BW) was calculated.

Results: There was a total of 11 participants (male $n = 8$) that completed measurements at Time 1 (T1) in December 2022 and Time 2 (T2) in December 2023 (age = 12.5 ± 2.2 years; age range = 8.9-15.7 years). There was a significant ($p < 0.05$) increase from T1 to T2 for weight (40.2 ± 12.2 vs. 45.1 ± 14.1 kg; range = 2.7-9.3 kg), HGO-D (22.8 ± 9.6 vs. 27.5 ± 11.9 kg), and HGO-ND (21.4 ± 8.3 vs. 24.9 ± 9.6 kg). There were no differences ($p > 0.05$) from T1 to T2 for HGO-D/BW (0.55 ± 0.10 vs. 0.59 ± 0.09), HGO-ND/BW (0.52 ± 0.07 vs. 0.54 ± 0.08), ARM-D (30.9 ± 18.5 vs. 22.3 ± 20.6 seconds), and ARM-ND (29.0 ± 17.1 vs. 19.6 ± 18.0 seconds). **Conclusions:** The youth ninja participants increased weight and grip strength yet maintained grip strength to weight ratio and single arm hang time. More participants and physical tests should be included to detect potential changes in physical capacity from multiple seasons of ninja training, as well as the impact of ninja participation on future physical activity and health outcomes.

Physical Activity and Quality of Life in Children and Youth with Type 1 Diabetes

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Background: Previous research suggests youth with type 1 diabetes (T1D) are not meeting physical activity (PA) guidelines despite clinical guidelines highlighting the need for regular PA for disease management. PA may also contribute to improved quality of life (QoL) in children and youth with PA. However, the current evidence base on the impact of PA on QoL in this population is conflicting. **Objective:** The current study aimed to assess habitual PA level and QoL in youth with T1D. **Methods:** Children and youth (8-19yrs) with T1D were recruited from the Interior of British Columbia, Canada. Participants completed age-appropriate versions of the Pediatric Quality of Life Inventory (PedsQL) questionnaire. Electronic medical records, where available, were accessed to record glycated hemoglobin (HbA1c). Participants were mailed a Fitbit Charge 5 to record habitual PA as daily step counts (steps/d) for 28 consecutive days. Fitbit data were extracted into REDCap via custom-written API. Participants were included in analyses if they provided >14 valid days of Fitbit data (≥ 600 min/day of wear time). Analyses were conducted in R ($p < 0.05$). **Results:** Forty-three participants (40% girls; age 15.4 (11.3-16.4)yrs) were included. Median HbA1c was 7.6 (6.8-7.8)% (norm=8.5%). Median steps/d was 11,570 (8,646-13,927), which was higher among boys (12,420 (10,099-14,982)) than girls (9,348 (7,142-12,128)); $p=0.003$) and on weekdays (11,903 (8,897-14,796)) vs weekends (8,836 (5,766-12,263)); $p < 0.001$). Total PedsQL score (78.8 (70.5-85.2)) was not significantly associated with steps/d ($\rho=0.22$; $p=0.16$). PedsQL score was not different between boys (80.0 (73.1-85.2)) and girls (77.0 (67.8-82.7)); $p=0.73$). **Conclusion:** This study suggests there may not be an association between QoL and PA in children and youth with T1D, which may, in part, be due to the relatively high PA levels and low PedsQL scores in this sample compared to similar populations. **Funding:** Kelowna General Hospital Foundation.

Movement Behaviours and Health Indicators in Children with a Chronic Medical Condition or Disability: An International Multi-Centre Program

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Background: Children's adherence to movement behaviour (i.e. physical activity, sleep, and sedentary time) guidelines positively impacts their health indicators (i.e. quality of life and mental health). However, the development of movement behaviour guidelines did not consider children with a chronic medical condition or disability (CMCD). While accelerometers offer accurate movement behaviour measurements, they may not be feasible for children with CMCDs in clinical settings, highlighting the need for practical measurement tools. **Objectives:** 1) Pilot a novel health survey to determine representation/recruitment rate of children with CMCDs/their parent to participate; 2) determine criterion validity of survey movement behaviour aspects against device-based measures; 3) explore the relationship between movement behaviours and health indicators among children with CMCDs. **Methods:** 2,000 children, ages 12-17 years, with a CMCD for ≥ 1 year plus their parent are recruited from McMaster Children's Hospital clinics and the community. Health surveys assessing movement behaviours and health indicators are used for data collection. To validate survey-based movement behaviours, 400 children will wear waist-worn accelerometers for 7 days (24h/day). **Results:** Recruitment began in February 2024 with 21 families participating as of May 2024 representing 6 primary conditions/disabilities. Based on the recruitment in five clinics at the McMaster site, eligibility rate is 27.6%, recruitment rate is 88.4% and enrolment rate of 33.8%. **Conclusions:** Recruitment and enrollment are ongoing. Recruitment barriers include age, new diagnosis, and language. **Significance:** This study aims to develop a measurement tool with clinical utility for movement behaviours of children with CMCDs. This understanding may help improve their quality of life, promote independence, relieve symptoms, and reduce the risk of developing comorbidities.

Impact of Community-Based Built and Social Environment Interventions on Children's Active Transportation and Park Use in Nova Scotia, Canada

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Background: Movement-friendly communities support children's physical activity. "Let's Get Moving Nova Scotia" is an action plan to create a more active and healthier population. Related investments have enhanced built and social environments in four communities in the province. This study examined how these enhancements impacted children's active transportation and park use in these settings. **Methods:** This study is part of a larger "Communities on the Move" evaluation. To evaluate children's active transportation and park usage, we used a mixed-methods explanatory sequential design. We conducted age- and gender-perceived counts of walkers, wheelers, and cyclists in key locations in communities and used the SOPARC tool (i.e., the system for observing play and recreation in communities) at two timepoints (T1: baseline; T2: one-year follow-up). We conducted follow-up interviews and document reviews to contextualize the findings. Descriptive statistics and content analysis summarized quantitative and qualitative data, respectively. **Results:** Three communities had at least two count timepoints and were included in this study. From T1 to T2, in all three communities, we observed more children cycling (22%). In two of three communities, we observed more children walking or wheeling (5.5%), with the third community seeing a larger proportion of children walking and wheeling (47% to 50%) but no change in total number. From T1 to T2, fewer children were observed in park settings (-33%); however, those observed were engaging in higher physical activity intensities. Follow-up interviews emphasized the role of supportive built (e.g., sidewalks and bike lanes) and social (e.g., cycling events and equipment loan programs) elements in fostering movement among children. **Conclusions:** Enhancing built and social support in communities promotes children's physical activity. Continued follow-up is needed to map the long-term benefits of environmental interventions on children's movement.

The Relationship of Family Functioning and Boundary-Setting to Children's Achievement of 24-hr Movement Guidelines

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Background: Children's behaviors are influenced by family norms, but most research has focused on the role of the family in the context of diet. The purpose of this study was to assess how family functioning and boundary-setting are related to children's achievement of 24-hr movement guidelines. **Methods:** Participants were 8-14-year-old children and one parent per family. Families completed survey assessments of screen time (ST), sleep, and family functioning. Children wore a commercial activity tracker for one week to assess physical activity (PA). Children meeting each of ST (< 2hr/day), sleep (> 9 hr/night), and PA (> 60 min/day) guidelines were classified as meeting 24-hr movement guidelines. Family functioning and boundary-setting were determined from survey responses. Descriptive statistics were calculated for participant characteristics, survey responses, and movement behaviors. Structural equation modeling was used to test the hypothesis that family functioning and boundary-setting predict children's 24-hr movement behaviors. **Results:** Only 16.3% of the sample (n=7) met 24-hr movement guidelines, with 51.5%, 25.6%, and 77.8% meeting PA, ST, and sleep recommendations, respectively. Eighty percent of parents restricted the time-of-day children used screen media, while just over half required permission (52.5%) or controlled total ST (55%). SEM model fit was good (RMSEA: 0.043, CFI: 0.990). A lack of ST boundaries was a significant predictor of achieving 24-hr movement guidelines and of family functioning, though estimates were relatively low (-0.37 and 0.39, respectively). **Conclusions:** Setting consistent boundaries around screen media use is associated with meeting 24-hr movement guidelines and with family functioning, but that family functioning is not independently associated with meeting recommendations. Further research should include indicators of boundary-setting with respect to PA and sleep for a more complete understanding of these relationships.

Analysis of Maximal Cardiopulmonary Exercise Testing Data in Pediatric, Adolescent, and Young Adult Patients Utilizing the Bruce Protocol

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Background: The Bruce protocol is widely utilized for pediatric clinical cardiopulmonary exercise testing (CPET). Guidelines suggest ideal CPET duration 8-12min and peak heart rate at least 85% of age-predicted maximal heart rate (APMHR). CPETs >12 min may cause lower extremity fatigue leading to premature termination. CPETs <8 min may indicate speed and grade are too challenging for patients with lower fitness. Our purpose was to analyze patient and test characteristics based on CPET duration.

Methods: Analysis of 3,182 Bruce protocol CPETs by patients aged 6-22y with structurally normal hearts and exertional symptoms categorized into 3 groups based on duration: <7 min, 8-12 min, >13 min. Patient characteristics and CPET performance of the 3 groups were compared.

Results: 1,628 Bruce protocol CPETs were 8-12min. Of those tests, 70.8% reached RER of at least 1.10 and 95.1% achieved above or at 85% APMHR. A total of 179 CPETs (63.7% female, age 13.9y) were <7 min. A total of 149 CPETs (13.4% female, age 15.5y) were >13 min. Among the 179 CPETs <7 min, 81 (45.3%) failed to achieve RER at least 1.10 ($p<0.001$), and 46 (25.7%) failed to achieve 85% of APMHR ($p<0.001$). When compared to the ideal duration group, this group was shorter ($p=0.001$), had greater BMI ($p<0.001$) and higher resting HR ($p=0.008$). Among the 149 CPETs >13 min, 57 (38.3%) failed to achieve an RER of at least 1.10 ($p=0.021$) and all achieved > 85% of APMHR. When compared to the ideal duration group, this group was older ($p<0.001$), taller ($p<0.001$), male ($p<0.001$) and had lower resting HR ($p<0.001$). **Conclusions:** Tests below and above ideal duration fail to meet maximal CPET RER criteria and those below ideal duration also fail to meet 85% APMHR. Pre-test factors differ among these three groups. There are pediatric patients for whom the Bruce protocol results in neither ideal test duration nor maximal CPET criteria. Understanding patient characteristics may allow for selection of a more appropriate CPET protocol.

Supporting Teachers' Implementation of Movement Integration in the Classroom and Capturing Student Experiences

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Background: Physical activity (PA) is associated with many health and behavioural benefits however, only 28% of children and youth are meeting Canada's PA guidelines. Movement integration (MI) opportunities (short bursts of PA) in the classroom during regular school time have been suggested to increase PA. Yet, many teachers face personal challenges to implementing MI. Providing teachers with the support, resources, and professional development for MI may alleviate some of the challenges to using MI in the classroom. Additionally, there is a scarce amount of research exploring the experiences of children and youth participating in MI interventions. Therefore, the purpose of this research was to support teachers' implementation of MI in the classroom for their students and assess the impact on student learning, wellness, and experience. **Methods:** Students from grades five to seven in two schools matched for demographics, participated in a 12-week MI intervention. Two 5-minute MI sessions per week were implemented by a trained facilitator and all teachers implemented those two MI sessions on different days that week. Students completed a set of questionnaires before and after the MI intervention to assess their PA behaviours, learning, and wellness. Additionally, a sub-sample of 5 students per grade from each school was invited to participate in a write, draw, show, and tell group discussion to share their experiences with the MI intervention activities. **Results:** Currently, 136 students from both schools have consented and participated in baseline data collection and 8 of the 12-week MI intervention has been delivered. Field notes illustrate students' satisfaction with MI activities that are gamified compared to fitness-based movement activities and include socialization among peers. Also, teachers perceive their students enjoying MI opportunities implemented during the school day and having innovative MI activities provided by the facilitator. **Conclusions:** Providing teachers with the support and resources to implement MI in their classrooms may significantly impact the health, PA behaviours, and PA experiences of their students.

No Sex or Race Differences for Muscular Strength or Cardiorespiratory Fitness Exist in a Sample of K-2 Children

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Background: Physical fitness is an essential marker for children's health status and development. Evidence supports that maximum muscular strength and cardiorespiratory fitness are positively associated with health indicators in children. However, few studies have analyzed sex and race differences in muscular strength relative to body size and cardiorespiratory fitness in elementary children. Purpose: To determine if there are differences in cardiorespiratory fitness and muscular strength based on sex and race in a diverse sample of elementary students. **Methods:** Kindergarten to second-grade children (n=182; 5 to 8 years old; 52.7% female; 44% non-white) from Michigan were participants. Sex and race were self-reported by parents. Cardiorespiratory fitness was assessed using the 6-minute walking test (6MWT). Muscular strength was assessed using a handgrip dynamometer, and results were divided by weight to calculate relative strength. ANOVA was used to determine if cardiorespiratory fitness and muscular strength were significantly different by sex and race. **Results:** No significant differences by sex or race were observed in the 6MWT ($F(3, 178) = 1.038, p > .05$). A significant difference by race was observed for absolute muscular strength ($F(3, 178) = 3.386, p < .05$), but the differences disappeared for relative muscular strength ($F(3, 178) = 1.105, p > .05$). **Conclusions:** The models showed no effect of sex in the 6MWT, which is consistent with previous literature. Although the model showed that absolute muscular strength was associated with race, the differences disappeared when adjusted for body weight, which is similar to the existing evidence. Thus, findings in previous literature hold true for the current sample, which is more diverse than in many of the existing studies.

Exploring the Impact of Physical Activity Intensity on Inhibition Control in Preschoolers

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Background: There is evidence supporting the notion that engagement in physical activity (PA) positively impacts cognitive performance. However, there remains a gap in the literature regarding its specific effects on inhibitory control (IC) in preschool-aged children. IC is the ability to suppress impulses and extraneous stimuli while completing a task, a crucial skill for academic readiness, that develops rapidly after the age of 3y. **Purpose:** To explore the associations among physical activity intensity (light, moderate, vigorous) and IC. **Methods:** Participants were 18 children (Age=4.16±0.55y; Girls=11,61%) enrolled in a preschool in the southern part of the US. Accelerometry was used to assess PA for 7 days on each child. Two assessments of IC were completed by each participant: Go/No-Go (accuracy and reaction time) and Head-Toes-Knee-Shoulder-Revised Test (HTKS-R; total score). Children were classified as meets PA recommendations if they participated in (1) 180 minutes of total daily PA including (2) 60 minutes of moderate-to-vigorous PA. Descriptive statistics, spearman correlations, and Mann-Whitney U tests were used to address the research question. **Results:** There was a significant inverse association between vigorous PA and Go/No-Go noncongruent accuracy ($r_s = -0.496$; $p = 0.036$). Several correlations approached significance. Light PA appeared to be associated with a slower reaction time on the congruent trials ($r_s = -0.387$; $p = 0.113$). Also, the number of sedentary bouts may result in higher congruent accuracy ($r_s = 0.411$, $p = 0.090$) and a faster reaction time ($r_s = -0.354$; $p = 0.150$). Most participants (61%) met PA recommendations; however, there were no differences in IC between children who met and did not meet PA recommendations (range; $p = 0.375-0.724$). **Conclusions:** Preliminary data analysis did not show the expected associations between PA and IC. Future research should continue to explore the development of IC skills and their relationship with PA in young children.

Enhancing Pediatric Exercise Lab Reporting Through Database Standardization: A Multisite Comparative Analysis

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Background: Standardization of pediatric exercise lab reports is essential for comprehensive patient care; however, significant heterogeneity exists among pediatric exercise programs. Over the past 10 years, we have utilized an internally developed institutional database, to streamline data entry and generate uniform exercise reports. This study aimed to evaluate the completeness of these reports and compare them with those from other sites within our multi-center healthcare system. **Methods:** Our investigation included three pediatric exercise labs within our institution across Wilmington, DE, Orlando, FL and Pensacola, FL, each catering to similar patient demographics and indications. Sites 1 and 3 use a bike or treadmill ergometer. Site 2 uses a treadmill only. A consensus exercise score sheet, totaling 54 points for bike studies and 51 for treadmill studies, was adopted across all sites. At site 1, twenty exercise reports generated by the database were randomly selected and scored independently by a MD that did not supervise the test. Ten studies were selected at site 2 and nine at site 3 by the supervising physicians and scored by the same physician. Sites 2 and 3 do not use the database. Independent t tests assuming equal variances were used to compare report values. **Results:** Average bike ergometer reports scores were significantly greater ($p < 0.001$) for site 1 (45 ± 1.3) compared to site 3 (40 ± 0.9). Average treadmill scores were significantly greater ($p < 0.001$) for site 1 (42 ± 1.7) compared to site 3 (32 ± 2.8). **Conclusions:** Generating an exercise report from an institutional database yields a more complete report. Future studies are called for to adopt a database model at exercise sites to create a standardized report.

Exercise Training Resulted in Clinically Relevant Alterations to the Monocyte Transcriptome in Adolescents with Asthma

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Background: There is mounting evidence that innate immune cells, monocytes, are involved in asthma pathogenesis. Exercise training may improve asthma symptoms and airway inflammation, but the molecular mechanisms are poorly understood. We hypothesized that 8-week exercise training would alter the monocyte transcriptome profile in adolescents with asthma and elucidate beneficial molecular mechanisms. **Methods:** Transcriptome profiles of monocytes from 9 adolescents with asthma (6 females, 3 males) and 21 healthy controls (9 females, 12 males), aged 14-17 years, were analyzed before and after 8 weeks of endurance exercise training (1-h session, 3 days a week). Monocytes were isolated (Miltenyi Biotec), and RNA-seq was performed. R package limma (v3.50.3) was used for differential gene expression analysis at baseline (FDR<0.1) and post-training (p-value<0.01). DAVID Bioinformatics tool identified significantly enriched KEGG gene pathways and GO biological processes. **Results:** At baseline, 113 genes were up-regulated and 79 down-regulated in asthma compared to controls. Genes were enriched in energy production (e.g., oxidative phosphorylation, thermogenesis) and adaptive immune response (e.g., immunoglobulin production, antigen binding). Exercise training resulted in changes in 211 genes in asthma compared to controls (74 up-regulated, 137 down-regulated; 43 also differently expressed at baseline). Fifty-two down-regulated genes are associated with the immunoglobulin-mediated immune response, critical in asthma pathophysiology. **Conclusions:** Monocyte gene expression in asthmatic adolescents differed from controls both at baseline and post-training. Training induced a distinct monocyte transcriptome response related to antigen and immunoglobulin receptor binding activity. Exercise training appears to mimic immune regulation seen with beta-adrenergic and anti-inflammatory asthma medications.

Applying a Social Network Analysis to Kindergarten Indoor Free Play

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Background: Social connection is important to children's health and wellbeing. Social connections can be visually represented and explained through social network analyses (SNAs) which assess the structure and strength of network connections, providing more information than just overall time spent in social interaction. The purpose of this study is to understand the social connections of kindergarteners during indoor free play. **Methods:** All children (n=8) and teachers (n=2) in one classroom of an on-campus kindergarten program were video recorded during a 30-minute indoor free-play period. Behavioral Observation Research Interactive Software (BORIS) was used to code start and stop times for each child's interactions based on the Observational System for Recording Physical Activity in Children - Preschool (OSRAC-P). A SNA, with individuals as nodes and interactions (interacting or doing the same thing in proximity) as ties, weighted by total time spent in interaction (tie strength), was conducted in RStudio using the igraph package. Density (ties divided by the possible number of ties), and centrality (a property of network position, consisting of four measures: degree, eigenvector, betweenness, closeness) were determined for the whole network. **Results:** Average total interaction time was 8.4 ± 5.9 min and 93.3% of possible connections existed (density). Degree indicated that, on average, individuals were connected to 8.4 ± 0.8 others (range 7-9). Betweenness 4.8 ± 10.4 (0-33), eigenvector 0.6 ± 0.4 (0-1), and closeness 0.0 ± 0.0 (0-0) illustrate the highly connected nature of the network. **Conclusions:** Children were all connected during this free play period. Future research should consider whether kindergarteners' social networks change over time or with changes to the physical environment. Additionally, other SNA properties and their relationships with physical activity and health outcomes should be explored. Funding: USU Seed Program to Advance Research Collaboration.

Cortical Bone Deficits in Children with Congenital Heart Disease

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Background: Little is known about the bone microstructure of children with congenital heart disease (CHD), but it has been suggested they may have lower bone strength than their healthy peers. Therefore, the purpose of this study was to evaluate the bone microstructure of children with CHD compared to a previously published reference standard of typically developing peers. **Methods:** 27 children with CHD (12 female) participated in the study. High-resolution peripheral quantitative computed tomography scans were performed to assess bone microarchitecture of the non-dominant radius and tibia for all participants. Z-scores were calculated using sex-, ethnic-, and age-specific healthy reference values (Gabel et al., 2018). Additionally, participants' anthropometric measures were compared to CDC growth centiles (Kuczmarski et al., 2002). **Results:** Children with CHD's height and weight fell within the expected range for their age and sex (Z-score 0.58 and 0.29, respectively). When compared to bone microstructure reference standards, males and females with CHD had significantly lower cortical thickness at radius (Z-score -6.6 and -3.4, respectively). Males also had significantly lower thickness at the tibia (Z-score -4.3). There were no differences in any other bone microstructure variables which included total area, total bone mineral density, cortical bone mineral density, trabecular bone volume to tissue volume, number of trabeculae and trabecular thickness. **Conclusions:** This study provides insight into potential impairments in children with CHD's bone microstructure. Children with CHD may have impaired cortical thickness at the distal radius and tibia. Future research should examine if this is found in a larger sample size. Additionally, considerations may need to be made for cortical bone strengthening activities as children with CHD age. Funding: Saskatchewan Health Research Foundation, Canadian Institute of Health Research.

High-Magnitude Physical Activity and Musculoskeletal Fitness in Youth Predict Young Adult Bone Strength: Iowa Bone Development Study

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Introduction: Early adulthood marks the end of significant bone mass accretion as peak levels of bone mass are reached during this time. Low peak bone mass during early adulthood increases the risk of down-the-road bone fragility and fractures. However, fracture risk is more than just densitometry-measured bone mass since the resistance of a specific bone to deformation is determined by a combination of material and structural properties. It is stress during deformation that most closely predicts fracture risk or bone strength. Finite element analysis (FEA), developed in engineering mechanics, is a computer technique to determine structural stress analysis. When FEA is combined with high-resolution computed tomography, it provides researchers a more precise tool to determine bone outcomes, specifically bone fracture risk due to insufficient bone strength. Objective: To describe associations between physical activity (PA) and musculoskeletal fitness in youth to bone strength in early adulthood.

Methods: The study sample included 328 Iowa Bone Development Study participants (184 females) followed from age 17 to 23 yrs. Average-acceleration and intensity-gradient were longitudinally assessed at age 17, 19, 21, 23 using the Actigraph GTX+ activity monitor. Average-acceleration, the mean acceleration across the 24-hour day captures the daily total volume of PA. Intensity-gradient measures the distribution of intensity across the 24-hour-day reflecting the amount of high-magnitude PA across three planes. Musculoskeletal fitness was longitudinally assessed at ages 17, 19, 23 via vertical jump (lower body power) and hand grip (a proxy measure of overall strength). At age 23 years, tibial bone compressive modulus and compressive stiffness, indicators of bone quality and amount in relation to likelihood of fracture, were determined using high-resolution multi-row detector computed tomography (CT) and Finite Element Analysis. Sex-specific Ridge Regression and Ordinary Least Squares (OLS) Regression models were fit for each bone outcome (modulus and stiffness) on a 70% training set. Models' predictive abilities were evaluated on the remaining 30% of data using root mean square error (RMSE). Outcomes were adjusted for age 23 weight, height, calcium intake, and exact age.

Results: At age 23, for both males and females, intensity-gradient

predicted compressive stiffness ($p < 0.05$). The total explained variability was 27% for females and 44% for males. Intensity-gradient also predicted compressive modulus in females (14%). Musculoskeletal fitness contributed to the prediction of compressive stiffness in males and females; though its contribution was less than intensity-gradient. **Conclusions:** Using state-of-the-art measurements of exposures and outcomes, this study provides evidence to support the promotion of high-magnitude, multi-dimensional physical activity for later life bone strength. It suggests that the concept of total volume of physical activity is not bone-strengthening physical activity and that improvements in musculoskeletal fitness will reduce fracture risk.

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