

**TABLE OF CONTENTS**

**WELCOME LETTERS**

**NASPEM PRESIDENT DR. KARIN PFEIFFER ..... 2**

**CONFERENCE CHAIR DR. DAWN COE ..... 3**

**2016 NASPEM CONFERENCE COMMITTEES AND BOARD MEMBERS ..... 4**

**CONFERENCE OBJECTIVES ..... 5**

**CONTINUING EDUCATION ..... 5**

**SCHEDULE OF EVENTS**

**WEDNESDAY..... 6**

**THURSDAY ..... 6**

**FRIDAY..... 8**

**SATURDAY ..... 10**

**INVITED SPEAKERS BIOGRAPHIES**

**DR. HAN KEMPER..... 12**

**DR. ROBERT LIEM..... 12**

**DR. DANIELA RUBIN ..... 13**

**DR. DON MORGAN ..... 13**

**DR. MATT PONTIFEX..... 14**

**DR. LEAH ROBINSON..... 14**

**INAUGURAL DR. TOM ROWLAND SERIES..... 15**

**A FORUM EXPLORING NEW CHALLENGES FACING PEDIATRIC EXERCISE SCIENCE**

**ORAL FREE COMMUNICATION ABSTRACTS ..... 16**

**POSTER PRESENTATION ABSTRACTS..... 31**

**SPONSOR ACKNOWLEDGMENTS ..... BACK COVER**

August 1, 2016

Dear NASPEM 2016 Conference Participants,

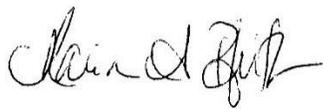
On behalf of the Board of Directors, welcome to the 2016 North American Society for Pediatric Exercise Medicine (NASPEM) biennial meeting. I am delighted that you are attending our scientific conference. The program includes three speakers as part of the Inaugural Dr. Tom Rowland series (compliments of Human Kinetics), Professor Han Kemper as the Oded Bar-Or Memorial lecturer, five keynote speakers, six oral free communications sessions, and three poster free communications sessions, which represented 71 abstract submissions. All of our keynote/featured speakers are nationally and internationally regarded, and we are thrilled that they agreed to address our group. We are also excited to present, for the first time at a NASPEM meeting, a session devoted to "The Year that Was" as presented in our organization's flagship journal, Pediatric Exercise Science. As you will see, all of our planned sessions and free communications represent a fantastic scientific agenda.

I am excited to be holding this meeting in Knoxville, home of the University of Tennessee Volunteers, Women's Basketball Hall of Fame, Smoky Mountains, 1982 World's Fair, and one great town. We have a fantastic spouse program planned, with trips to Asheville, NC and lovely downtown Knoxville. I invite you to enjoy one of the several great restaurants in town for dinner on Wednesday night, prior to our opening session. Additionally, we have a special student mixer planned so that our future leaders can get to know each other and bond.

I owe many people thanks for their assistance throughout the planning and execution of this event. Our generous conference supporters deserve many thanks for their support, as does Dawn Coe and her team for their amazing work with planning this fantastic meeting. We appreciate the assistance of University of Tennessee staff and graduate student, Ashlyn Schwartz. Many thanks go to the Board of Directors, especially members of the biennial meeting planning committee: Bruce Alpert, Don Dengel, Joe Eisenmann, and Ali McManus. Thanks also go to our session moderators and the behind-the-scenes efforts from abstract reviewers and student awards judges.

Of course I need to thank all of you for attending, participating, and supporting NASPEM. We truly need our members to make conferences, and our entire organization, successful. Enjoy the meeting!

Sincerely,



Karin A. Pfeiffer, Ph.D., FACSM

President, NASPEM





August 1, 2016

Dear Colleagues and Friends,

It is my honor to welcome you to the 2016 North American Society for Pediatric Exercise Medicine Biennial Scientific Meeting in Knoxville, home of the University of Tennessee!

The conference committee did an exceptional job planning the scientific program. We are very fortunate to have Dr. Han Kemper as the Oded Bar-Or Memorial Lecture Speaker. We will also be joined by an outstanding lineup of featured speakers, who will speak on cutting-edge, innovative research in emerging and new research areas. We received a record number of abstracts and expect excellent presentations from seasoned faculty and current student researchers. We hope to see these individuals interact and network during NASPEM 2016 meeting.

The Knoxville community offers a diverse sampling of historical sites, outdoor adventures, shopping, and food and drink. The historic Tennessee and Bijou theaters provide spectacular entertainment. Knoxville is home of the 1982 World's Fair and features World's Fair Park and the iconic Sunsphere. Market Square and Old City, located in downtown Knoxville, offer an eclectic mix of great local restaurants, bars, and shops. Knoxville outdoor attractions feature the urban wilderness, which includes an extensive greenway system and local hiking and outdoor adventure opportunities. Just outside of Knoxville is home to The Great Smoky Mountain National Park, Dollywood, and Gatlinburg. Knoxville's southern hospitality will welcome you and provide you with an exceptional educational and social experience.

I would like to thank the Board of Directors, the planning committee, and the scientific committee for their hard work and dedication to this meeting. I would also like to personally thank Dr. Karin Pfeiffer, Dr. Bruce Alpert, and University of Tennessee graduate student Ashlyn Schwartz for their assistance with the program planning.

I hope you enjoy the scientific and social aspects of NASPEM 2016, as well as Knoxville and the surrounding communities. Go Vols!

Sincerely,

A handwritten signature in black ink, appearing to read 'DPCoe'.

Dawn P. Coe, Ph.D., FACSM

NASPEM 2016 Conference Chair



## 2016 NASPEM CONFERENCE COMMITTEES AND BOARD MEMBERS

### CONFERENCE ORGANIZING COMMITTEE

Dawn Coe, Ph.D., Chairperson, The University of Tennessee, Knoxville  
 Bruce Alpert, M.D., The University of Tennessee, Retired  
 Don Dengel, Ph.D., University of Minnesota  
 Joe Eisenmann, Ph.D., Michigan State University  
 Karin Pfeiffer, Ph.D., Michigan State University  
 Ali McManus, Ph.D., The University of British Columbia  
 Ashlyn Schwartz, B.S., The University of Tennessee, Knoxville

### ABSTRACT SELECTION COMMITTEE

Ali McManus, Ph.D., Chairperson, The University of British Columbia  
 Karin Pfeiffer, Ph.D., Michigan State University  
 Emily Guseman, Ph.D., University of Wyoming  
 Shannon Siegel, Ph.D., University of San Francisco

### NASPEM BOARD OF DIRECTORS

President	Karin Pfeiffer, Ph.D., Michigan State University
Past President	Michael McBride, Ph.D., Children's Hospital of Philadelphia
President-Elect	Ali McManus, Ph.D., The University of British Columbia
Treasurer	Bruce Alpert, Ph.D., The University of Tennessee, Retired
Secretary	Patricia Longmuir, Ph.D., Children's Hospital of Eastern Ontario
Board Members	John Cairney, Ph.D., McMaster University
	Don Dengel, Ph.D., University of Minnesota
	Stefan Jackowski, Ph.D., University of Saskatchewan
	Emily Guseman, Ph.D., University of Wyoming
	Lauren Sherar, Ph.D., Loughborough University
	Lanay Mudd, Ph.D., National Institutes of Health
	Keith Tolfrey, Ph.D., Loughborough University
Guest Members	Bareket Falk, Ph.D., Brock University, <i>PES</i> Editor
	Dawn P.Coe, Ph.D., The University of Tennessee, 2016 Conference Chair

## CONFERENCE OBJECTIVES

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

1. Discuss the impact of sickle cell anemia on exercise testing and regular exercise.
2. Describe the key effects of physical activity on cognition.
3. Determine the effects of physical activity interventions on youth with Prader-Willi Syndrome.
4. Discuss the impact of the community on children's health.
5. Describe the growth and maturation process and the impact of physical activity as well as future directions for this area of research.
6. Identify several applications for physical literacy in Pediatric Exercise Science.
7. Explore new challenges facing Pediatric Exercise Science in the areas of Exercise and the Brain, Aerobic Exercise and Training in Pediatrics, and Immune Response to Exercise and Training.

## ACCREDITATION

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)<sup>TM</sup>*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

PAAs, 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.

---

---

**WEDNESDAY, AUGUST 10, 2016**

---

---

2:00 – 7:00 PM	REGISTRATION
2:00 – 5:00 PM	<b>NASPEM BOARD OF DIRECTORS MEETING</b> DOWNTOWN GRILL AND BREWERY
7:30 – 9:00 PM	<b>INAUGURAL DR. TOM ROWLAND SERIES: A FORUM</b> EXPLORING NEW CHALLENGES FACING PEDIATRIC EXERCISE SCIENCE  <b>BAREKET FALK, PH.D.,</b> BROCK UNIVERSITY <b>CHARLES HILLMAN, PH.D.,</b> NORTHEASTERN UNIVERSITY <b>BRIAN TIMMONS, PH.D.,</b> MCMASTER UNIVERSITY  <i>DESSERTS AND CASH BAR</i>

---

---

**THURSDAY, AUGUST 11<sup>TH</sup>, 2016**

---

---

7:00 – 8:00 AM	CONTINENTAL BREAKFAST & REGISTRATION
8:15 – 8:30 AM	<b>WELCOME, KARIN PFEIFFER, NASPEM PRESIDENT</b>
8:30 – 9:30 AM	FEATURED SPEAKER  <b>DR. ROBERT LIEM,</b> ANN & ROBERT H. LURIE CHILDREN'S HOSPITAL OF CHICAGO, NORTHWESTERN UNIVERSITY  <b><i>"APPLYING EXERCISE SCIENCE TO SICKLE CELL ANEMIA: TIME TO GET MOVING"</i></b>
9:30 – 10:30 AM	<b>FREE COMMUNICATION, ORAL</b> MODERATOR: <b>JOHN CAIRNEY, PH.D.,</b> MCMASTER UNIVERSITY
9:30 – 9:45 AM	<b>ALPOUS,</b> CANADIAN PHYSICAL LITERACY (CAPL) SCREEN: SIMPLE, QUICK, AND ACCURATE IDENTIFICATION OF CHILDREN WITH IMPORTANT PHYSICAL LITERACY DEFICITS
9:45 – 10:00 AM	<b>CLARK,</b> PHYSICAL LITERACY IN CHILDREN AND YOUTH: A CONSTRUCT VALIDATION STUDY
10:00 – 10:15 AM	<b>*BEDARD,</b> THE EFFECTIVENESS OF A MOTOR AND PRE- LITERACY COMMUNITY-BASED PROGRAM IN PRESCHOOL AGED CHILDREN
10:15 – 10:30 AM	<b>*ST. LAURENT,</b> EFFECT OF A SUSPENSION-TRAINER BASED MOVEMENT PROGRAM ON FUNDAMENTAL MOVEMENTS IN YOUTH

**\*DENOTES STUDENT RESEARCHER**

10:30 – 10:45 AM	<b>REFRESHMENT BREAK</b>
10:45 – 12:00 PM	<b>FREE COMMUNICATION, ORAL</b> MODERATOR: <b>KARIN PFEIFFER, PH.D.</b> , MICHIGAN STATE UNIVERSITY
10:45 – 11:00 AM	<b>SCHWARTZ</b> , THE IMPACT OF GENDER SEGREGATION ON PHYSICAL ACTIVITY LEVELS IN YOUNG CHILDREN
11:00 – 11:15 AM	<b>GUSEMAN</b> , PARENTAL FACTORS ASSOCIATED WITH PRESCHOOLERS' PHYSICAL ACTIVITY BEHAVIORS.
11:15 – 11:30 AM	<b>OBEID</b> , BARRIERS TO PHYSICAL ACTIVITY AND OBJECTIVELY-MEASURED ACTIVITY IN CHILDREN WITH AND WITHOUT A CHRONIC MEDICAL CONDITION
11:30 – 11:45 AM	<b>*KING-DOWLING</b> , LONGITUDINAL RELATIONSHIP BETWEEN MOTOR PROFICIENCY, SHORT-TERM MUSCLE POWER AND PHYSICAL ACTIVITY IN THE EARLY YEARS
12:00 – 1:00 PM	FEATURED SPEAKER <b>DR, DANIELA RUBIN</b> , CALIFORNIA STATE UNIVERSITY, FULLERTON  <b><i>“PRADER-WILLI SYNDROME: CHALLENGES AND OPPORTUNITIES FOR THE FIELD OF KINESIOLOGY”</i></b>
1:00 – 2:00 PM	LUNCH
2:00 – 3:00 PM	FEATURED SPEAKER <b>DR, DON MORGAN</b> , MIDDLE TENNESSEE STATE UNIVERSITY  <b><i>“PROMOTING ACTIVE LIFESTYLES IN TENNESSEE YOUTH THROUGH COMMUNITY PARTNERSHIPS”</i></b>
3:00 – 4:00 PM	<b>REFRESHMENT BREAK</b> <b>FREE COMMUNICATION, POSTER</b>

4:00 – 5:15 PM	<b>FREE COMMUNICATION, ORAL</b> MODERATOR: <b>ALI MCMANUS</b> , PH.D., THE UNIVERSITY OF BRITISH COLUMBIA
4:00 – 4:15 PM	<b>FALK</b> , EFFECTS OF PLYOMETRIC AND RESISTANCE TRAINING ON MUSCLE STRENGTH AND NEUROMOTOR FUNCTION IN ADOLESCENT SOCCER PLAYERS
4:15 – 4:30 PM	<b>*DYKSTRA</b> , THE USE OF EXERCISE AS A STIMULUS FOR A SHIFT IN FUEL PREFERENCE FOR THE EVALUATION OF METABOLIC FLEXIBILITY IN CHILDREN
4:30 – 4:45 PM	<b>*CHU</b> , THE RESPONSIVENESS OF METABOLIC FLEXIBILITY TO 7 DAYS OF EXERCISE TRAINING IN CHILDREN WITH OBESITY
4:45 – 5:00 PM	<b>*SMALLCOMBE</b> , EFFECT OF SCHOOL-BASED 5-A-SIDE FOOTBALL ACTIVITY ON POSTPRANDIAL LIPAEMIA IN ADOLESCENT BOYS
5:00 – 5:15 PM	<b>TOLFREY</b> , EFFECT OF ACCUMULATED WALKING AND BREAKS IN SITTING TIME DURING A SIMULATED SCHOOL DAY ON POSTPRANDIAL METABOLISM IN INACTIVE ADOLESCENT GIRLS
6:00 PM	<b>DINNER EVENT – NEYLAND STADIUM</b>

---



---

**FRIDAY, AUGUST 12<sup>TH</sup>, 2016**

---



---

7:00 – 8:00 AM	<i>PEDIATRIC EXERCISE SCIENCE</i> EDITORIAL BOARD MEETING
7:00 – 8:00 AM	CONTINENTAL BREAKFAST & REGISTRATION
8:30 – 9:30 AM	<b>ODED BAR-OR MEMORIAL LECTURE-</b> <b>DR. HAN KEMPER</b> , VU UNIVERSITY MEDICAL CENTER <b><i>“(H)ISTORY OF THE AMSTERDAM GROWTH AND HEALTH LONGITUDINAL STUDY (AGAHLS): THE WHO’S, WHY’S, WHERE’S AND WHEN’S OF A LIFETIME RESEARCH”</i></b>

9:30 – 10:30 AM	<b>FREE COMMUNICATION, ORAL</b> MODERATOR: <b>EMILY GUSEMAN</b> , PH.D., UNIVERSITY OF WYOMING
9:30 – 9:45 AM	* <b>BURKART</b> , RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY, SLEEP, AND CLASSROOM BEHAVIOR VARIABLES IN PRESCHOOL CHILDREN
9:45 – 10:00 AM	* <b>PROUDFOOT</b> , INTENSITY OF PHYSICAL ACTIVITY IMPACTS THE RATE OF CHANGE OF ARTERIAL STIFFNESS IN THE EARLY YEARS
10:00 – 10:15 AM	<b>VOLGYI</b> , ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND REGIONAL WHITE MATTER MICROSTRUCTURE IN CHILDREN
10:15 – 10:30 AM	<b>MUDD</b> , RELATIONS AMONG MATERNAL PHYSICAL ACTIVITY DURING PREGNANCY AND OFFSPRING BODY COMPOSITION
10:30 – 10:45 AM	<b>REFRESHMENT BREAK</b>
10:45 – 12:00 PM	<b>FREE COMMUNICATION, ORAL</b> MODERATOR: <b>JOYCE OBEID</b> , PH.D., MCMASTER UNIVERSITY
10:45 – 11:00 AM	* <b>CLEVINGER</b> , ACCELEROMETER SENSITIVITY TO CHANGE BETWEEN UNSTRUCTURED AND STRUCTURED PHYSICAL ACTIVITY
11:00 – 11:15 AM	<b>SHERAR</b> , OBJECTIVELY MEASURED PHYSICAL ACTIVITY OF EXTREME EARLY AND LATE MATURING GIRLS
11:15 – 11:30 AM	* <b>VANDERLOO</b> , SUPPORTING PHYSICAL ACTIVITY IN THE CHILDCARE ENVIRONMENT (SPACE): A CLUSTER RANDOMIZED CONTROLLED TRIAL
11:30 – 11:45 AM	<b>OPEN (ABSTRACT WITHDRAWN)</b>
12:00 – 1:00 PM	FEATURED SPEAKER <b>DR, MATT PONTIFEX</b> , MICHIGAN STATE UNIVERSITY <b><i>“PHYSICAL ACTIVITY INDUCED MODULATIONS IN COGNITION”</i></b>
1:00 – 2:00 PM	<b>LUNCH</b>

2:00 – 3:00 PM	<p>FEATURED SPEAKER</p> <p><b>DR, LEAH ROBINSON</b>, THE UNIVERSITY OF MICHIGAN</p> <p><i>“PHYSICAL LITERACY ... A MEANS TO PROMOTE ACTIVITY AND TRAJECTORIES OF HEALTH FOR CHILDREN”</i></p>
3:00 – 4:00 PM	<p>REFRESHMENT BREAK</p> <p>FREE COMMUNICATION, POSTER</p>
4:00 – 5:00 PM	BUSINESS MEETING
6:00 PM	DINNER EVENT – THE WOMEN’S BASKETBALL HALL OF FAME

---



---

**SATURDAY, AUGUST 13<sup>TH</sup>, 2016**

---



---

7:00 – 8:00 AM	CONTINENTAL BREAKFAST & REGISTRATION
8:30 – 9:30 AM	<p>FREE COMMUNICATION, ORAL</p> <p>MODERATOR: <b>ADAM BAXTER-JONES</b>, PH.D., UNIVERSITY OF SASKATCHEWAN</p>
8:30 – 8:45 AM	<b>ERLANDSON</b> , BONE DENSITY AND ESTIMATED STRENGTH IN CHILDREN WITH CONGENITAL HEART DEFECTS
8:45 – 9:00 AM	<b>JANZ (FRANCIS)</b> , ADOLESCENT PHYSICAL ACTIVITY, MATURATIONAL TIMING AND YOUNG ADULT BONE STRENGTH: IOWA BONE DEVELOPMENT STUDY (IBDS)
9:00 – 9:15 AM	<b>MEZIL</b> , BONE AND EXERCISE OUTCOMES IN HEALTHY CHILDREN AND CHILDREN WITH CHRONIC INFLAMMATORY DISEASE
9:15 – 9:30 AM	<b>HAY</b> , CHARACTERISTICS OF CHILDREN WITH FRACTURES AT DIAGNOSIS OF ALL: THE INFLUENCE OF PHYSICAL ACTIVITY
9:30 – 10:30 AM	FREE COMMUNICATION, POSTER
10:30 – 10:45 AM	REFRESHMENT BREAK

10:45 – 12:00 PM

**“THE YEAR THAT WAS”**

*PEDIATRIC EXERCISE SCIENCE* EDITORIAL STAFF

12:00 – 12:45 PM

**STUDENT AWARDS**

**PWP 2017**

**NASPEM 2018**

*PASSING THE GAVEL*

*ADJOURNMENT*

12:45 – 1:00 PM

PICK UP BOXED LUNCH

1:00 – 6:00 PM

DAY TRIP TO THE GREAT SMOKY MOUNTAINS NATIONAL PARK

## **FEATURED SPEAKERS**



**DR. HAN KEMPER**

***ODED BAR-OR MEMORIAL LECTURE  
SPEAKER***

***(H)ISTORY OF THE AMSTERDAM GROWTH AND  
HEALTH LONGITUDINAL STUDY (AGAHLS): THE  
WHO'S, WHY'S, WHERE'S AND WHEN'S OF A  
LIFETIME RESEARCH.***

Dr. Kemper retired from VU University Medical Center in the EMGO+ Institute for Care and Health Research. Dr. Kemper was the principal investigator of the Amsterdam Growth and Health Longitudinal Study from 1974 until 2004. Dr. Kemper's publications from this study exceed 300 articles and 10 book chapters and books. Dr. Kemper currently serves as the European Editor of *Pediatric Exercise Science*.



**DR. ROBERT LIEM**

***APPLYING EXERCISE SCIENCE TO SICKLE CELL  
ANEMIA: TIME TO GET MOVING***

Dr. Robert Liem is a pediatric hematologist in the Division of Hematology, Oncology, and Stem Cell Transplant at Ann & Robert H. Lurie Children's Hospital of Chicago and the Director of the Comprehensive Sickle Cell Disease Program. He is also an Associate Professor of Pediatrics at the Northwestern University Feinberg School of Medicine. His primary clinical interests relate to disorders of hemoglobin, including sickle cell disease and thalassemia. His clinical research program focuses on cardiopulmonary disease and exercise physiology in children and adolescents with sickle cell anemia. He currently holds a NHLBI K23 award, entitled, "The Physiologic Assessment of Exercise Capacity in Pediatric Sickle Cell Anemia". This project aims to study cardiopulmonary responses to exercise, the acute inflammatory effects of exercise, as well as longitudinal changes in fitness in children and young adults with sickle cell anemia. Other research areas of interest include habitual physical activity, aerobic conditioning and vascular function in this population.



**DR. DANIELA RUBIN**

***PRADER-WILLI SYNDROME: CHALLENGES AND OPPORTUNITIES FOR THE FIELD OF KINESIOLOGY***

Dr. Daniela Rubin is an Associate Professor in Kinesiology at California State University Fullerton. Her area of study is exercise physiology, with an emphasis in exercise endocrinology. Since 2008 Dr. Rubin has focused her projects on the topic of Prader-Willi Syndrome, Childhood Obesity and Physical Activity funded by the Department of Defense. She has evaluated hormonal, metabolic and inflammatory responses to exercise of different modalities and the role of excess body fat in youth and adults. Dr. Rubin is also interested in the promotion of an active lifestyle in children and adolescents. Since she has been at CSUF, she has worked in community and family based physical activity interventions for youth. Her team has tested a physical activity curriculum to be used at home in children with and without disability called **“Active Play at Home”** and is currently testing another physical activity curriculum for children ages 4-7 (***Home-based Active Play for Parents and Youth-Early Beginnings***).



**DR. DON MORGAN**

***PROMOTING ACTIVE LIFESTYLES IN TENNESSEE YOUTH THROUGH COMMUNITY PARTNERSHIPS***

Dr. Don Morgan is a Professor in the Department of Health and Human Performance at Middle Tennessee State University and Director of the Center for Physical Activity and Health in Youth. A Past-President of the North American Society for Pediatric Exercise Medicine, Dr. Morgan is a Fellow of the American College of Sports Medicine, the National Academy of Kinesiology, and the American Academy for Cerebral Palsy and Developmental Medicine. Over the past decade, Dr. Morgan’s research and public health promotion efforts, which have focused on enhancing mobility and physical fitness and increasing the activity and fitness levels of youth in Tennessee, have been funded by the National Institutes of Health and the Centers for Disease Control and Prevention.



***DR. MATT PONTIFEX***

***PHYSICAL ACTIVITY INDUCED MODULATIONS IN COGNITION***

Dr. Pontifex is an assistant professor in the Department of Kinesiology at Michigan State University. He conducts research in the area of cognitive kinesiology with a focus towards examining the relation between health-oriented behaviors and higher-order cognitive function during preadolescence; and the application of these health-oriented behaviors as a means for improving cognitive health, academic performance and overall effective functioning during maturation.



***DR. LEAH ROBINSON***

***PHYSICAL LITERACY ... A MEANS TO PROMOTE ACTIVITY AND TRAJECTORIES OF HEALTH FOR CHILDREN***

Leah E. Robinson is an Associate Professor of Movement Science in the School of Kinesiology and Research Associate Professor in the Center for Human Growth and Development at the University of Michigan. She is a Fellow in the American College of Sports Medicine. She completed a Doctorate of Philosophy in Sport and Exercise Science at The Ohio State University. Her research agenda takes a developmental perspective to three complementary areas: motor skill acquisition, physical activity, and developmental health in preschool and school-age children.

Specifically, she seeks to maximize motor skills and physical activity in pediatric populations through the design and implementation of evidence-based interventions (i.e., CHAMP). Her research has been funded by the National Institutes of Health and the Robert Wood Johnson Foundation.

## INAUGURAL DR. TOM ROWLAND SERIES

A FORUM EXPLORING NEW CHALLENGES FACING PEDIATRIC EXERCISE SCIENCE



A group of speakers will provide the inaugural series named for Dr. Tom Rowland. The line-up of speakers includes: Bareket Falk (Brock University), Charles Hillman (Northeastern University), and Brian Timmons (McMaster University). These researchers will speak on the challenges in the field of pediatric exercise science. Topics of this series include the need for self-assessment, exercise and the brain, and the immune response to exercise and training.

# ABSTRACTS – FREE COMMUNICATIONS, ORAL

## THURSDAY, AUGUST 11<sup>TH</sup>, 2016

9:30-9:45 AM

---

### Canadian Physical Literacy (CaPL) Screen: Simple, Quick, and Accurate Identification of Children with Important Physical Literacy Deficits

A. Alpous & PE. Longmuir, The Children's Hospital of Eastern Ontario Research Institute

**Background:** Physical literacy is the motivation, physical competence and knowledge to engage in physical activity for life. Valid and reliable physical literacy assessments may require time, space, training and resources that exceed what is available in community settings. We sought to develop simple and quick physical literacy screening tasks that could identify children with limited physical literacy in a variety of settings. **Methods:** Participants were 263 children, 8 to 12 years (59.3% female), recruited from recreation, education and healthcare settings. They performed the Canadian Assessment of Physical Literacy (CAPL), a detailed assessment of a child's capacity for a physically active lifestyle. Children also performed 8 potential physical literacy screening tasks, including one test of strength, two balance tests, one endurance test, questions related to physical activity and four motor skills assessments. Sensitivity and specificity scores for each screening task and for combined pairs of screening tasks were calculated based on above/below the 10<sup>th</sup> percentile for CAPL score. **Results:** Individual screening tasks and total CAPL physical literacy score were significantly but moderately correlated (range: 0.22 to 0.44;  $p < 0.01$ ). Sensitivity of individual screening tasks to identify children below the 10th percentile for CAPL score ranged from 60% to 100%. Specificity ranged from 9.6% to 87.8%. Two combination protocols were identified as having high specificity and sensitivity: a) self-reporting activity level as compared to peers, below 6 out of 10 and a forward and backward running task, below 3 out of 4 (90.0% sensitivity, 80.0% specificity) and b) answering two parents support questions, answering never, not often or sometimes and a wall sit for less than 20 seconds (89.2% sensitivity, 66.7% specificity). **Discussion:** Two sensitive and specific physical literacy screening protocols for children 8 to 12 years of age were identified. Self-reported activity relative to peers combined with backward running had higher sensitivity, but required a larger space. Specificity was slightly lower for the parent support questions plus wall sit, but the protocols can be completed with very limited space. Future research should evaluate the reliability of the screening protocols and screening task suitability for children with identified disabilities/chronic illnesses.

9:45-10:00 AM

---

### Physical Literacy in Children and Youth: A Construct Validation Study

J. Cairney, H. Clark, McMaster University

**Background:** Physical literacy has been proposed as foundational to maintaining physical activity throughout the life-course (Higgs, 2010). Yet, the paucity of research on physical literacy has contributed to confusion regarding the construct and its relationship with physical activity. Concern has been raised regarding the tendency to conflate physical literacy with fundamental movement skills (Whitehead, 2012). However, we propose that the inclusion of physical activity, fitness, and body composition within the construct (Longmuir et al., 2013) is of equal concern. The current study investigated a model of physical literacy consistent with Whitehead's (2012) conceptual definition that includes motor ability, perceived competence, enjoyment, and motivation. **Methods:** We assessed a sample of grade 5 students ( $N = 1,448$ ) and grade 7 students ( $N = 698$ ) from the Physical Health and Activity Study Team (PHAST) Study. We used items from existing measures to capture the following proposed domains of physical literacy: **Motor ability** was measured using the Bruininks–Oseretsky test of motor proficiency—Short form BOTMP-SF (Bruininks, 1978) subscales; **Perceived competence** in physical activity was measured using Harter's (1985) Self-Perception Profile for Children athletic self-concept subscale; **Enjoyment** was measured using the enjoyment of physical education subscale of the Children's Self-perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA; Hay, 1992); and **Motivation** was assessed using the predilection subscale of the CSAPPA. **Results:** A comparison between bifactor, hierarchical, and unidimensional models indicated physical literacy was best represented by a bifactor model in both the grade 5 ( $X^2(270) = 460.013, p < .001, RMSEA = .022, CFI = .987$ ) and grade 7 samples ( $X^2(271) = 271, p < .001, RMSEA = .022, CFI = .992$ ). Most items moderately loaded both onto the general physical literacy construct and the specific factors (e.g., motor ability, enjoyment). **Discussion:** Our results supported a multidimensional physical literacy construct that is consistent with the conceptual definition of physical literacy (Higgs, 2010; Whitehead, 2012). This study suggests the need to develop measures of physical literacy consistent with the construct identified in the current study. Future research is needed to investigate the relationship between physical literacy and physical activity.

10:00-10:15 AM

---

### The Effectiveness of a Motor and Pre-literacy Community-based Program in Preschool Aged Children

C. Bedard, E. Bremer, W. Campbell, J. Cairney, McMaster University

**Background:** Children begin developing fundamental motor skills, such as running and kicking, and pre-literacy skills, such as print awareness, during early childhood. Optimal development of these domains does not always occur naturally (especially in the context of an increasingly sedentary culture); however, they will when the child has opportunities to participate in early childhood education or programs that directly attend to these domains. The design of such programs should consider the relationship between motor abilities and complex cognitive abilities. Furthermore, given the high prevalence of inactivity, overweight/obesity, lack of school readiness, and motor coordination challenges, these programs should be designed for children across the spectrum of development including children with typical development since it is clear Canadian children are not developing optimally. Therefore, the objective of this study is to evaluate the effectiveness of a motor and pre-literacy skill program for a community sample of 3-4 year old children. **Methods:** A quasi-experimental study design was used to evaluate the program in 19 families (experimental group,  $n=8$ ; control group,  $n=11$ ). The program was run for one hour/week for 10 consecutive weeks and consisted of motor skill instruction, free-play, and an interactive reading circle. Motor and pre-literacy skills were assessed in all children pre- and post-intervention using the Peabody Developmental Motor Scales-2 and the Preschool Word and Print Awareness tool. **Results:** The average age of the children is 44 months and 47% were males. Two one-way ANCOVAs were conducted to detect a difference between experimental and wait-list control group on gross motor skills (stationary, locomotor, and object manipulation) and print awareness controlling for baseline scores. There was a significant effect of group on gross motor raw scores overall ( $F(1, 16)=4.67, p<.05$ ) and print awareness ( $F(1, 16)=11.9, p<.05$ ), after controlling for baseline scores. **Discussion:** This study was one of the first to examine the impact of a motor skill and pre-literacy program in preschool children with typical development. The results of this study will inform the continued development of the program as it becomes implemented in local and regional communities in Ontario, Canada.

10:15-10:30 AM

---

### Effect of a Suspension-Trainer Based Movement Program on Fundamental Movements in Youth

C. St. Laurent, B. Masteller, T. St. Laurent, S. Alhassan, and J. Sirard, University of Massachusetts Amherst

**Background:** Suspension-training (S-T) is a physical activity modality that may have potential to improve functional movement in youth, but has not been studied in this population. The Functional Movement Screen™ (FMS) can identify potential movement deficiencies that may increase children's risk of injury and likelihood of developing poor movement patterns. The purpose of this analysis was to assess the efficacy of a S-T movement program, compared with controls, on the fundamental movements assessed by the FMS. **Methods:** Children (n=28) who participated in at least one organized sport (46% male; mean±sd: age 9.3±1.5 yrs; BMI percentile 68.6±27.5) were randomly assigned to intervention (INT; n=17) or control (CON; n=11) groups. The FMS movements were scored (range 1 to 3) at baseline and follow-up and included the deep squat, hurdle step, inline lunge, shoulder mobility, active straight-leg raise, trunk stability pushup, and rotary stability. The INT group participated in a six-week S-T movement program for two one-hour sessions per week, adapted from a new school-based S-T curriculum. Regression models assessed the effects of time and time by treatment group interaction and were adjusted for age. **Results:** The INT participants significantly improved in all FMS fundamental movement scores ( $p \leq 0.04$ ), except in shoulder mobility ( $p = 0.13$ ). The average improvement in movement scores for the INT group was  $0.59 \pm 0.59$  (range 0.24 to 0.76), while the scores for the CON group decreased slightly ( $-0.13 \pm 0.61$ ). **Discussion:** The S-T based movement program used in this study may be beneficial in improving fundamental movements in youth who participate in at least one organized sport. Research has shown that inactive and overweight youth are at a higher risk of poor functional movement and therefore, score lower on the FMS. Future youth S-T interventions would benefit from larger, more diverse samples and fitness practitioners may want to incorporate S-T into youth programming to improve functional movement. Supported by: Equipment donation by Fitness Anywhere, LLC, San Francisco, CA

10:45-11:00 AM

---

### The Impact of Gender Segregation on Physical Activity Levels in Young Children

Ashlyn N. Schwartz, Dawn P. Coe, and Hillary N. Fouts, University of Tennessee

**Background:** The Energetic/Behavioral Synchrony hypothesis states that energy expenditure influences social segregation. This theory has been supported by studies during middle and late childhood, when gender segregation by activity level typically peaks. However, there is limited research on physical activity levels and the emergence of gender segregation in early childhood. Therefore, the purpose of this study was to determine patterns of gender segregation and physical activity levels among preschool and kindergarten children during outdoor free play.

**Methods:** Participants were 42 young children (4.7 ±0.7 y) enrolled in a University laboratory school. Each child was observed by a trained researcher every 30 seconds during a 10-minute interval while engaging in outdoor play. Social composition was coded by gender make-up (solitary, same gender, different gender, and mixed-gender). Physical activity level was assessed using the ActiGraph GT3X+ accelerometer. Accelerometer data were downloaded as activity counts and were converted to counts per minute (CPM) for data analysis. Higher CPM indicates higher intensity activity. Independent-samples T-tests were used to determine differences in activity levels (CPM) between genders (boys and girls) and among social groups (solitary, same gender, different gender, and mixed-gender). **Results:** No differences were found in activity levels among social compositions (1,691.3±846.5 CPM solitary;  $p = 0.531$ , 1,810.9±795.7 CPM same gender;  $p = 0.432$ , 1,961.0±1,471.2 CPM different gender;  $p = 0.552$ , 1,534.8±595.3 CPM mixed gender;  $p = 0.749$  or by gender (1,575.7±658.6 CPM girls vs. 1,830.5±896.3 CPM boys;  $p = 0.409$ ). The majority of children played alone or with a child of the same gender (85.7% and 73.8%, respectively) during outdoor play time. Only 28.6% spent some time playing with a child of another gender and 38.9% played in a mixed-gender group. **Conclusion:** Gender segregation does not appear to affect activity levels in young children. However, it appears that the children in this sample spent most of their time solitary or with a child of the same gender, which may eventually lead to further gender segregation and differences in activity levels. Further investigation using a larger sample size and time of observation is warranted to establish this association as well as to determine patterns of social composition and its effect on physical activity levels.

11:00 -11:15 AM

---

### Parental factors associated with preschoolers' physical activity behaviors.

Emily Hill Guseman, Cassandra Ayres, Madison Moller, Kara Purcelley, and Katherine Wilkins

University of Wyoming

**Background:** Previous studies investigating parental factors associated with preschooler physical activity (PA) are inconclusive and often do not consider two year-old children or seasonal variation in parental behavior. Therefore, the purpose of this study was to identify parent factors associated with PA in 2 to 5 year-old children, and how these factors vary by season. **Methods:** Participants in this study were invited to complete an online version of the Preschool Physical Activity Questionnaire (Pre-PAQ) via advertisements on social media, email, and word of mouth. Parents who provided an email address in winter 2016 were invited to participate again in spring 2016. Parents were classified with respect to physical activity recommendations ( $\pm 150$  min/week). Children's PA and outdoor play were adjusted for age and compared between parent PA groups. Partial correlations controlling for child age were calculated to compare parent and child PA levels and multinomial logistic regression was used to examine factors associated with parental encouragement of child PA. Data here represent the winter 2016 survey only. **Results:** Child time in non-sedentary activity was weakly correlated with parent MVPA and walking time on weekdays, but not weekends. Children of parents who met PA recommendations participated in more outdoor play on weekdays ( $60.1 \pm 6.8$  min/day vs.  $39.0 \pm 6.1$  min/day) and weekends ( $62.4 \pm 6.2$  min/day vs.  $45.4 \pm 5.6$  min/day) than children of parents who did not meet PA recommendations. Further, parents who did not meet PA recommendations were 82% less likely to report encouraging their children to play outdoors when the weather is suitable. **Conclusion:** Parent PA is associated with children's weekday, but not weekend, PA while only outdoor playtime levels varied between parent PA groups. This suggests that physically active parents may be more mindful of their children's opportunities for outdoor play and more likely to encourage such activity during the week. Weekend activity may be less constrained by commonly experienced barriers to PA, such as perceived lack of free time.

11:15 - 11:30 AM

---

### Barriers to physical activity and objectively-measured activity in children with and without a chronic medical condition

J Obeid, T. Nguyen, H.E. Ploeger, and B.W. Timmons, McMaster University

**Background:** Children with chronic medical conditions often present with low levels of physical activity compared with their healthy peers. Understanding perceived barriers to physical activity may allow for more targeted and effective interventions to improve regular participation in activity in these youth. The aim of this study was to compare perceived barriers to physical activity in children with and without a chronic medical condition, and to examine the association between these self-reported barriers and objectively-measured physical activity. **Methods:** Children diagnosed with a single chronic medical condition (CMC,  $n=74$ ) of juvenile idiopathic arthritis ( $n=11$ ), cystic fibrosis ( $n=13$ ), inflammatory bowel disease ( $n=19$ ), type 1 diabetes mellitus ( $n=16$ ), or survivors of brain cancer ( $n=16$ ), and healthy controls (HC,  $n=30$ ) completed a questionnaire on perceived barriers to physical activity. Items were scored on a 5-point scale (1=never to 5=often), and averaged within 6 categories: body-, resource-, social-, fitness-, convenience-, and disease-related barriers. Participants were then asked to wear an ActiGraph GT1M accelerometer over the right hip for a 7-day period. Activity data were collected in 3-sec epochs, and analyzed for sedentary time (SED), light (LPA), moderate (MPA), vigorous (VPA), and moderate-to-vigorous (MVPA) physical activity normalized to wear time. **Results:** Perceived barriers and activity by intensity were similar across CMC ( $F=0.2941.566$ ,  $p>0.193$ ). Compared with HC, CMC demonstrated a trend towards higher total barriers (mean $\pm$ SD; HC vs. CMC:  $1.5\pm 0.3$  vs.  $1.7\pm 0.4$ ,  $p=0.051$ ). Body-, convenience-, and resource-related barriers were similar in HC and CMC ( $p>0.5$ ), a trend towards elevated social-related barriers ( $1.5\pm 0.4$  vs.  $1.7\pm 0.6$ ,  $p=0.064$ ) and significantly elevated fitness- ( $1.2\pm 0.3$  vs.  $1.4\pm 0.6$ ,  $p=0.011$ ) and disease-related ( $1.0$  vs.  $1.7\pm 0.9$ ,  $p<0.001$ ) barriers were observed in CMC. MVPA was lower in CMC ( $5.3\pm 2.1$  vs.  $4.3\pm 1.6$  min/hr,  $p=0.021$ ), which was likely due to lower VPA ( $2.3\pm 1.3$  vs.  $1.7\pm 0.9$  min/hr,  $p=0.012$ ). Only time spent in VPA was negatively associated with total barriers, as well as body- and social-related barriers ( $\rho=-0.242$  to  $-0.277$ ,  $p<0.03$ ). **Discussion:** Perceived barriers to physical activity were elevated in CMC compared with their healthy peers. Individual perception of body- and social-related factors may influence time spent in vigorous physical activity, and may be important considerations for future study design.

11:30 -12:00 PM

---

### Longitudinal relationship between motor proficiency, short-term muscle power and physical activity in the early years

S. King-Dowling, N.A. Proudfoot, N. Di Cristofaro, H.A.T. Caldwell, J. Cairney, B.W. Timmons, McMaster University

**Background:** Motor skill competence is positively associated with fitness levels in children and adolescents. It is hypothesized that physical activity is an important mediator in this relationship, however this has not been directly tested using longitudinal data in young children. The purpose of this study was to determine if motor proficiency predicts short-term muscle power (STMP) over time from preschool to early childhood and whether or not this relationship is mediated by vigorous physical activity (VPA). **Methods:** Participants 3 to 5 years of age were recruited and completed 3 annual assessments as part of the Health Outcomes and Physical activity in Preschoolers (HOPP) Study. Motor proficiency was assessed using the Bruininks-Oseretsky Test of Motor Proficiency 2<sup>nd</sup> Edition – Short Form. STMP, including peak power (PP) and mean power (MP), was evaluated using a modified 10-second Wingate protocol on a cycle ergometer. Physical activity was measured over 7-days using accelerometers and was analyzed in 3-second epochs to determine average daily minutes of VPA. Only children who wore the accelerometer  $\geq 10$  hours on  $\geq 3$  days were included in the analyses. Mixed effects modeling was used to determine if motor proficiency predicts STMP over time, controlling for age at baseline, sex, height and weight, and if VPA mediates this relationship. **Results:** 419 children (208 girls, age  $4.5 \pm 0.9$  years at baseline) participated. Overall motor proficiency was a significant predictor of absolute STMP (PP estimate=0.55,  $p < .001$ ; MP estimate=0.66,  $p < .001$ ) and VPA (estimate=0.20,  $p < .001$ ) in both boys and girls over time. Although VPA also predicted STMP (PP estimate=0.13,  $p = .001$ , MP estimate=0.16,  $p < .001$ ) it did not mediate the relationship between motor proficiency and STMP.

**Discussion:** Motor competence is a strong predictor of STMP from preschool to early childhood in both boys and girls, independent of VPA engagement. Motor proficiency may hinder performance on fitness tests due to high coordination demands. Motor proficiency may be an important target for intervention to improve both PA and fitness performance in early childhood.

Supported by the Canadian Institutes of Health Research (CIHR).

4:00 -4:15 PM

---

### Effects of Plyometric and Resistance Training on Muscle Strength and Neuromotor Function in Adolescent Soccer Players

B. McKinlay, P. Wallace, R. Dotan, D. Long & B. Falk, Faculty of Applied Health Sciences, Brock University, St Catharines, ON, Canada

**Background:** Resistance and plyometric training have been widely studied among adult athletes, but much less so in child athletes. **Aim:** To examine the differential effects of 8-week resistance (RT) or plyometric (PLYO) training (in addition to regular, sport-specific training) on static and dynamic knee-extension peak torque (pT), peak rate of torque development (pRTD), and on jump performance, in adolescent male soccer players. **Methods:** Forty one 11–13-year-old players were divided into three groups: RT (n=14), PLYO (n=13), and control (CON; n=14). Participants performed five maximal isometric and five maximal isokinetic (240°/s) knee extensions pre- and post-training. pT, pRTD, rate of initial muscle activation ( $Q_{30}$ ), and jump performance were examined. **Results:** Both RT and PLYO resulted in significant ( $p < 0.05$ ) increases in pT (18 and 13%, respectively), pRTD (12 and 18%, respectively) and jump performance (8 and 14%, respectively). Compared with CON, RT resulted in significantly greater increases in both isometric and isokinetic pT, while PLYO resulted in increases in isometric pRTD and jump performance.  $Q_{30}$  increased 20% in PLYO, 5% in RT, and –5% in CON ( $p = 0.1$ ). There was no training effect on the time to attain the 240°/s velocity. **Discussion:** In adolescent soccer players, as in adults, RT appears more effective in increasing maximal strength, while PLYO is more advantageous in enhancing explosive strength. PLYO had no advantage in fast dynamic contractions. PLYO, but not RT, increased (isometric) rate of muscle-activation in adolescent athletes. The mechanism behind this PLYO effect is presently unclear.

4:15 -4:30 PM

---

### The Use of Exercise as a Stimulus for a Shift in Fuel Preference for the Evaluation of Metabolic Flexibility in Children

B. Dykstra, M. Hidde, J. Erichsen, A. Mahon, Ball State University

**Background:** Metabolic flexibility is the ability to switch fuel preference between fat and carbohydrate in response to a given stimulus. Some common methods for assessing metabolic flexibility are invasive and not practical for use in children. The purpose of this study was to explore the possibility of using prior exercise as stimulus for measuring metabolic flexibility with respect to fat metabolism. **Methods:** Boys and girls (n=10) participated in this study. Participants reported to the laboratory for two visits. On the first visit, anthropometric measurements were obtained and a graded exercise test to maximal effort was performed. The second visit occurred in the morning, one hour post-prandial, following standardized meals for the preceding dinner and breakfast. Two 20-minute exercise bouts were completed. The first bout consisted of 10 minutes at 50% of  $VO_{2max}$  followed by 10 minutes at 75% of  $VO_{2max}$ . Following a 10-minute break, the second bout was performed at 50% of  $VO_{2max}$ . Univariate tests of significance were used to evaluate fat oxidation responses (percent fat use [%FAT] and rate of fat use [FOX]) at 10 minutes of the first bout and 5, 10, 15, and 20 minutes of the second bout. Statistical significance was set at  $p \leq 0.05$ . **Results:** Subjects were  $10.4 \pm 1.6$  years, pubertal stage 1 or 2, according to Tanner, and had a  $VO_{2max}$  of  $1.52 \pm 0.37$  L·min<sup>-1</sup> ( $44.2 \pm 7.9$  ml·kg<sup>-1</sup>·min<sup>-1</sup>). From the first bout to the end of the second bout, %FAT ranged from  $28 \pm 10\%$  to  $42 \pm 8\%$  and FOX ranged from  $0.105 \pm 0.045$  g·min<sup>-1</sup> to  $0.157 \pm 0.050$  g·min<sup>-1</sup>. Values in the first bout were significantly lower than at any point during the second bout. **Discussion:** The increase in fat oxidation during the second exercise bout is evidence of metabolic flexibility in fat metabolism. This suggests that a prior exercise bout may be a sufficient stimulus to evaluate metabolic flexibility. This finding is particularly useful for research involving children because of the challenges associated with some of the methods for evaluating metabolic flexibility. Additionally, because of the importance of skeletal muscle as a metabolic regulator, using an exercise stimulus may have an advantage over assessing metabolic flexibility at rest.

4:30 -4:45 PM

---

### Exercise Training in Children with Obesity

L. Chu, K.M. Morrison, M.C. Riddell, S. Raha, B.W. Timmons, McMaster University; York University

**Background:** The capacity to match carbohydrate (CHO) utilization with CHO availability (i.e., metabolic flexibility) is important, especially for children at risk for developing type 2 diabetes. In adults, impaired metabolic flexibility is associated with insulin resistance, and evidence suggests that 7--days of exercise training can improve insulin resistance. The responsiveness of metabolic flexibility to exercise training in children is unknown. We hypothesized that 7--days of exercise training would improve metabolic flexibility and insulin resistance in children with obesity. **Methods:** Participants visited the McMaster Children's Hospital on 2 separate days before and after 7 consecutive days of exercise training. At visit 1, fasting blood work was completed, and anthropometry, body composition and aerobic fitness ( $VO_{2max}$ ) were assessed. At visit 2, a <sup>13</sup>C--enriched CHO drink was ingested 30 min before exercise (3 x 20 min bouts with 5 min breaks) at 45%  $VO_{2max}$ . Breath measurements were collected to calculate exogenous CHO oxidation and determine the oxidative efficiency of exogenous CHO (metabolic flexibility). Stationary bikes were transported to the participant's homes for supervised sessions, which consisted of alternating between continuous exercise (3 x 15 min at 80% HR<sub>max</sub>) and high intensity interval exercise (6 sets of 4 x 15 sec sprints). Visits 1 and 2 were then repeated at least 48 hours after the exercise training. **Results:** Preliminary results showed 7 out of the 9 participants improved their metabolic flexibility after exercise training ( $20.8 \pm 1.9\%$  to  $23.4 \pm 2.7\%$ ), but mean differences were not significant in the entire group ( $20.7 \pm 1.9\%$ ,  $21.8 \pm 4.2\%$ ;  $p=0.33$ ). As expected, no changes in percent body fat ( $44.6 \pm 5.2\%$ ,  $44.6 \pm 5.4\%$ ;  $p=1.00$ ) or  $VO_{2max}$  ( $22.5 \pm 5.1$  ml/kg/min,  $22.3 \pm 3.7$  ml/kg/min;  $p=0.83$ ) were found after training. **Discussion:** These findings suggest that 7--days of exercise training improved metabolic flexibility in some children with obesity, but not all. Future analysis will be conducted in more participants to confirm. HOMA--IR will also be measured to determine if exercise training improved insulin resistance. This research was funded by the Canadian Institutes of Health Research.

4:45 -5:00 PM

---

### Effect of school-based 5-a-side football activity on postprandial lipaemia in adolescent boys

J.W. Smallcombe, L.A. Barrett, K. Tolfrey, Loughborough University

**Background:** An acute bout of prior, moderate- to high-intensity exercise attenuates postprandial lipaemia (PPL) in young people. However, the laboratory based exercise known to induce this desirable physiological response bears little resemblance to the free living physical activities in which young people typically engage. Therefore, this study was designed to compare the effect of laboratory based treadmill exercise and free-living afterschool football activity on PPL in adolescent boys. **Methods:** Fifteen boys (12.6 (0.5) years) completed three, 2-day experimental conditions. On day 1, participants either: rested (CON); exercised for 48 min on a treadmill at 60% peak  $\text{VO}_2$  (TM-EX); or played 48 min of 5-a-side football (FBALL). On day 2, participants attended school where a capillary blood sample was provided to determine fasting triacylglycerol concentration ([TAG]). Participants then consumed a standardised breakfast (0 h) and lunch (4.5 h) and blood samples were provided postprandially at 2.5, 5.0 and 7.0 h for [TAG]. **Results:** During TM-EX a heart rate of 157 (7)  $\text{beats}\cdot\text{min}^{-1}$  was elicited and a total distance of 5.9 (0.5) km was covered. In contrast, during FBALL a heart rate of 175 (8) was elicited and a total distance of 3.5 (0.4) km was covered. Based on ratios of geometric means, fasting [TAG] was lower after TM-EX (95% CI = -27 to -2%, ES = 0.46) and FBALL (95% CI = -41 to -18%, ES = 1.00) compared with CON. Fasting [TAG] was also significantly lower in FBALL compared with TM-EX (95% CI = -25 to -5%, ES = 0.53). The total area under the [TAG] versus time curve (TAUC-TAG) was 17% lower in TM-EX vs. CON (95% CI = -29 to -4%, ES = 0.49) and 23% lower in FBALL vs. CON (95% CI = -33 to -12%, ES = 0.69). Although TAUC-TAG was 7% lower in FBALL compared with TM-EX, this difference was trivial and did not reach statistical significance (95% CI = -19 to 6%, ES = 0.19). **Discussion:** Small sided, afterschool football activity attenuates PPL in adolescent boys. The metabolic responses to small sided football activity are similar to those observed after laboratory-based treadmill exercise.

5:00 -5:15 PM

---

### Effect of accumulated walking and breaks in sitting time during a simulated school day on postprandial metabolism in inactive adolescent girls

K.Tolfrey, J.W. Smallcombe, L.A. Barrett, Loughborough University

**Background:** The number of girls meeting age-specific physical activity recommendations declines precipitously during adolescence. Alternative forms of accessible physical activity that may confer benefit to the long-term metabolic health of this population represents an important avenue for research. This study aimed to assess the effect of short, repeated bouts of walking and breaks in sitting time on postprandial metabolism in inactive adolescent girls. **Methods:** Seventeen girls (12.8 (0.4) years) completed two, 3-day experimental conditions. On each of days 1 and 2 of the physical activity condition (PA), participants completed 4 × 10 min bouts of self-paced treadmill walking and accumulated 18 × 5 min standing bouts over the course a simulated school day (07:30 to 15:30). On PA day 3, participants attended school as normal with no additional physical activity prescribed. On all 3 days of the control condition (CON), participants attended school as normal with no specific physical activity prescribed. On days 2 and 3 of both PA and CON, a capillary blood sample was provided to determine fasting [TAG] and [glucose]. Participants then consumed a standardised breakfast (0 h) and lunch (4.7 h) and blood samples were provided postprandially at 2.7, 5.3 and 7.3 h for [TAG] and [glucose]. **Results:** The mean 10 min, treadmill walking speed of 5.8 (0.3)  $\text{km}\cdot\text{h}^{-1}$  elicited a heart rate of 143  $\text{beats}\cdot\text{min}^{-1}$  and OMNI rating of 2 (easy). Dietary intake and composition 24 h before day 1 was similar between PA and CON (ES≤0.27). Linear mixed model analyses indicated that total areas under the time curves for natural logs of triacylglycerol (TAG) and glucose were not meaningfully different between PA and CON (ES≤0.04) and the changes from day 2 to 3 were consistent between PA and CON (ES=0.10). **Discussion:** The combined accumulation of 260 min of walking and breaks in sitting time over two consecutive simulated school days in the PA condition was insufficient to attenuate postprandial lipaemia or glycaemia in inactive adolescent girls compared with standard school attendance (CON). Further research is required to assess the effect of long-term adherence to light activity and breaks in sitting time on postprandial metabolism.

# ABSTRACTS – FREE COMMUNICATIONS, ORAL

## FRIDAY, AUGUST 12<sup>TH</sup>, 2016

9:30 -9:45 AM

---

### **Relationships between Physical Activity, Sleep, and Classroom Behavior Variables in Preschool Children**

S. Burkart, C. St. Laurent, C. Greever, M. Ahmadi, and S. Alhassan, University of Massachusetts Amherst

**Background:** Nearly half of all preschoolers are not meeting physical activity (PA) guidelines. Currently, very few studies have examined the impact of PA programs incorporated into the preschool day, and none have implemented a PA program rooted in their academic curriculum. PA has been shown to improve on-task behavior, one component of classroom behavior, in preschoolers. Poor classroom behavior has been associated with sleep habits. However, current data provide conflicting evidence for PA and sleep relationships in children. The purpose of this secondary analysis was to examine associations between sedentary behavior, PA, sleep habits, and classroom behavior variables in preschool children. **Methods:** Baseline data from children ( $n=52$ , age= $3.6\pm 0.8$  years, BMI percentile= $50.1\pm 27.1$ ) in two preschools participating in the Preschool Activity, Diet, and Sleep (PADS) Pilot Study was utilized for this analysis. Both sedentary behavior and PA were measured with an Actigraph accelerometer for seven consecutive days. The Strengths and Difficulties Questionnaire behavioral screening tool was used to assess classroom behavior. This 25-item form was completed by teachers and includes subscales encompassing hyperactivity/inattention, emotional symptoms, conduct problems, peer problems, and prosocial behavior. Parents completed the Sleep Disturbance Scale to assess sleep habits. Pearson correlations were used to examine associations between physical activity, sleep, and classroom behavior variables. **Results:** Sedentary behavior (% time) was negatively associated with conduct problems ( $r=-0.46$ ,  $p=0.005$ ) and peer problems ( $r=-0.34$ ,  $p=0.04$ ). Light activity (% time) was positively associated with conduct problems ( $r=0.51$ ,  $p=0.002$ ), peer problems ( $r=0.43$ ,  $p=0.01$ ), and total behavior difficulty score ( $r=0.42$ ,  $p=0.01$ ). Moderate-to-vigorous PA (% time) was positively associated with conduct problems ( $r=0.39$ ,  $p=0.02$ ). Sleep disturbance total score was negatively associated with BMI percentile ( $r=-0.36$ ,  $p=0.03$ ) and positively related to conduct problems ( $r=0.32$ ,  $p=0.049$ ). Emotional problems were positively associated with excessive somnolence ( $r=0.36$ ,  $p=0.03$ ). **Discussion:** Sedentary behavior and PA seem to be related to classroom behavior variables. It is possible that structured PA may reduce classroom behavior problems in preschoolers. The inverse relationships between sleep and classroom behavior problems suggests that improving sleep quality and duration may impact classroom behavior.

## 9:45 -10:00 AM

---

### **Intensity of physical activity impacts the rate of change of arterial stiffness in the early years.**

N.A. Proudfoot, N. Shenouda, S. King-Dowling, N. Di Cristofaro, M.J. MacDonald, B.W. Timmons  
McMaster University

**Background:** Arterial stiffness, an indicator of vascular health, increases with age even in children. Physical activity may slow the increase in arterial stiffness; however, the impact of physical activity on arterial stiffness in the early years is unknown. Therefore, the purpose of this study was to determine if greater amounts and intensity of physical activity is associated with a slower rate of change of arterial stiffness in preschool-aged children. **Methods:** Participants were 3 to 5 years old at the time of enrollment and completed annual assessments for 3 years as part of the Health Outcomes and Physical activity in Preschoolers (HOPP) Study. Physical activity data obtained over 7-days using accelerometers was analyzed in 3-second epochs to determine daily total physical activity (TPA) and moderate-to-vigorous physical activity (MVPA). Arterial stiffness was measured using whole-body pulse wave velocity (PWV) assessed between the carotid and dorsalis pedis arteries at rest. Separate linear mixed effects modeling was used to determine if TPA and MVPA impacted the rate of change of PWV, controlling for age at baseline and sex. **Results:** Four hundred and sixteen children (207 girls; age:  $4.5 \pm 0.9$  years) participated. Over the 3 year period, participants engaged in an average of  $256 \pm 39$  minutes of TPA with  $99 \pm 23$  minutes of MVPA per day. The average PWV was  $4.9 \pm 0.5$  m/s and PWV increased with time ( $B=0.17$ ,  $p<0.0001$ ). TPA was predictive of PWV and this relationship was consistent over time ( $B=-0.001$ ,  $p<0.01$ ). There was a significant time\*MVPA interaction ( $B=-0.002$ ,  $p=0.004$ ), indicating the rate of change over time in PWV differs based on levels of MVPA. **Discussion:** Arterial stiffness, as measured by PWV, increased over a 3-year period in the early years. Children who engaged in greater amounts of physical activity had lower arterial stiffness; however the rate of change of arterial stiffness was slower in children who engaged in greater amounts of MVPA, but not TPA. This suggests that engaging in more intense physical activity in early childhood may result in better vascular health trajectories. Future research will examine if this favourable health trajectory tracks through childhood to adolescence.

## 10:00 -10:15 AM

---

### **Association between Physical Activity and Regional White Matter Microstructure in Children**

E Völgyi, S Narayana, BN Bydlinski, TL Jones C Thornburgh, AC Papanicolaou, PA Richey, AF Choudri, JC Han and R Rezaie, University of Tennessee Health Science Center

**Background:** There is increasing evidence supporting the concept of exercise-related changes in brain structure and function in adults and, more recently, pre-adolescent children. To further address this relationship, we investigated the association between physical activity and white matter microstructure in a cohort of 6- and 7-year-old children. **Methods:** Twenty-five healthy, right-handed children, 6-7 years of age, from southwest Tennessee who had no neurological conditions were enrolled to participate in the study. Participants underwent diffusion tensor imaging (DTI) and 7-day physical activity assessment using accelerometry (GT3X-BT, Actigraph Inc.). Fractional anisotropy (FA) values were calculated using an automated atlas-based method for *a priori* white matter tracts, based on previous literature, and included the corpus callosum, corona radiata, superior longitudinal fasciculus, posterior thalamic radiation and cerebral peduncle. Accelerometer data were categorized as absolute time and percentage of wear-time spent in sedentary, light, moderate and vigorous physical activity. Associations between physical activity and white matter integrity were analyzed using partial correlations, controlling for age and sex. Alpha was set to 0.05. **Results:** Average times spent in sedentary, light, moderate and vigorous physical activity per day were  $553 \pm 97$  min (58% of total monitored time),  $341 \pm 57$  min (35%),  $49 \pm 18$  min (5%) and  $21 \pm 13$  min (2%), respectively. We found a negative association between absolute time spent in sedentary activity and FA of corpus callosum splenium ( $r=-0.482$ ), as well as bilateral posterior corona radiata ( $r=-0.426$ ). Percent wear-time spent in vigorous activity was positively correlated with FA of the right posterior thalamic radiation ( $r=0.428$ ), and percent wear-time spent in moderate-to-vigorous activity was positively correlated with FA of the left posterior corona radiata ( $r=0.417$ ). For all of these correlations,  $p<0.05$ . **Discussion:** The findings reported in this study demonstrate the extent to which levels of physical activity and sedentary behavior are associated with integrity of structures underlying visual processing, motor control, and interhemispheric information transfer, in 6-7-year-old children. Given the implications of physical activity for overall cognitive health, strategies focusing on decreasing sedentary time and elevating especially

moderate and vigorous physical activity levels during the most responsive developmental window in children could induce neurobiological changes leading to improved behavioral outcomes.

10:15 -10:30 AM

---

### Relations Among Maternal Physical Activity during Pregnancy and Offspring Body Composition

L. Mudd, J. Scheurer, M. Pruett, A. Kapur, S. Ramel, NCCIH, Bethesda, University of Minnesota; Michigan State University

**Background:** Maternal physical activity (PA) during pregnancy, particularly in the third trimester, has been associated with lower neonatal fat mass and reduced risk of high birth weight. However, whether pregnancy-related PA may have a lasting effect on child body composition has yet to be determined. The purpose of this study was to examine associations between trimester-specific pregnancy PA and offspring body composition in infancy and four years of age among term-born children. It was hypothesized that third trimester PA would show the strongest relationships with offspring body composition and would be inversely associated with child fat mass at age four.

**Methods:** Participants of the Minnesota Infant Nutrition, Neurodevelopment, and Obesity Study were asked to recall participation in PA for a typical week in the first (T1), second (T2) and third (T3) trimesters at about five years postpartum (range 4.76-6.5 yrs). Total min/wk of PA was calculated for T1, T2, and T3. Participants were categorized as participating in any/none Moderate PA or Vigorous PA for each timeframe. Offspring anthropometrics and body composition via air displacement plethysmography were measured at three months and four years of age (kg weight, kg fat mass, kg fat free mass, and percent fat). Additional data were obtained via self-report (e.g., pre-pregnancy BMI) and the medical record (e.g. gestational age at delivery). Multivariate linear regression was used for analyses.

**Results:** Of 82 possible participants, 55 (67%) recalled PA participation, and of these, 37 had complete body composition data. Participation in PA declined from a median (range) of 87.5 (0-450) min/wk in T1 to 70 (0-330) min/wk in T3. Recalled PA was not significantly associated with body composition measures at birth. Participation in any vigorous PA in T3 was associated with lower child fat mass at 4-yrs ( $\beta = -1.230$ ,  $p < 0.05$ ), and remained significant after adjustment for gestational age at delivery, pre-pregnancy BMI, and infancy fat mass. **Discussion:** As hypothesized, our results show that participation in PA in late pregnancy may have lasting benefits for child body composition; however, vigorous PA may be needed to obtain these effects. Replication of these findings in a larger sample is needed.

10:45 -11:00 AM

---

### Accelerometer Sensitivity to Change between Unstructured and Structured Physical Activity

Kimberly A. Clevenger, Rebecca W. Moore, Darijan Suton, Alexander H.K. Montoye, Stewart G. Trost, Karin A. Pfeiffer, Michigan State University, East Lansing, Eastern Michigan University, University of Massachusetts, Ball State University, Queensland University of Technology

**Background:** Research has shown that accelerometers are sensitive to changes in physical activity level between low and high intensity activity sessions. However, it is unknown how well smaller differences in intensity can be detected. The purposes of this study were to determine if accelerometers were sensitive to change in physical activity level between structured and unstructured activity and if this sensitivity to change was consistent over a four-year period. **Methods:** Participants (6-16 y; N=206) volunteered to participate in a low intensity and high intensity activity session each year for four years. During each session, they participated in both structured and unstructured games (20-30 min each). Participants wore a uniaxial accelerometer (15-sec epoch, Evenson cut-points) and were directly observed to determine time spent in sedentary behavior, light, moderate, vigorous, or moderate-to-vigorous physical activity (MVPA). Paired t-tests determined if direct observation activity level was different between structured and unstructured activities for each session. Standardized Response Means (SRM) were calculated as absolute change in accelerometer-measured activity level duration divided by the standard deviation of the changes. SRM was only calculated when direct observation revealed a significant difference in activity level duration between structured and unstructured activity. Values were classified as low ( $>0.2$ , but  $\leq 0.5$ ), moderate ( $>0.5$ , but  $< 0.8$ ), or high ( $\geq 0.8$ ).

**Results:** Fewer differences were seen in activity level between structured and unstructured play during low intensity sessions (overall unstructured +0.39 MVPA minutes) compared to high intensity sessions (overall structured +4.08

MVPA minutes). SRM was greater during high intensity compared to low intensity sessions across all four years (2.01 vs. 0.34). Average SRM increased from year 1 (0.87) to 2 (1.91), then decreased from year 3 (1.83) to 4 (1.27). SRM was high for sedentary (0.81) light (1.81), vigorous (1.88), and MVPA (1.18), but low for moderate intensity (0.44). **Discussion:** In this sample, accelerometry was able to detect smaller changes in activity level than demonstrated in previous research, at all activity intensities. This supports accelerometers' ability to detect changes in youth activity levels over time.

11:00 -11:15 AM

---

### **Objectively measured physical activity of extreme early and late maturing girls**

L.B. Sherar, S.P. Cumming, D.H. Bodicoat, R.T. Edwards, C.L. Edwardson, T. Gorely, D.M. Harrington, K. Harrington, K. Khunti, T. Plekhanova, A.V. Rowlands, T. Yates, M.J. Davies  
Loughborough University, University of Bath, Leicester University of Bangor, University of Stirling

**Background:** There is good reason to believe that biological maturation may contribute to physical activity (PA) behaviour, especially in early adolescent females. However, research to date has been limited by small sample size which has prevented selective sampling of children at the extremes of the maturity continuum. The purpose of this analysis was to explore the differences in objectively measured moderate-to-vigorous physical activity (MVPA) between the least and most biologically mature girls within a large UK adolescent sample. **Methods** Data are taken from the baseline sample of the Girls Active cluster randomised controlled trial. Overall, 1753 girls aged 11-14 (recruited randomly from 20 schools) wore a GENEActiv accelerometer 24-hours/day for 7 days on the non-dominant wrist. MVPA was defined as  $\geq 200$  milli-g. Age at peak height velocity (APHV), an indicator of biological maturity, was predicted using anthropometric measures. Girls presenting in the 10<sup>th</sup> and 90<sup>th</sup> percentile for APHV were categorized as early and late maturing, respectively. Maturity group differences in physical activity were assessed using a MANCOVA, controlling for SES, age and monitor wear time. **Results** Data on 1344 (77%) girls (24.5% non-white; 12.8 (0.79) years; APHV 12.6 (0.8) years) with complete data (including 7 days of accelerometer wear) were available for analyses. From this group 176 girls (13%; APHV 8-11.6 years) were classified as early maturing and 136 (10%; APHV 13.5-15.0 (0.32) years) as late maturing. After controlling for covariates, early maturing girls were less active on an average weekday (43.9 vs 50.8 minutes;  $p < 0.05$ ) and an average weekend day (35.8 vs 42.4 minutes;  $p < 0.05$ ) when compared with late maturing girls. Over an average week early maturing girls participated in ~48 minutes less MVPA compared to late maturing girls. Considering the overall low participation in MVPA, this maturity related difference in MVPA could be meaningful. **Discussion** These findings support the contention that early maturing girls are at heightened risk for disengagement from physical activity.

**Supporting Physical Activity in the Childcare Environment (SPACE): A Cluster Randomized Controlled Trial**

L. M. Vanderloo, P. Tucker, A. Gaston, B. W. Timmons, A. M. Johnson, S. M. Burke, &amp; J. D. Irwin

University of Western Ontario, McMaster University

**Background:** Physical activity is integral to the health and development of young children. Many Canadian preschoolers are enrolled in some form of non-parental care, and thus underscores the need to support and promote physical activity among this young cohort within these environments. The main objective of the Supporting Physical Activity in the Childcare Environment (SPACE) study was to implement and evaluate an evidence-based physical activity intervention for preschoolers attending childcare. Specifically, this project aimed to improve the physical activity levels (and decrease sedentary time) among preschoolers enrolled in centre-based childcare. **Methods:** The SPACE intervention, a cluster randomized control trial, comprised of: 1. environmental modifications (i.e., addition of novel portable equipment), 2. staff training (i.e., benefits of physical activity and physical activity instruction), and 3. curriculum changes to the preschool classrooms (i.e., restructuring the frequency of outdoor playtime). This 8-week intervention was introduced in 11 randomly selected childcare centres, while 11 centres acted as a control group (and maintained a normal curriculum). Participants (2.5-4 years;  $n = 336$ ) were fitted with Actical™ accelerometers (MiniMitter, Bend, OR; 15 s epoch) for 5 consecutive days during childcare hours to assess activity levels. Four repeated measures ANCOVAs were carried out for each intensity level [i.e., light physical activity (LPA), moderate-to-vigorous physical activity (MVPA), total physical activity (TPA), and sedentary time] to determine changes in activity pre/post intervention. Age and sex were entered as covariates. **Results:** Upon examining the interaction effect between time (i.e., pre and post) and condition (i.e., control and experimental), levels of LPA were not found to significantly change pre/post ( $p > .584$ ); however, a statistically significant increase was reported for MVPA ( $p < .001$ ) and TPA ( $p < .046$ ), and a statistically significant decrease was noted for sedentary time ( $p < .046$ ). **Discussion:** The findings of this work indicate that the SPACE study was effective at improving preschoolers' MVPA and TPA levels, and at limiting sedentary time in childcare. Follow-up measurements (6- and 12-months) will determine the effectiveness of the SPACE intervention in sustaining improved activity behaviours during childcare hours.

# ABSTRACTS – FREE COMMUNICATIONS, ORAL

## SATURDAY, AUGUST 13<sup>TH</sup>, 2016

8:30 -8:45 AM

---

**Title: Bone Density and Estimated Strength at the Radius and Tibia in Children with Congenital Heart Defects**

M.C. Erlandson, S. Runalls, K. Wright, A. Kakadekar, S. Pharis, C. Pockett, C.R. Tomczak, University of Saskatchewan, University of Regina

**Background:** Children with congenital heart defects (CHD) have been found to have markedly low levels of physical activity (PA) compared to typically developing peers. It is well known that PA during the growing years has a beneficial effect on bone health with the most active children laying down more bone than their less active peers. If children with CHD are avoiding PA, current and future bone health may be compromised. Currently very little is known of the bone health of children with CHD. The purpose of this study was to investigate the bone density and estimated strength of children with CHD. **Methods:** Twenty-eight children, 7-15 years of age, with CHD were age and sex matched to 23 typically developing peers. Anthropometric measures of height and weight were obtained. PA was assessed using the Physical Activity Questionnaire for Children/Adolescents (PAQ-C / A) and accelerometry. Peripheral quantitative computed tomography (pQCT) scans of the non-dominant radius and tibia were also acquired. Independent sample *t*-tests were used to compare anthropometric and PA data. Multivariate analysis of covariance was used to compare pQCT measured bone density, content, area and estimated strength between children with CHD and typically developing peers while controlling for: sex, age, height, muscle cross-sectional area (MCSA) and PA levels. **Results:** There were no differences in anthropometric measures or PA levels between children with CHD and controls ( $p>0.05$ ). Once age, sex, height, MCSA and PA were accounted for, there were no significant differences between children with CHD and controls in pQCT measured total, cortical and trabecular bone density, content, area and estimated strength properties ( $p>0.05$ ). **Discussion:** In contrast to previous research we did not find any difference in PA levels between children with CHD and their typically developing peers. We also found no differences in bone health parameters between the groups. These findings suggest that regularly physically active children with CHD have normal bone health. However, future research should examine children with CHD by sub-group diagnose to determine if certain sub-sets may be at risk.

8:45 -9:00 AM

---

### Adolescent Physical Activity, Maturation Timing and Young Adult Bone Strength: Iowa Bone Development Study (IBDS)

KF Janz, EM Letuchy, TL Burns, SM Levy, University of Iowa

**Background:** Early maturing adolescents have been reported to have stronger bones as adults than peers. However, few studies have adjusted for the time between maturation and adult bone outcomes. It is also possible that physical activity patterns of early maturers differ than peers. This study examined whether maturation timing influences bone strength in young adulthood. **Methods:** IBDS members with at least 3 scanning visits between age 11 and 19.5 were studied (n=407, 213 females). DXA scans for hip and pQCT scans of tibia at 4% (trabecular) and 38% (cortical) sites were obtained. Outcomes included femoral neck (FN) section modulus (Z), FN cross sectional area (CSA), tibia bone strength index (BSI), and tibia torsion strength (pSSI). Physical activity was measured using the self-report PAQ-A. Age at peak height velocity (PHV age) was estimated from the Mirwald equation. Sex-specific maturity groups were defined based on distribution of PHV age: early maturity (lower 20%), intermediate, late maturity (upper 20%). Sex-specific bone trajectories were developed as two-level growth models with up to 5 repeated measurements. Models included biological-age (age at scan-PHV age), biological-age squared, and maturity group; height, weight, and PAQ-A were added as time varying covariates. Models included random effects for intercept and biological-age slope. Least squares means were calculated and compared for groups at 7 years past PHV age (males) and 9 years past PHV age (females), with and without adjustment for body size. **Results:** Early maturing participants had much larger body size and (unadjusted) bone strength measures as adults. With body size and physical activity adjustment and maturation alignment, the compressive strength of the early group was less than late group for males (BSI: 151 vs. 159 mg<sup>2</sup>/mm<sup>4</sup>, p<0.01). For females, early and late groups differed in pSSI (1605 vs. 1486 mm<sup>3</sup>, p <0.01) suggesting better torsional strength in early maturers. Physical activity was associated with all bone strength measures for males and females. **Discussion:** After adjustment, during early adulthood, early maturity in males has a negative effect on bone strength; in females the effect is somewhat positive. Adolescent physical activity is a consistent predictor of young adult bone strength.

9:00 -9:15 AM

---

### Bone and exercise outcomes in healthy children and children with chronic inflammatory disease

Y. Mezil, J. Obeid, H. Ploeger, T. Nguyen, T. Cellucci, R. Issenman, and B.W. Timmons, McMaster University

**Background:** Chronic inflammatory diseases, such as juvenile idiopathic arthritis (JIA) and Crohn's disease (CD), are characterized by pro-inflammatory status, which can alter bone metabolism. This predisposes children with JIA and CD to low bone mineral content and higher risk of bone fracture. Exercise is an effective approach to strengthen bone and increase bone accrual in healthy and children with inflammatory conditions. This may be linked to mechanical loading or delayed anti-inflammatory effects of exercise, which can trigger bone turnover. The aim of this study was to utilize an *in vitro* model to examine the effects of exercise and inflammation on osteoblast proliferation. **Methods:** Serum samples from 30 youth (JIA n=8, 13.36 ± 2.37 years; CD n=9, 14.08 ± 2.44 years; and Controls n=13, 14.10 ± 2.52 years) that participated in a previous exercise study were analyzed using *in vitro* experiments. The exercise protocol consisted of two 30-minute bouts of cycling at 50% of their peak mechanical power. Blood samples were collected at rest, immediately post-exercise, and at 1 hour of recovery. Inflammatory status was assessed by measuring cytokines IL-6 and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) in resting serum using high-sensitivity ELISA kits. Serum samples were also used to incubate MC3T3E1 osteoblasts *in vitro* for 48-hours. Osteoblast proliferation was measured using an MTS assay. Effects of exercise and inflammation were analyzed using one-way and two-way ANOVA while relationships between osteoblast proliferation and inflammatory status and aerobic fitness were analyzed using Pearson correlation. **Results:** There was no significant difference in osteoblast proliferation between JIA, CD, and healthy controls at rest (F=0.967, p=0.392). Exercise did not cause any significant effects on osteoblast proliferation between groups (F=0.0377, p=0.578,). Furthermore, osteoblast proliferation was not related to inflammatory status at rest (r = -0.149-0.243, p>0.05) or aerobic fitness (r=-0.164, p=0.412). **Discussion:** Exercise and chronic disease did not present any significant effects on *in vitro* osteoblast proliferation. This may be attributed to a delayed osteoblast

response, which may be preceded by upstream signaling molecules of osteoblast proliferation, as well as effective disease management in JIA and CD patients, which may have attenuated inflammatory status. Further investigation is required.

9:15 -9:30 AM

---

**Characteristics of Children with Fractures at Diagnosis of ALL: the Influence of Physical Activity.**

J. Hay, B. Martin, B. Wilson, P.M. Miettunen, J. L. Jaremko, A. M. Huber, K Houghton, J. Ho, R. Grant, D.B. Dix, M. Charron, R. Barr, T. Blydt-Hansen, J Ma L.M. Ward and the Canadian STOPP Consortium  
Brock University, University of Alberta, University of Calgary, University of Alberta, University, Halifax, University of British Columbia, University of Calgary, University of Toronto, McMaster University, University of Manitoba, University of Ottawa, National Pediatric Bone Health Working Group

**Background:** A significant percentage of children newly diagnosed with acute lymphoblastic leukemia (ALL) present with vertebral fracture(s). In the pan-Canadian Steroid Induced Osteoporosis in Pediatric Populations (STOPP) study, a longitudinal natural history of ALL, 17% of children presented with at least a single lumbar fracture at diagnosis. Understanding the influences on bone fragility early in the disease process would have significant benefit when coordinating care for children when initiating treatment. **Methods:** We examined data taken around the time of diagnosis of 188 children (ages 2.5 to 16.9) newly diagnosed with ALL. We compared 29 children with vertebral fractures (mean age 6.49 (4.08)) to those 157 (7.15 (3.85)) without vertebral fractures. Measures included areal BMD (DEXA), fractures (x-ray), Tanner stage, (from pictures), pain (self-report), nutrition (7 day recall) and activity from the HAES. Glucocorticoid (GC) exposure was derived from clinical records. **Results:** Analyses of variance found NSD between the two groups in age, gender, Tanner stage, Ca intake or VitD intake (both %RDA), inactive hours, change in activity from pre-illness levels, GC exposure by mass or surface area, ALL risk classification, or duration from symptom onset until diagnosis. The non-fracture group had significantly higher ( $p < .002$ ) lumbar BMDa z-scores. The fracture group reported significantly more back pain ( $p < .001$ ) and significantly ( $p < .02$ ) more somewhat active hours (walking, etc.) in the two weeks prior to assessment. Poisson regression analysis (Likelihood Ratio Chi-Square value = 132.768,  $p = 0.001$ ) demonstrated a significantly elevated risk of fractures with decreased BMDa Z-scores ( $p < .001$ ) and increased age ( $p < .02$ ), BMI z-score ( $p < .001$ ), pain ( $p < .004$ ), and total weekly somewhat active hours ( $p < .001$ ). No other variables had significant effects. **Discussion:** These results suggest that the older children in the STOPP study, with greater mass and greater durations of activity, appear to be at elevated risk of lumbar fractures at diagnosis. For some children, the pathological effects of ALL on bone may lead to rapid increases in bone fragility. As a consequence stress from previously normal activity levels may be sufficient to provoke lumbar fractures. As high intensity activity is often suppressed in illness, attention to lower intensity weight-bearing activity is warranted.

## ABSTRACTS – FREE COMMUNICATIONS, POSTER THURSDAY, AUGUST 11<sup>TH</sup>, 2016

### 1. The role of total body and trunk fat mass at PHV on subsequent weight status in emerging adulthood.

E. Barbour-Tuck, M.A. Erlandson, H. Foulds, N. Muhajarine, A.D.G., Baxter-Jones, University of Saskatchewan

**Background:** Excess body fat, particularly trunk fat, is associated with increased cardiovascular disease risk and development of the metabolic syndrome, in both children and adults. The purpose of this study was to describe changes in fat mass distribution from adolescence through emerging adulthood, examining differences by adolescent weight status and sex. **Methods:** 126 participants (59 male) from the Pediatric Bone Mineral Accrual Study (PBMAS) were measured serially from 1991 - 2011. Age at peak height velocity (PHV) was ascertained and used to calculate biological age (BA; years from PHV). Percentage total body fat (%TBF) was estimated from DXA scans. Individuals were grouped as normal weight (NW) or overweight/obese (OW/OB) at PHV using age and sex specific cut-offs. Percent trunk fat (%TF), lower limb fat (%LLF) and their ratio (TF:LLF) were analyzed using *t*-tests to assess for differences in variables between sexes and groups. **Results:** Mean age at PHV was  $13.6 \pm 0.9$  in males and  $12.0 \pm 0.9$  in females. Mean %TBF increased from PHV to adulthood, surpassing age and sex specific cut-off for NW at BA +4 years and +8 years in females and males respectively ( $p < 0.05$ ). Females had significantly greater %TBF, TF(g), LLF(g) at all ages compared to males, but less %TF and greater %LLF by BA +5 years ( $p < 0.05$ ). The TF:LLF ratio surpassed 1.0 at BA +17 in NW females and +9 in NW males. In OW/OB adolescents the ratio surpassed 1.0 at BA +3 in females and BA +6 in males. Significant differences in segmental variables between groups were present from -2 to +2 (%LLF) and -2 to +4 (%TF) in males, and -2 to +4 (%LLF) and -2 to +5 (%TF) in females ( $p < 0.05$ ). **Discussion:** This study suggests that the prevalence of OW/OB increases with age and differences between weight groups at PHV disappear during late adolescence and emergent adulthood. Furthermore, during emergent adulthood, relative %TF becomes greater than relative %LLF, occurring earlier in those who were OW/OB adolescence. These OW/OB adolescents may be at higher health risks compared to their NW peers due to earlier exposure to a predominance of trunk fat.

### 2. Teachers' influence on weight-related behaviors of preschoolers

D.J. Barr-Anderson, N. Chasmar, D. McNeil, K. Polinski, S. Truman, University of Minnesota, Clemson University, University of South Carolina, University of Colorado Denver

**Background:** Physical activity (PA) and diet behaviors of young children who are provided child care outside of the home may be heavily influenced by not only parents but also their teachers. Although a very valued and valuable profession, many child care providers in preschool settings have the profile of low economic status and low educational attainment that may put them at risk for weight-related issues. The purpose of this study was to test the feasibility of a multi-component PA and healthy eating intervention that targeted preschool teachers but engaged parents and students to improve these behaviors in a predominantly African-American sample of 3-5 year old children. **Methods:** An eight-week intervention that targeted teachers, and engaged students and parents, was implemented. Preschool teachers met once a week to participate in interactive PA and nutrition sessions. Twice a week, children were led by teachers in 10-minute PA breaks that included an academic focus, and over a four-week period, they completed a 10km Walkathon. Parents and teachers participated in a Pedometer Challenge over four weeks and tracked their daily steps. Process evaluation and outcome data, including classroom PA logs, anthropometric measures of teachers, and surveys about the health behaviors of teachers, parents, and children, were collected. **Results:** Eighteen teachers and 54 parents completed surveys at baseline; 13 teachers and 37 parents completed surveys at the end of the program. Teachers reported a non-significant decrease in PA. However, parents reported an increase in their child's moderate-to-vigorous PA that was approaching significance (22.8 mins/day at baseline vs. 28.0 mins/day at follow-up,  $p = 0.06$ ). Approximately 30% more teachers reported an increased consumption of fruits and vegetables, which paralleled parents' non-significant increase of their child's fruit and vegetable consumption (3.8 at baseline vs. 3.9 at follow-up). Parents were not targeted for behavioral changes, but they reported that the take-home information about PA and healthy eating prompted them to make changes with their children. **Discussion:** A multi-component intervention that targets teachers and engages students and parents has the potential to positively impact weight-related behaviors of African-American preschoolers.

### 3. A fitness index model for Italian adolescents living in Southern Italy. The ASSO project

Antonino Bianco, Caterina Mammina, Monèm Jemni, Anna Rita Filippi, Giuseppe Battaglia, Marianna Bellafiore, Antonio Paoli, Giuseppe Messina, Antonio Palma, Garden Tabacchi.

University of Palermo, Qatar University, Doha, Qatar, University of Padova, POSTURALAB Italia

**Aim:** Strong relations between physical fitness and health in adolescents have been established in the last decades. The main objectives of the present investigation were to assess major physical fitness components in a sample of Italian school adolescents, comparing them with international data, and providing a fitness index model derived from percentile cut-off values of five considered physical fitness components. **Methods:** A total of 644 school pupils ( $15.9 \pm 1.1$  yrs;  $M=399$ ;  $F=245$ ) were tested using the ASSO-Fitness Test Battery (FTB), a tool developed within the Adolescents and Surveillance System for the Obesity prevention project, which included the handgrip, standing broad-jump, sit-up to exhaustion,  $4 \times 10$ m shuttle run and 20m shuttle run tests. Stratified percentile values and related smoothed curves were obtained. The method of principal components analysis (PCA) was applied to the considered five fitness components to derive a continuous fitness level score (the Fit-Score). A Likert-type scale on the Fit-Score values was applied to obtain an intuitive classification of the individual level of fitness: very poor ( $X < P20$ ), poor ( $P20 \leq X < P40$ ), medium ( $P40 \leq X < P60$ ), good ( $P60 \leq X < P80$ ) and very good ( $X \geq P80$ ). **Results:** Boys had higher fitness levels compared to girls; they also showed an incremental trend amongst fitness levels with age in all physical components. These results could be overlapped with those related to European adolescents. Data revealed high correlations ( $r > 0.5$ ) between the Fit-Score and all the fitness components. The median Fit-Score was equal to 33 for females and 53 for males (in a scale of 0-100). **Conclusions:** The ASSO-FTB allowed the assessment of health-related fitness components in a convenient sample of Italian adolescents and provided a fitness index model incorporating all these components for an intuitive classification of fitness levels. If this model will be confirmed, the monitoring of these variables will allow early detection of health related issues in a mass population and hence will give the opportunity to plan appropriate interventions.

### 4. Initial Submaximal RER and Tidal Volume Variability Appear Inversely Related to Direction of Response to Marathon Training

G. Biltz, C. Lundstrom, K. Uithoven, University of Minnesota

**Background:** Aerobic Exercise (AEX) training effects on steady state, breath-to-breath (btb) variability of respiratory exchange ratio (RER) and tidal volume (TV) have been observed to be inversely related to initial variability status. This study assesses the relationship between AEX and directional change in btb variability of RER and TV in a new cohort of novice marathon runners. Sample entropy (SampEn) scores were calculated on concurrent RER and TV time series data to characterize their initial pattern and compare changes with training. **Methods:** Thirty runners (16 female, 14 male, average age  $19.4 \pm 0.6$  years) enrolled in a marathon training course and volunteered to participate in the study. Subjects underwent 16-weeks of AEX training along with pre- and post-training testing, which included: 2-mile time trial and maximal aerobic capacity ( $VO_2$  max). RER and TV variability were determined pre- and post-training by a 6-minute steady state run at 65% of their predicted  $VO_2$  max. Gas exchange data was collected using a Medgraphics Ultima (MGC Diagnostics, St. Paul, MN) metabolic cart. SampEn analysis of RER and TV variability were calculated using Kubios software (University of Eastern Finland, Kuopio, Finland). Paired t-tests were used to compare SampEn scores on pre- and post-training RER and TV time series for the entire cohort. The cohort was divided ( $n = 17$ ) and low ( $n = 13$ ) initial RER SampEn, with a group mean cutpoint of 0.80. ANOVA with repeated measures was used to assess group effects. **Results:** Training did not significantly change submaximal, steady state RER and TV variability for the whole cohort. However, when subjects were divided into high or low initial RER SampEn score, there was a significant group X time interaction ( $p \leq 0.001$ ), demonstrating an inverse directional change with AEX. Changes in SampEn scores for RER and TV were correlated ( $r = 0.628$ ,  $p \leq 0.001$ ) using Pearson's r. **Discussion:** AEX training effect appears to be bidirectional and inversely related to the initial RER variability status, as measured by SampEn. Variability analysis of btb RER and TV may provide a marker for the adaptability of a subject's aerobic status.

## 5. An Interactive Gym Game to Assess Physical Activity Adequacy and Predilection: The CSAPPA Questionnaire for Children Unable to Read and Write

A. Blais, P.E. Longmuir, Children's Hospital of Eastern Ontario Research Institute and University of Ottawa,  
**Background:** The Children's Self-Perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) questionnaire assesses motivation to engage in physical activity. However, CSAPPA completion is difficult for younger children and those with disabilities who are unable to read or write. Verbal CSAPPA administration is time consuming, and difficult with groups of children. The purpose of this study was to investigate whether an interactive game format could be used to enable autonomous responses to the CSAPPA items among groups of children unable to independently read the questions and record their responses. **Methods:** Children (n=26), 6 to 11 years of age, recorded their response to each CSAPPA question with the assistance of a leader. Each class then completed the interactive game during one gym session. From the centre of the gym children chose the statement "most like me" by running to the side of the gym designated for their preferred response. A second run allowed children to respond "really sure" or "sort of sure". Leaders recorded the final location of each child as the child's response. The adequacy and predilection sub-scores from the CSAPPA questionnaire and interactive game were compared using paired t-tests to examine whether there were significant differences in the responses obtained. Statistical significance was set at  $p > 0.05$ . **Results:** There was a positive and moderately strong association between the verbal and interactive gym game responses for the adequacy ( $r = .47, p < .05$ ) and predilection ( $r = .53, p < .01$ ) sub-scores of the CSAPPA. Mean adequacy scores were not significantly different (95% CI of the difference: -2.35, 2.18;  $p = 0.94$ ), whether obtained verbally ( $M = 19.9, SD = 5.29$ ) or via the interactive gym game ( $M = 20.0, SD = 5.10$ ). There were also no significant differences (95% CI of the difference: -2.24, 2.31;  $p = 0.97$ ) between the predilection scores from the verbal questionnaire ( $M = 25.9, SD = 6.00$ ) and the interactive game ( $M = 25.88, SD = 5.56$ ). **Discussion:** The CSAPPA gym game may be an appropriate method of evaluating physical activity adequacy and predilection among children unable to autonomously complete a written questionnaire. Further research should evaluate equivalency of the verbal and game responses in a larger group of young children and those with learning disabilities.

## 6. Measuring fitness in children with autism spectrum disorder: Preliminary results from the FitKids Study

E. Bremer & J. Cairney, McMaster University

**Background:** Children with autism spectrum disorder (ASD) are less physically fit than other children. We cannot assume existing measures of fitness will work for children with ASD owing to the many challenges associated with the disorder. To date, the practicality and reliability of the fitness measures used in the literature has not been evaluated in this population. The objectives of this study are to examine the feasibility and reliability of physical fitness tests in 7-12 year old children with ASD to identify the assessment(s) best suited to this population. **Methods:** Children with ASD 7-12 years of age will visit the lab four times over an 8-week period. Visit 1 will be a familiarization visit. Visit 2 will assess movement skills, BMI, physical activity, intelligence, behaviour, and demographic/medical history. Visits 3-4 will assess fitness, administered in a random order: standing long jump; sit and reach; grip strength; progressive treadmill test; 6-minute walk test; Wingate anaerobic cycling test; muscle power sprint test. A random subsample of participants will be asked to return 2-3 weeks later, to perform each fitness test a second time – in the same order, to determine test-retest reliability (Visits 5-6). Feasibility will be assessed immediately following each test with a brief, visual analogue scale-based, questionnaire completed by the participant and assessor, respectively. Mean scores of the feasibility questionnaires will be compared via t-tests. Intraclass correlations will be used to examine the test-retest reliability of each of the fitness assessments. **Results:** Data collection is ongoing. While only 3 children have been tested to date, we anticipate that we will have preliminary findings from 10-15 participants to present. \*\*  
**Discussion:** Results from this study will help us to better understand the types of fitness assessments suitable for children with ASD. These findings will help to inform the measures included in future observational and intervention research in this population.

\*\* This research is supported by the 2015 Marco Cabrera Student Research Award from the North American Society for Pediatric Exercise Medicine.

## 7. Efficacy of Two Resistance Training Modes in Adolescents

J.T. Warning, K.A. Pfeiffer, M. Vorkapich, A. Diltz, J.M. Pivarnik, Michigan State University

**Background:** Resistance training programs can potentially improve adolescents' health- and skill-related fitness outcomes, which are important for development. Many resistance training modes are currently available, but few studies have evaluated modes other than traditional weight lifting with dumbbells or machines, such as kettlebells and plyometrics. The purpose of this study was to evaluate the efficacy of two different training modes, kettlebell only and kettlebell plus plyometric training, on health- and skill-related fitness outcomes in adolescents. **Methods:** Participants included 24 adolescents (17 boys, 7 girls; age range 11-15 years) from the Lansing, MI area who were randomized into either a combined kettlebell and plyometric (KBP; n=13) or a kettlebell only (KB; n=11) program. Training sessions took place twice per week for eight weeks on non-consecutive days. The kettlebell program intensity consisted of a 12-15 repetition maximum. The plyometric program intensity consisted of 8-10 repetitions. Outcome measures included performance on the long jump, countermovement vertical jump, 40-yard dash, and sit-and-reach. These were assessed at baseline, after training, and four weeks post-training. Maturity status was assessed using the maturity offset approach. A repeated-measures ANCOVA was used to determine the effects of the training program, controlling for age and maturation status. Bonferroni correction was used to account for multiple comparisons. **Results:** Without controlling for covariates, there were no main effects for group (all  $p>0.01$ ). A main effect of time was found for the 40-yard dash ( $F=5.230$ ,  $p=0.009$ ) (4-week post ( $6.38 \pm 0.19$  sec) $>$ pre-test ( $6.65 \pm 0.21$  sec),  $p=0.006$ ). There were no group by time interactions (all  $p>0.01$ ). **Conclusion:** Bi-weekly training for eight weeks did not improve fitness outcomes in adolescents, however, traditional resistance training programs have shown improvements in both health- and skill-related fitness after eight weeks of training. Sprint performance improved after cessation of training at four-week follow up. Since the training program included a higher repetition range (light training load), specificity of training was not met for outcomes focused on muscular power. Future training studies should consider a heavier training load for improving fitness outcomes. Funded by North American Society for Pediatric Exercise Medicine and Michigan State University College of Education

## 8. Does maturational timing influence the leg length, leg strength velocity relationships in adolescent boys?

T.J. Tait, E. Barbour-Tuck, M. Erlandson, D. Bailey, A.D.G. Baxter-Jones, University of Saskatchewan

**Background:** During adolescence early maturers (EM) tend to be bigger and strong than their late maturing (LM) peers of the same chronological age (CA). This is because EM reach peak velocities in growth characteristics at earlier CA. Strength is dependent in part on muscle size, and muscle size on bone size; therefore, it is arguable that leg length (LL) growth and leg strength (LS) will be related. The nature of the relationship between LL and LS, and how the timing of maturation may influence these is unknown. The purpose of this study was to investigate if peak velocities for LL and LS, in males, occur in the same sequence regardless of maturity group. **Methods:** 227 males participated in the Saskatchewan Growth and Development Study. Between 1964 and 1973, annual measurements included height (H), sitting height (SH), weight and knee extension strength. LL was calculated from H and SH. Serial measures of anthropometrics were used to identify velocities for H, LL and LS. Age at peak height velocity (PHV) was used to create a biological age (BA – years from PHV) and maturity timing categories: average maturers (AM), EM, and LM. Mean differences between groups were test with *t*-tests and ANOVA. Alpha was set at .05. **Results:** There were no significant differences in the CA at which PLLV and PLSV occurred within maturity groupings ( $p>0.05$ ). PLLV and PLSV occurred at a later BA in EM (BA  $0.0 \pm 0.7$ ,  $0.2 \pm 1.1$ ) than LM ( $-0.4 \pm 0.9$ ,  $-0.5 \pm 1.9$ ) ( $p<0.05$ ). The CA of PLLV between maturity groups was significantly earlier in EM ( $12.9 \pm 0.8$  yrs.) compared to AM ( $13.7 \pm 0.9$  yrs.) and LM ( $14.6 \pm 0.9$  yrs.) ( $p<0.05$ ). The CA's of PLSV ( $13.5 \pm 0.4$ ) were not significantly different between the maturity groups. **Discussion:** As would be expected EM reach PLLV at an earlier CA and with greater magnitude when compared to AM and LM. The time interval between PLLV and PLSV are not affected by timing of maturation; however, EM reach their peak velocities for LL and LS at a significantly later BA. The long-term implication of these findings on strength development is unknown.

## 9. Enhancing Physical Activity Knowledge of Grade 6 Students: The Y Kids Academy

Warsame Yusuf, Sam Cardarelli, Anastasia Alpous, Kelly Shaw, Tosha Rhodenizer, Rob Adams, Patricia E.

Longmuir, Children's Hospital of Eastern Ontario Research Institute, YMCA-YWCA of the National Capital Region

**Background:** Canadian Physical Activity Guidelines recommend children accumulate 60+ minutes of moderate-to-vigorous physical activity daily. Currently only 7% of healthy Canadian children meet these guidelines. The purpose of this study, which was in conjunction with the YMCA-YWCA of the National Capital Region, was to investigate the physical activity knowledge impact of the Y Kids Academy, a citywide course aimed at improving the proportion of Canadian children that meet the Canadian Physical Activity Guidelines. **Methods:** Grade 6 children were eligible to enroll in the Y Kids Academy, which took place at YMCA-YWCA centres across the National Capital Region. Before attending Y Kids, each child completed the Canadian Assessment of Physical Literacy (CAPL), which measured physical literacy motivation, physical competence, knowledge and behavior. CAPL scores were compared to data for 3000 Canadian children to evaluate baseline physical literacy among Y Kids participants. Participants were also assessed using the Y Kids questionnaire, which evaluated course knowledge before (Baseline), after (1<sup>st</sup> follow up), and five months after completing the Y Kids Academy course (2<sup>nd</sup> follow up). **Results:** 163 children (73 female, 45%), 9 to 14 years of age (mean 11.1 years  $\pm$  0.82) were enrolled in the study. At baseline, CAPL scores were similar ( $p=0.99$ ) between Y Kids participants (mean score  $62.41 \pm 11.8$ ) and Canadian children ( $60.70 \pm 11.8$ ). Y Kids knowledge increased ( $p<0.001$ ) from baseline (mean score  $10.39 \pm 5.4$ ) to end of course ( $12.73 \pm 6.5$ ). Five months after course completion, knowledge remained above baseline (mean difference  $2.69 \pm 5.2$ ,  $p=0.03$ ) and was unchanged from the post-course assessment ( $0.00 \pm 5.7$ ,  $p=0.5$ ). **Discussion:** The physical literacy of children enrolled in the Y Kids Academy was not significantly different from Canadian reference data, indicating that the Y Kids Academy was appealing to children with higher and lower physical literacy. The Y Kids Academy effectively increases the physical activity knowledge of older children and young adolescents, an improvement sustained over 5 months, even among those with limited knowledge, motivation, physical competence or daily physical activity behavior. Future research should investigate the impact of Y Kids participation on these other aspects of physical literacy.

## 10. Identifying Children with Medically Necessary Physical Activity Restrictions: Optimizing their Safe and Successful Participation with Peers and in Community

M.Y. Xia, A. Doja, C.M. Duffy, L. Gardin, R.M. Gow, R. Jurencak, S.L. Katz, L.S.W. Lai, C. Lamontagne, S. Lee, J. Loughheed, A. McCormick, H.J. McMillan, D. Pohl, J. Roth, C. Theoret-Douglas, K. Watanabe Duffy, D. Wong, R. Zemek, P.E. Longmuir, University of Ottawa Faculty of Medicine

**Background:** Physical activity optimizes children's health but current tools cannot identify children, under 15 years, with medically necessary activity restrictions. Expert consensus was that medically necessary activity restrictions should be identified by asking parents, "Has a healthcare provider told you that there are some types of physical activity that your child should not do?" This study evaluated the sensitivity, specificity, and reliability of this proposed question. **Methods:** Parents of children 3 to 14 years old who visited the Children's Hospital of Eastern Ontario from June to August, 2015, were approached and asked to answer the proposed question along with 9 distractor questions. A second survey sent 7 days later evaluated response reliability. Sensitivity and specificity were assessed comparing parent-reported activity restrictions to information obtained from each child's treating physician. **Results:** A total of 200 initial parent surveys were collected (Rheumatology=34, Rehabilitation=11, Cardiology=52, Emergency Department=31, Respiriology=22, Neurology=50), 74 of which completed the second survey. The sensitivity, specificity, and reliability of the question of interest were 27%, 94%, and 93%, respectively. Low sensitivity occurred among patients seen in the epilepsy ( $n=19$ ) and rehabilitation (neuromuscular=8; spina bifida=2; chronic pain=1) clinics. Excluding these patients, sensitivity was 86%. Agreement beyond what would be expected by chance was found for parents' and corresponding treating physician's answers to the question (Kappa = 0.25,  $p<.0005$ ) and parents' answers on the first and second survey (Kappa = 0.7,  $p<.0005$ ). **Discussion:** Misunderstanding of the question occurred routinely among epilepsy and rehabilitation medicine patients, resulting in overall low sensitivity. Many parents recruited from these clinics focused on the word "types" in the question of interest. Alternative wording of the question, such as focusing more broadly on how physical activities are performed and supervised, is required for identifying activity restrictions in children with physical disabilities or epilepsy. The current question effectively identified children requiring physical activity restrictions in cardiology, respiriology, rheumatology, and emergency medicine clinics, with overall

sensitivity, specificity, and Kappa calculations being 86%, 95%, and 0.55 ( $p < .0005$ ), respectively. Future research should examine modified question wording in a larger and more diverse sample of children with medical conditions.

### 11. Adolescent Stress, Coping Resources, And Health In High Risk Students Participating In A Studio Based Learning Summer Camp

Katherine E. Wood, Megan E. Holmes, Kay Brocato, JohnEric W. Smith, Mississippi State University

Psychological health in adolescence is a major concern as literature suggests that, if uncontrolled, stress can lead to chronic health conditions in adulthood. **Purpose:** This study examined factors that contribute to stress in adolescence and how coping can influence overall health. **Methods:** At risk 6th-9th grade students ( $n=16$ ) were invited to participate in an educational summer camp project aimed at developing knowledge of core curriculum by working on specific design projects. Participates were asked to complete two surveys one on stressors and how they affected them. The other was on coping mechanisms and to what extent they used each of them. **Results:** Mean height approximated 162.1 cm which is in the 50<sup>th</sup> percentile, mean weight was 62 kg. Of the 16 participants, 9 were in the BMI category of normal weight and 7 were in the BMI category of overweight or obese. Mean total stress scores of the normal weight category was 119.8. The overweight category reported a slightly higher total stress score of 124.7. In the coping questionnaire we focused on coping mechanisms that allowed participates to engage in demanding activities. The normal weight category had a mean score of 12.6; whereas the overweight category had a mean score of 11.1. **Discussion:** Physical activity may improve factors associated with poor adult health and increase ta child's ability to cope.

### 12. Change in Preschoolers' Health-Related Quality of Life Following the Implementation of a Childcare Physical Activity Intervention

S. Truelove, P. Tucker, University of Western Ontario

**Background:** Previous studies support that being active offers many physical, social, and emotional benefits that contribute to a higher health-related quality of life (HRQOL); however, this has yet to be established in the preschool (i.e., 2.5-5 years) population. The Supporting Physical Activity in the Childcare Environment (SPACE) intervention was designed to improve physical activity (PA) levels of preschoolers in centre-based childcare (via curriculum changes, staff training, and portable play equipment). It was hypothesized that preschoolers who received the PA intervention would have higher HRQOL following the 8-week intervention. **Methods:** This randomized control trial included 22 childcare centres ( $n = 11$  experimental and 11 control) in London, Ontario. Preschoolers' HRQOL was measured using the parent-report Pediatric Quality of Life Inventory 4.0 pre-intervention and at the end of the 8-week intervention. The inventory contained 15 questions spanning four domains (i.e., physical, social, emotional, and school functioning). Three repeated measures ANOVAs were conducted to determine if preschoolers in the experimental condition displayed an increased HRQOL (Physical, Psychosocial [inclusive of social, emotional, and school functioning], and Total) post-intervention compared to preschoolers in the control group. All scores were transformed from a 5-point Likert scale to a scale from 0-100. **Results:** While 336 preschoolers enrolled in the SPACE intervention, only 201 preschoolers had complete survey data at both time points and were retained for the HRQOL analyses. Total HRQOL decreased for the experimental condition (84.57 vs 83.83) and increased in the control group (86.60 vs 86.71). For Physical HRQOL, both groups' scores decreased (experimental 90.32 vs 89.84; control 91.82 vs 91.62), whereas Psychosocial HRQOL increased for the control group (81.04 vs 81.66), and decreased for the experimental group (78.61 vs 77.68). No observed changes were statistically significant ( $p > .05$ ). **Discussion:** Although the findings contradict our hypothesis, the intervention was not specifically designed to improve HRQOL. As the intervention only took place during childcare hours, preschoolers' behaviour may not translate to their home setting. More research is needed to explore the relationship between PA participation and HRQOL in the preschool population.

### 13. Clinical significance of ST-T wave changes in pediatric cardiac patients in the exercise lab

Sohum Trivedi.; Joel Temple; Jenna Octavio; Deepika Thacker; Rami Kharouf, Takeshi Tsuda, Samuel S. Gidding; Brad Robinson, A.I. duPont Hospital for Children, Thomas Jefferson University

**Background:** Exercise-induced ST-T wave depression rarely occurs in the pediatric exercise lab but its prevalence and significance are unknown. **Methods:** We reviewed 4400 graded exercise stress tests (EST) or chemical stress tests performed in our hospital from 2004-16. ST-T wave depression was defined as  $\geq 2$  mm ST-T wave depression in multiple leads. Myocardial perfusion imaging (MPI) with  $^{99m}\text{Tc}$  Sestamibi injection before and at peak exercise and/or cardiac catheterization (CC) was performed when indicated. Myocardial ischemia was determined by positive MPI or coronary artery obstruction on CC or abnormal hemodynamics measured by echo or CC. **Results:** Eighteen patients with ST-T segment depression (0.4% incidence; Age 10.1 $\pm$ 4 years; 72% male) were divided into 2 groups: Group A (12/18) with myocardial ischemia (true positives) and Group B (6/18) without myocardial ischemia (false positives). The cardiac diagnosis in Group A consisted of aortic stenosis (AS): 4, truncus arteriosus (TA): 2, hypertrophic cardiomyopathy (HCM): 2, transposition of great arteries s/p arterial switch operation (TGA, s/p ASO):1, hypertension: 1, Kawasaki disease: 1, restrictive cardiomyopathy (RCM):1. Group B included: patients s/p Fontan operation: 3, s/p Tetralogy of Fallot (TOF) repair: 2 and TGA s/p ASO: 1. In group A, 5 patients had surgery to correct the underlying abnormalities (3 AS, 1 TA, 1 TGA s/p ASO). Of these 5 patients, 4 showed resolved ST-T segment depression resolved. Of the other 7 patients, 1 patient with AS was lost to f/u. 1 patient with TA died awaiting transplant, 2 HCM patients and 1 hypertensive patient were placed on medication, 1 Kawasaki patient was scheduled for CC and 1 RCM patient had an AICD placed. In group B (6/18), no coronary abnormalities were found in the 1 TGA s/p ASO patient, 2 patients s/p TOF repair or 3 patients s/p Fontan. **Discussion:** In a pediatric exercise lab, ST-T wave depression is rare (0.4%) but can represent true myocardial ischemia and help management (66%). In 33% of the cases, ST-T wave depression was a non-specific finding unrelated to coronary artery disease in those s/p TOF or Fontan repair or TGA s/p ASO .

### 14. Relationship between cardiorespiratory fitness and anthropometric variables among school going adolescent in Nigeria

SO Onagbiye & AL Toriola, Physical Activity, Sport and Recreation Focus Area, North-West University, South Africa, Tshwane University of Technology

**Background:** The increase in physical activity (PA) levels has been known to be associated with improved cardiorespiratory status which helps in reducing non-communicable diseases (NCDs) risks factor. However, the interaction between CRF and anthropometric variables such as age, height, body weight, and body mass index (BMI) stay unclear and needs further study. This study investigated the relationship between CRF and anthropometric variables among school-going adolescent in Nigeria. **Methods:** Two hundred and fifty (125 male, 125 female) healthy participants ranging from 12 to 20 years of age (mean  $\pm$  SD: 15.2 $\pm$ 1.92 years) who were randomly selected participated in this study. Height, body weight, and BMI were measured. Cooper 12 minutes run exercise tests were conducted to assess CRF as indicated by maximal oxygen uptake ( $\text{VO}_{2\text{max}}$ ). Associations between cardiorespiratory fitness, age, height, weight, and BMI were explored by univariate and multivariate analyses at  $\alpha = 0.05$ . **Results:** Significant direct associations were found for between weight and age ( $r = 0.26$ ,  $p = 0.01$ ), age and height ( $r = 0.17$ ,  $p = 0.01$ ), age and BMI ( $r = 0.27$ ,  $p = 0.01$ ), weight and height ( $r = 0.77$ ,  $p = 0.01$ ), weight and BMI ( $r = 0.82$ ,  $p = 0.01$ ), and height and BMI ( $r = 0.27$ ,  $p = 0.01$ ). Significant inverse correlation was observed between  $\text{VO}_{2\text{max}}$  and BMI ( $r = -0.17$ ,  $p = 0.01$ ). In the regression model, age, weight, height and BMI accounted for 6.1 % of the variance in cardiorespiratory fitness of the participants. **Conclusion:** Age, height, weight and BMI are significant predictors of CRF in school-going adolescents.

### 15. Characteristics of Children with Fractures at Diagnosis of ALL: the Influence of Physical Activity.

J. Hay, B. Martin, B. Wilson, P.M. Miettunen, J. L. Jaremko, A. M. Huber, K Houghton, J. Ho, R. Grant<sup>8</sup>, D.B. Dix, M. Charron<sup>8</sup>, R. Barr, T. Blydt-Hansen, J Ma L.M. Ward and the Canadian STOPP Consortium

Brock University, University of Alberta, University of Calgary, Dalhousie University, University of British Columbia, University of Toronto, McMaster University, University of Manitoba, Winnipeg, MB, University of Ottawa, National Pediatric Bone Health Working Group

**Background:** A significant percentage of children newly diagnosed with acute lymphoblastic leukemia (ALL) present with vertebral fracture(s). In the pan-Canadian Steroid Induced Osteoporosis in Pediatric Populations (STOPP) study, a longitudinal natural history of ALL, 17% of children presented with at least a single lumbar fracture at diagnosis. Understanding the influences on bone fragility early in the disease process would have significant benefit when coordinating care for children when initiating treatment. **Methods:** We examined data taken around the time of diagnosis of 188 children (ages 2.5 to 16.9) newly diagnosed with ALL. We compared 29 children with vertebral fractures (mean age 6.49 (4.08)) to those 157 (7.15 (3.85)) without vertebral fractures. Measures included areal BMD (DEXA), fractures (x-ray), Tanner stage, (from pictures), pain (self-report), nutrition (7 day recall) and activity from the HAES. Glucocorticoid (GC) exposure was derived from clinical records. **Results:** Analyses of variance found NSD between the two groups in age, gender, Tanner stage, Ca intake or VitD intake (both %RDA), inactive hours, change in activity from pre-illness levels, GC exposure by mass or surface area, ALL risk classification, or duration from symptom onset until diagnosis. The non-fracture group had significantly higher ( $p < .002$ ) lumbar BMDa z-scores. The fracture group reported significantly more back pain ( $p < .001$ ) and significantly ( $p < .02$ ) more somewhat active hours (walking, etc.) in the two weeks prior to assessment. Poisson regression analysis (Likelihood Ratio Chi-Square value = 132.768,  $p = 0.001$ ) demonstrated a significantly elevated risk of fractures with decreased BMDa Z-scores ( $p < .001$ ) and increased age ( $p < .02$ ), BMI z-score ( $p < .001$ ), pain ( $p < .004$ ), and total weekly somewhat active hours ( $p < .001$ ). No other variables had significant effects. **Discussion:** These results suggest that the older children in the STOPP study, with greater mass and greater durations of activity, appear to be at elevated risk of lumbar fractures at diagnosis. For some children, the pathological effects of ALL on bone may lead to rapid increases in bone fragility. As a consequence stress from previously normal activity levels may be sufficient to provoke lumbar fractures. As high intensity activity is often suppressed in illness, attention to lower intensity weight-bearing activity is warranted.

#### 16. Conveying Physical Activity Recommendations to Youth with Inherited Arrhythmia Syndromes: Development of a Knowledge Translation Tool

K. Moncion, R.M. Gow, P.E. Longmuir, University of Ottawa, Children's Hospital of Eastern Ontario Research Institute

**Background:** Healthcare professionals, families and others caring for youth with inherited arrhythmia syndromes lack resources for conveying physical activity recommendations. Activity recommendations for many youths with arrhythmias are often based on heart rate, rather than dynamic and static effort or type of sport. The purpose of this study was to develop a simple, easy to understand, written information form to convey physical activity recommendations for patients with inherited arrhythmia syndromes. **Methods:** Published physical activity recommendations for patients with arrhythmias were summarized. A draft information form was created to specify the heart rate restriction for the youth, activities suitable to the heart rate restriction, and tips for minimizing heart rate during physical activity. An 8-item survey (1-10 scale) evaluated the content and format of the draft form. Scores from 8 to 10 were considered "acceptable", 5 to 7 were "fair", and 0 to 5 were "poor". **Results:** 16 participants completed the survey [8 healthcare professionals (5 cardiologists, 2 nurses, 1 ECG technician), 4 youth with inherited arrhythmia syndromes and their mothers]. Total mean survey score for all participants was  $8.8 \pm 0.2$ . Highest ratings were "conveys a positive message" (mean =  $9.3 \pm 0.1$ ) and "increased knowledge and confidence in activity recommendations" (mean =  $9.2 \pm 0.1$ ). Visual appeal had the lowest rating (mean =  $8.1 \pm 0.2$ ). Recommended changes were adding pictures/colours to enhance visual appeal. A revised form was created in response to the survey results. **Discussion:** Previous research indicated that parents find it unsettling to receive vague physical activity recommendations from health care professionals, and that many patients with arrhythmias and their families experience physical activity-related fear and anxiety. This study developed a simple, easy to understand written information form for conveying physical activity information about youth with arrhythmias. Healthcare professionals, patients and parents felt it conveyed a positive message and increased their physical activity confidence and knowledge. The form can be individually tailored for each patient's cardiac condition by the cardiologist. Future research is required to evaluate the information form effectiveness and impact on the physical activity participation of youth with inherited arrhythmia syndromes.

# ABSTRACTS – FREE COMMUNICATIONS, POSTER

## FRIDAY, AUGUST 12<sup>TH</sup>, 2016

### 1. Neighbourhood Socio-economic Status and Aerobic Fitness in Children: A Longitudinal Study.

D. Chirico, S. Veldhuizen, B.E. Faight, J. Hay, J. Cairney, McMaster University

**Background:** Cardiorespiratory fitness (CRF) is an important marker of overall health in adulthood, and is strongly associated with morbidity and mortality. CRF tracks from childhood into adulthood; therefore, it is important to identify barriers to the development of CRF. Socio-economic status (SES) is associated with health outcomes and behaviour, and may impact CRF in children and adolescents. The purpose of this study is to determine whether there is an association between SES and CRF in children and adolescents. **Methods:** Data come from the Physical Health Activity Study Team (PHAST) project, a longitudinal cohort study of children conducted between 2004-2010. The target population included all children in the fourth grade enrolled in the public school system in the Niagara region of Ontario, Canada. The Léger 20-m shuttle run test was used as a field-based measure of fitness. SES was assessed using the median income in the 2011 Canadian census in the dissemination area (DA) of residence as a proxy for household income. Growth curve modeling characterized change in fitness over time. Model 1 included sex, age at each assessment, and the interaction of these terms. Model 2 included DA and age as random effects.

Neighbourhood income was added to this model. Finally, an interaction of the two variables was created to test whether the effect of neighbourhood SES changed with age. **Results:** Relative  $VO_{2max}$  declined with age for both sexes (coefficient=-0.61,  $p<0.001$ ), but did so more rapidly among females (coefficient=-2.47,  $p<0.001$ ). DA income was highly significant when added to the model (coefficient=0.53,  $p<0.001$ ), indicating an overall difference between residents of wealthier and poorer neighbourhoods. The interaction of DA median income and age was not significant.

**Discussion:** The findings from this study indicate that a SES income gradient exists for aerobic fitness, which is already present at age 9, and does not change with age. This implies that an explanation might be sought in early-life influences on childhood CRF. The identification of disparities in fitness raises questions regarding social equity; that some children are more disadvantaged than others is an ethical, as well as a public health concern, that requires further research.

## 2. Does maturity status predict selection onto provincial sports teams?

D. Dale, E. Barbour-Tuck, M. Erlandson, M., L.B. Sherar, W. Proctor, L. Humbert, A.D.G. Baxter-Jones, University of Saskatchewan, Loughborough University, Sask Sport Inc

**Background:** Sport Canada's Long Term Athlete Development (LTAD) model acknowledges that there are limitations to ensuring appropriate development of team sports, especially with regards to selecting into chronological age (CA) bands. Adolescent of the same CA can be 4 to 5 years apart developmentally. It's suggested that late maturation could impede selection and effect long-term sports participation. The purpose of this study was to determine whether biologically maturity played a role in selection onto provincial sport teams. **Methods:** 820 participants (564 males, 256 females) aged 11 to 17 attending Saskatchewan youth sport team tryouts (hockey, soccer, basketball, football, volleyball, and baseball) were recruited. CA and anthropometric measures were recorded. A biological age (BA, years from peak height velocity [PHV]) was predicted. Participants were grouped into three maturation categories; pre (0.5 yrs before PHV), peri (1 year around PHV), and post (0.5 yrs after PHV). At the end of the tryouts team rosters were developed. Selection onto teams by maturity group was analyzed using Chi Square. **Results:** In male athletes there were significant within group differences between the proportion selected verses not selected in both prePHV (37.5 vs. 62.5%) and periPHV (38.3 vs. 61.7%), but not in the postPHV groups (48.7 vs 51.3%) ( $p>0.05$ ). In females, there were no differences postPHV (56.7 vs. 43%) ( $p>0.05$ ), only 38.5% of periPHV were selected and 0% of prePHV. There was a significant team selection by sport and maturity grouping interaction ( $p<0.05$ ). The proportion of athletes selected versus not selected did not differ between maturity groups in baseball, hockey or volleyball. **Discussion:** In this sample of youth athlete's, selection bias during adolescence in favour of more mature athletes was only observed in males and only in specific sports: soccer, basketball and football. It can be concluded that given the older BA of the girls, maturity did not appear to influence selection. However, the results suggest provincial sport organizations need new and better strategies for dealing with the potential selection bias of maturity in males for certain sports. Furthermore, a balance of shorter-term performance outcomes with longer-term athlete development and talent identification processes should be considered.

## 3. Validity of the Fitbit One for Assessing Physical Activity During Exergame Play

Allie Diltz, Jourdin Barkman, Wei Peng, Karin A. Pfeiffer, Michigan State University

**Background:** Although prevalence of childhood obesity has reached a plateau, a main contributing factor is lack of physical activity (PA). Researchers have suggested exergames as a method to encourage PA in youth. However, given the various types of movement, games, and game-playing modes that can take place during exergaming, it is not clear which objective monitor would provide the best estimates of PA during game play. The purpose of this study was to determine the validity of the Fitbit One for assessing PA during single- and multi-player modes of exergaming. **Methods:** Adolescents, 10-13 years old (26 male, 14 female), wore a Fitbit One (clipped to the waist band on the right hip) while playing exergames on the Xbox Kinect gaming system. Research assistants measured height and weight according to standardized procedures. Participants were fitted with a portable metabolic analyzer to collect expired gases and estimate energy expenditure. The Fitbit provided number of steps for each game, which a research assistant recorded. Participants played each game for 15 minutes in single- and 15 minutes in multi-player mode. Pearson and Spearman correlation analysis was used to determine validity separately for single- and multi-player modes. **Results:** Participants were (mean $\pm$ sd) 11.0 $\pm$ 0.9 years old, with BMI 19.5 $\pm$ 3.2 kg·m<sup>-2</sup>. Average energy expenditure during single-player mode was 15.6 $\pm$ 4.5 ml·kg<sup>-1</sup>·min<sup>-1</sup>, and during multi-player mode was 16.9 $\pm$ 4.6. Average steps were 548 $\pm$ 300 for single- and 735 $\pm$ 355 for multi-player mode. For Pearson correlations, there was a statistically significant relationship between VO<sub>2</sub> and Fitbit steps for single-player ( $r=0.40$ ,  $p<0.05$ ) but not multi-player mode ( $r=0.29$ ,  $p>0.05$ ). For Spearman correlations, both single-player ( $r=0.42$ ,  $p<0.01$ ) and multi-player ( $r=0.32$ ,  $p<0.05$ ) were significantly associated. **Discussion:** Fitbit One is worn on the hip rather than the wrist. It is possible that the device did not capture the higher energy expenditure during multi-player mode well, since previous literature has shown the Fitbit One to be less valid for capturing non-locomotor activities. The Fitbit One is likely not the most accurate choice for assessing PA during exergame play, but it can identify the most-to-least active individuals. Supported by Department of Media and Information Studies at Michigan State University

#### 4. Ratings of Perceived Exertion and Physiological Responses in Boys and Girls during Exercise

J. Erichsen, B. Dykstra, M. Hidde, and A. Mahon, Ball State University

**Background:** Children may have difficulty judging exercise intensity, which could adversely affect exercise adherence and the optimal health benefits. Knowledge of the ability to estimate and produce ratings of perceived exertion (RPE) may provide further insight into the child's thought process relating to exercise and activity participation and adherence. This study compared RPE and physiological responses in healthy children ( $n=15$ ,  $11.1\pm 1.0$  years) during estimation (graded exercise test [GXT] and steady-state bout) and production (steady-state bout) trials on a cycle ergometer. The hypothesis that the RPE and physiological responses would not differ among trials was tested. **Methods:** Participants completed a GXT for the determination of maximal oxygen consumption ( $VO_{2max}$ ). RPE was estimated every 30 seconds during this test. On a separate day, participants completed two 6-minute submaximal exercise bouts. During one, RPE was estimated while working at  $\sim 75\%$  of  $VO_{2max}$ . During the other, participants signaled the investigator to adjust the workload to produce the RPE that corresponded to  $\sim 75\%$  of  $VO_{2max}$ . Data were analyzed using a one-way MANOVA and paired t-tests. **Results:** The target intensity during the GXT corresponded to  $74.2\pm 2.5\%$  of  $VO_{2max}$ , the steady-state estimation trial was performed at  $76.5\pm 2.7\%$  of  $VO_{2max}$ , and the steady-state production trial was performed at  $68.5\pm 14.1\%$  of  $VO_{2max}$ . Although not significantly different, there was marked variability in  $\%VO_{2max}$  in the production trial.  $VO_2$ , heart rate, respiratory exchange ratio, pulmonary ventilation, and respiratory rate also were compared among the three bouts and there were no differences ( $p>0.05$ ) in responses. RPE at  $\sim 75\%$   $VO_{2max}$  also was compared between the two estimation trials and between the two steady-state trials. The mean RPE value selected at  $\sim 75\%$  of  $VO_{2max}$  during the GXT and produced during the production trial was  $6.7\pm 1.5$ ; during the steady-state estimation trial RPE was  $5.8\pm 2.0$  ( $p>0.05$ ). **Discussion:** At  $\sim 75\%$  of  $VO_{2max}$  during both graded and steady-state exercise participants estimated RPE in a similar manner. When asked to produce a given RPE, there were no significant differences in physiological responses, but marked variability was observed. Overall, these results may have implications for optimizing exercise prescriptions for children with disabilities or who are overweight or obese.

#### 5. From Start2Finish: Evaluation of an in-school physical activity program for children and youth

J. Graham, E. Bremer, M. Kwan, H. Clark, S. Veldhuizen, J. Cairney, McMaster University

**Background:** There is considerable evidence regarding the impact of physical activity and exercise on positive youth development and health. However, what is commonly missing from research in this area is a comprehensive model that can explain the positive impact of physical activity on youth developmental outcomes. The purpose of the present study is to evaluate the Start2Finish Process Model (Cairney and colleagues) which is based on existing research in the field of youth sport, physical activity, and the general health and development literature including two reviews (Kwan et al., 2014; Clarke et al., in press). The model proposes that regular participation in physical activity will positively impact children's motor skill development, physical fitness, reading and comprehension which, in turn, will positively affect various psychosocial and school outcomes and ultimately improve their overall health and well-being. We believe the Start2Finish 20/20 challenge, which requires children to engage in 20 minutes of physical activity a day for 20 weeks, has the potential to positively impact not only a child's physical health and development (e.g., fitness and body weight) but also social and psychological well-being, and scholastic achievement. **Methods:** Participants are 400 children (9-14 years of age,  $Age = 11.89\pm 1.34$ , 134 females) from the Hamilton-Wentworth Catholic School Board. Approximately half of the children are currently participating in the 20/20 challenge that is administered by their homeroom teacher during regular school hours. Participation in the study requires children to complete a questionnaire at three time points: baseline prior to engaging in the 20/20 challenge (January 2016), mid-point (end of March 2016), and upon completion of the 20/20 challenge (June 2016). The questionnaire assesses demographic variables, physical activity and sport participation, as well as several psychosocial variables (e.g., self-esteem, self-efficacy, social competence) in relation to physical activity, school, and overall health and wellbeing. **Results:** As data collection and analysis is on-going, full results will be presented at the 2016 biennial NASPEM conference. **Discussion:** We anticipate that children participating in the Start2Finish program will report greater increases in physical activity and sport participation, improved psychosocial outcomes, and improved overall health and wellbeing when compared to controls.

## 6. The Influence of Highland Dancing on Female Dancers' Bone Parameters

S. Runalls, M.C. Erlandson, University of Saskatchewan

**Background:** The effect of physical activity and sport participation on bone mineral accrual during growth has been a large area of interest due to the importance of bone health in later life. Sports, such as gymnastics, and other high-impact and weight bearing activities have been shown to have benefits for bone development when participation begins before puberty. Currently, no research has been done to investigate highland dance and its potential benefits on bone density and other bone parameters. Highland dance involves high impact loading of the lower limb and participation generally begins at an early age. The purpose of this study was to determine whether tibial bone density, area, and estimated strength were greater in post-menarcheal highland dancers compared to controls.

**Methods:** Bone geometric and densitometric parameters, measured by peripheral quantitative computed tomography (pQCT) at the radius and tibia, were compared between 6 female dancers and 6 controls. Participants were 18-23 years of age, and the highland dancers had participated in dance throughout their growing years. pQCT measures of bone health were assessed using multivariate analysis of covariance (covariates: age, height, site specific muscle cross-sectional area, age at menarche, and physical activity). **Results:** Highland dancers had significantly greater total density (20%), trabecular density (15%), and estimated bone strength (BSI) (27%) at the distal tibia ( $p < 0.05$ ). There were no differences in bone parameters at the tibial shaft or radius. **Discussion:** These results suggest that highland dance participation starting before menarche is beneficial to distal tibial bone density and estimated strength. The significant differences being seen distally compared to proximally suggests the distal site may display a greater propensity for adaptation to loading. Dancers were also found to have no differences at the radius when compared to non-dancers, suggesting that the benefits seen at the distal tibia are due to the loading experienced through highland dance, and not a genetic predisposition and selection into the sport. Therefore, highland dance participation during the growing years appears to result in bone benefits at the distal tibia.

## 7. Prevalence of High-Risk Waist-to-Height Ratio in Young Children

D. Keefer, Millersville University

**BACKGROUND:** Recent research (JAMA, 2014) demonstrated a significant drop in the percentage of children (ages 2 to 5 yr. old) who were at or above the 95<sup>th</sup> percentile of body mass index (BMI) comparing the 2003 to 2012 NHANES datasets (from 13.9% to 8.4%;  $P = .03$ ). Since waist-to-height ratio (WHTR) may be a better indicator of children's health status, the purpose of this investigation is to determine if the drop in BMI for this population is paralleled by a drop in WHTR. **Methods:** Data from children and adolescents ( $N = 741$  (2003) &  $787$  (2012); 2 to 5 years old) who were part of the 2003-2004 and 2011-2012 NHANES datasets were analyzed. Two-Sample t-Tests were used to compare Weight, Height, Waist, BMI and WHTR between the datasets. A z-score test compared the proportion of children found with a higher risk WHTR between the datasets. **Results:** The results demonstrate a significant decrease between the two sets of data (2003 vs 2012) for Weight (17.7 vs 16.9 kg;  $P < .001$ ); Height (102.6 vs 101.4 cm;  $P = .01$ ); Waist Circumference (52.0 vs 50.9;  $P < .001$ ); BMI (16.6 vs 16.3 kg/m<sup>2</sup>;  $P = .004$ ); and WHTR (0.509 vs 0.504;  $P = .05$ ). In addition, a non-significant difference ( $P = .06$ ) was noted between the proportion of children (54.2%) who had a high risk WHTR ( $>0.50$ ) and those whose risk was lower (49.2%) for 2003 and 2012, respectively. **Discussion:** In concurrence with the aforementioned research, the proportion of the population with a high-risk WHTR decreased between 2003 and 2012. However, this decrease in percent of young children with a high-risk WHTR did not reach a statistically significant level ( $P = .06$ ), whereas the decrease in proportion of children with high-risk BMI values was significant ( $P = .03$ ). All variables used to calculate these two measures (WHTR and BMI) also decreased significantly. Future research should document if this trend will continue in future years for young children as well as if the trend will present itself in children who are slightly older than those investigated in this study.

## 8. Feasibility of the SWITCH Classroom Module and its Effect on Classroom Engagement

K, Long, S. Vazou, L. Lanningham-Foster, G, Welk, Iowa State University

**Background:** Childhood obesity has more than doubled in the past 30 years and the school is an ideal place for children to be immersed in a healthy lifestyle environment. SWITCH is multi-component program designed to promote student health, by switching what students Do, View, and Chew. SWITCH classroom is a new module that integrates physical activity with academic subjects and nutrition in the classroom. The purposes of this study were to examine the feasibility of the SWITCH classroom module and its effect on student's self-perceived classroom engagement. **Methods:** Six 3<sup>rd</sup> grade classes (3 intervention,  $N=43$ ; 3 control,  $N=64$ ) from 3 schools in Iowa participated over a 7-week period. The subscales of behavioral and emotional engagement with learning (Skinner et al., 2009) were completed before and after the intervention by both groups. Engagement with the SWITCH activities was also measured at the end of the intervention. To assess intervention fidelity, intervention teachers recorded the frequency, duration, their experience and their students' experience from using the SWITCH activities through a daily log. **Results:** Over the seven-week implementation period, the compliance rate for using the SWITCH activities was on average 75% (~2.5 times out of the 3 recommended days). The teachers were satisfied with the activities ( $M=4.14\pm0.60$ , on a 5-point scale) and the students enjoyed them ( $M=2.84\pm0.39$ , on a 3-point scale). Behavioral and emotional engagement did not differ between groups across time, meaning that engagement for learning was not impaired due to the SWITCH classroom-based physical activities. Hierarchical regression analysis, controlling for gender and baseline engagement in learning, showed that both behavioral and emotional engagement in the SWITCH activities significantly predicted posttest engagement in learning. **Discussion:** The present findings affirm that the SWITCH classroom activities can be easily implemented in the classroom without negatively impacting students' engagement in learning. Given the short implementation period, it is possible that a longer intervention time is needed to elicit the desired changes. Additionally, the result that engagement in SWITCH physical activities predicted engagement in learning is very promising in enhancing students' engagement in learning.

## 9. Parent Perceptions of the Academic Mission of a Pediatric Tertiary Care Centre: Impact on Research and Teaching

P.E. Longmuir, M.Y. Xia, A. Doja, C.M. Duffy, L. Gardin, R.M. Gow, R. Jurencak, S.L. Katz, L.S.W. Lai, C. Lamontagne, S. Lee, J. Lougheed, A. McCormick, H.J. McMillan, D. Pohl, J. Roth, C. Theoret-Douglas, K. Watanabe Duffy, D. Wong, R. Zemek, University of Ottawa, Children's Hospital of Eastern Ontario Research Institute

**Background:** Academic hospitals combine clinical care, research and teaching. It is expected that patients will be seen by trainees (implied consent) but how patients are approached for research varies. Research may be integrated within the clinic setting or a distinct entity. Little is known about parent perceptions of research and teaching activities at academic hospitals, and whether perceptions differ by medical condition. **Methods:** Surveys of parents of children attending a tertiary care hospital. Four questions asked willingness to be approached for a) research or b) teaching, either i) during the hospital visit or ii) at home. Responses were always willing, probably willing, depends on specific request, not prior to discussion with the child's physician, not willing to be approached. **Results:** 158 parent surveys collected from parents of children, 3 to 14 years, with chronic illnesses (rheumatology ( $n=34$ ), cardiology ( $n=52$ ), respirology ( $n=22$ ), neurology ( $n=50$ )), physical disabilities (rehabilitation ( $n=8$ ), spina bifida ( $n=2$ ) chronic pain ( $n=1$ )) or seen in the emergency department ( $n=31$ ). 87%/91% of illness/disability parents, respectively, would always/probably be willing to have their child seen by a trainee, compared to 74% of emergency parents. Always/probably willing to participate in trainee education outside clinic visit was 50%, 63% and 42% among illness, disability and emergency parents. 72%/92% of illness/disability parents were always/probably willing to be approached for research during the clinic visit, compared to 55% of emergency parents. Contact at home regarding research differed significantly between groups ( $p=0.02$ ). 76%/92% of illness/disability parents were always/probably willing, versus 52% of emergency parents. 7% of emergency parents would never want their child seen by a trainee or to be approached for research compared to <2% of illness/disability parents. **Discussion:** Parents have positive attitudes towards both education and research activities during the clinic visit. Support for research is similarly strong among parents of children with a chronic illness or disability approached at home. These results indicate that parents view both research and education in a similar fashion. Clinicians who follow children with a chronic illness or disability should contact families regarding research opportunities, either in clinic or at home.

## 10. Relationships between Physical Fitness and Motor Skill Performance in Children with Autism Spectrum Disorder

A.D. Mahon, S. Dieringer, C.E. McIntosh, B.J. Dykstra, J.M. Erichsen, and D.E. McIntosh, Ball State University

**Background:** Children with Autism Spectrum Disorder (ASD) often demonstrate deficits in motor skill performance and physical fitness indices in comparison to children without ASD. Whether or not there are relationships between physical fitness and motor skills have been largely unexplored in children with ASD. Therefore, the purpose of this study was to examine correlations between motor skill performance, muscle strength and aerobic fitness in children with ASD. **Methods:** Data for this study was obtained from 10 boys with ASD ( $10.2 \pm 1.7$  yrs,  $46.2 \pm 24.0$  kg, and  $142.3 \pm 17.0$  cm) who were participating in a summer camp program for children with ASD. Handgrip (HG) muscle strength was measured in both hands with the highest grip strength used and expressed in absolute terms and relative to body mass. Aerobic fitness was assessed as the physical working capacity at a heart rate of 170 bpm (PWC170) and expressed in absolute terms and scaled to body mass. Locomotor skill and object control performance was assessed using the Test of Gross Motor Development-2. Correlations between measures of HG, PWC170, locomotor skill and object control were determined; significance was set at  $p < 0.05$ . **Results:** HG strength was  $15.8 \pm 5.1$  kg and  $0.39 \pm 0.11$  relative to mass, PWC170 and PWC170/kg were  $57.4 \pm 24.2$  W and  $1.4 \pm 0.7$  W/kg, respectively. The standard and percentile scores for locomotor skill were  $6.7 \pm 3.6$  and  $24.4 \pm 23.9$  and the standard and percentile scores for object control were  $5.3 \pm 3.5$  and  $14.5 \pm 25.4$ , respectively. Correlations among HG, HG/kg, PWC170, PWC170/kg, locomotor skill and object control ranged from  $r = -0.47$  to  $r = 0.39$ ,  $p > 0.05$ . **Discussion:** Muscle strength and aerobic fitness were not significantly related to motor skill performance in this group of children with ASD. However, the small sample may limit the overall generalizations that can be made. Future studies are warranted to better understand relationships among these variables as well as to establish effective intervention strategies to improve fitness and motor competence in children with ASD. This research was supported with funding provided by the Center for Autism Spectrum Disorder at Ball State University.

## 11. Title: Agreement of activity monitors during treadmill walking in teenagers with severe obesity.

Martha R. Manning, Billy N. Tune, Eszter Völgyi, Webb A. Smith, University of Memphis, University of Tennessee Health Science Center, Children's Foundation Research Institute, Le Bonheur Children's Hospital, Le Bonheur Children's Hospital

**Background:** Popularity of fitness trackers and step counters has increased tremendously making them frequently used tools in lifestyle intervention. The purpose of this study is to investigate the accuracy of multiple trackers across normal walking speeds in teenagers with obesity. **Methods:** Teenagers (13 and 16 years old) were recruited from the Healthy Lifestyle Clinic of the Pediatric Obesity Program at Le Bonheur Children's Hospital, Memphis, TN. Informed consent and assent were obtained from each parent and youth, respectively. Height and weight were assessed using a stadiometer and digital clinic scale. Patients were fitted with fitness tracking devices (Fitbit Flex, One, and Zip, the Jawbone UP Move, and Actigraph GT3X+) and they were asked to walk on a treadmill at 3 speeds (1.5, 2.5, and 3.5 mph) without support for 3 minutes per speed with 5-minute rest period to reset devices. In addition, steps were manually counted using a tally counter. Using SAS version 9.4, Pearson correlations ( $r$ ) were used to determine agreement between step measurements. **Results:** Our study included 9 teenagers ( $14.5 \pm 0.8$  years old) with severe obesity ( $168.4 \pm 5.8$  cm tall,  $107.9 \pm 17.9$  kg,  $99.2 \pm 0.56$  BMI %ile). All patients completed the walk test without issue. None of the devices significantly correlated (ranging from  $r = -0.39$ - $0.01$ , and  $p = 0.4$ - $0.9$ ) with counted step (gold standard) across all speeds. Across all speeds, Zip and One were the only device with significant correlation ( $r = 0.90$   $p = 0.005$ ). At 1.5 mph, there were no correlations between any device and counted steps ( $r = 0.48$ - $0.004$ , and  $p = 0.3$ - $0.9$ ) and only Zip and One correlated with each other ( $r = 0.96$ ,  $p = 0.0007$ ). At 2.5 mph, both the One ( $r = 0.96$ ,  $p = 0.0007$ ) and Zip ( $r = 0.9$ ,  $p = 0.006$ ) were correlated with counted steps and only Zip and One correlated with each other ( $r = 0.98$ ,  $p = 0.0001$ ). At 3.5 mph, both the One ( $r = 0.94$ ,  $p = 0.0013$ ) and Zip ( $r = 0.8$ ,  $p = 0.05$ ) were correlated with counted steps and only Zip and One correlated with each other ( $r = 0.9$ ,  $p = 0.005$ ). **Discussion:** The Fitbit One appears to have the best agreement with counted steps during treadmill walking in teenagers with severe obesity. More research is needed to evaluate the applications, reliability, and validity of these popular devices.

## 12. Factors associated with success in an exercise medicine clinic for children with a chronic medical condition.

M. McDonald, J Obeid, G. Jenkins, S. Thiessen, B Baird, B.W. Timmons, McMaster University

**Background:** Physical fitness during childhood is a powerful marker of health, even in disease. Yet, children with chronic conditions are less active and have reduced levels of aerobic fitness compared to healthy children. Research evidence clearly demonstrates that regular exercise can be used to improve aerobic fitness of many children with a chronic medical condition. However, there remains a gap in understanding factors associated with improved fitness in a clinical setting. The purpose of this study was to assess fitness levels and physical activity prescription associated with improvement in fitness among children with chronic disease attending the Exercise Medicine clinic at McMaster Children's Hospital. **Methods:** A retrospective review of medical charts of children with various chronic conditions was performed. Anthropometric measures (height, weight, % body fat), aerobic fitness (aerobic peak power, PP) and physical activity prescriptions were extracted from charts of patients who had a minimum of 3 clinic visits, over an average span of 11 months. **Results:** Baseline fitness in 42 children (age range: 6.9 – 18.4 years) was  $39.0 \pm 15.8\%$  lower than height-matched norms for healthy children ( $p < 0.001$ ). Repeated measures ANOVA for fitness over time showed a significant improvement ( $F(2,72)=7.130$ ,  $p=0.002$ ), with visit 3 > visit 1 (mean  $\pm$  SD:  $2.8 \pm 0.6$  vs.  $2.5 \pm 0.6$  Watts/kg fat free mass;  $t = -3.429$ ,  $p < 0.01$ ). Percent predicted PP at baseline was significantly correlated to  $\% \Delta$  in absolute PP, PP relative to body mass and PP relative to fat-free mass at visit 2 ( $r = -0.367$  to  $-0.345$ ,  $p < 0.05$ ), and to  $\% \Delta$  in absolute PP and PP relative to fat-free mass at visit 3 ( $r = -0.384$  to  $-0.347$ ,  $p < 0.05$ ). There were no differences in physical activity prescription for children with  $< 10\%$  and  $\geq 10\%$  improvement in absolute PP, PP relative to body mass, or fat-free mass from visit 1 to 3 ( $X^2 = 0.259$  to  $1.167$ ,  $p > 0.05$ ). **Discussion:** Patients with a chronic medical condition attending the exercise medicine clinic were able to increase aerobic fitness over time, where children demonstrating the lowest fitness improved most. The lack of relationship with physical activity prescription may be related to an inconsistent framework for prescribing exercise as medicine.

## 13. Are there critical periods of fat accrual during adolescence that influence adult male fat mass?

A.D.G. Baxter-Jones, E. Barbour-Tuck, M. Erlandson, L.B. Sherar, S.A. Jackowski, J.C. Eisenmann, D.A. Bailey, University of Saskatchewan, Loughborough University, Michigan State University

**Background:** Using body mass index (BMI) critical periods during growth have been identified that increase the risk of being overweight (OW) in adulthood. Though BMI is widely used as a marker of population OW and obesity (OB), it is unable to identify fat accrual and distribution. It is suggested that fat mass accrual in adolescence may be a more important marker of adult fat mass, than BMI development. The purpose of this study was to investigate longitudinally the effects of fat accrual during adolescence on subsequent adult fat mass. **Methods:** 76 male participants from the Saskatchewan Growth and Development Study (SGDS) (1964-2010) were tertiled using DXA derived adult percent total body fat (TBF) ( $G1 \leq 20.6\%$ ;  $G2 > 20.6\% < 27\%$ ;  $G3 \geq 27\%$ ). Serial anthropometric measures were collected from 7 to 17 years of age. A biological age (BA; years from peak height velocity (PHV=0)) was calculated. During adolescence TBF (%) and trunk fat (Tfat, mm) were estimated from skinfolds. Age appropriate % TBF cut-offs were used to identify weight status. Mean differences assessed by ANOVA. **Results:** In adulthood ( $43.5 \pm 6.3$  yrs.) TBF and Tfat differed between groups ( $p < 0.05$ ). 73% of the sample was OW in adulthood (100% in groups G2 and G3). In adolescence, prior to PHV, all subjects were normal weight (NW); however, TBF in G3 was significantly higher than G1 and G2 from BA's -4 to 0 ( $p < 0.05$ ). Only G3 became OW before emerging adulthood. Tfat was significantly higher in G3 compared to groups G1 from BA's -4 to +3 ( $p < 0.05$ ). The ratio of Tfat: TBF in adolescence climbed from a nadir at BA -5 to a plateau at +2. **Discussion:** These findings suggest that 4 years prior to attainment of PHV is a critical period for fat accrual for those at risk of becoming OW in adulthood; in terms of both total and trunk fat mass accruals. An apparent second critical period occurs during emerging adulthood. The results suggest that OW adults may be at heightened health risk due to concomitant gains in Tfat around PHV, even if they are identified as being normal weight during this period.

#### 14. Do the currently recommended heart rate and respiratory quotient criteria adequately identify maximal aerobic efforts in growing children?

A.S. Jabbal, D. Bailey, A.D.G. Baxter-Jones, M. Erlandson, University of Saskatchewan

**Background:** In adults, aerobic power ( $\text{VO}_2 \text{ max}$ ) is characterized by a plateau in oxygen consumption ( $\text{VO}_2$ ) with increasing exercise intensity. It has been shown that few children and adolescents show this adult described plateau. Since plateau is not determinable the term  $\text{VO}_2$  peak is deemed more appropriate for children and adolescents.  $\text{VO}_2$  peak is defined as the highest  $\text{VO}_2$  value observed during a maximal aerobic power test. To determine if this peak value is a true maximal value, the following criteria are recommended: a heart rate (HR) greater than 95% of maximum (220-age) and/or a respiratory quotient (RQ) greater than 0.99. The aim of this study was to determine how often these criteria were met and whether they were influenced by maturity status. **Methods:** 249 participants (7 to 17 years) from the Saskatchewan Growth and Development Study perform annual assessment between 1964 and 1973. Measures included: chronological age (CA), height, weight and an aerobic power test ( $\text{VO}_2$ ,  $\text{VCO}_2$  HR) test to voluntary exhaustion on a motorized treadmill. Peak  $\text{VO}_2$  was identified as were corresponding values for RQ ( $\text{VCO}_2/\text{VO}_2$ ) and HR. Age at peak height velocity (PHV) was estimated from serial height data and a biological age identified (years from PHV). To account for maturity CA was adjusted by subtracting BA from CA. **Results:** A peak  $\text{VO}_2$  was identified in 136 children (110 males, 26 females), 55% of the sample. Of these tests 28% of individuals met the criteria for establishing a true maximal effort using the RQ cutoff and 17% of individuals met the criteria using the HR criteria. The percentage who met the criteria significantly increased, for both RQ and HR, with increasing CA. Adjusting CA to account for maturity (age from PHV) did not affect the results ( $p>0.05$ ). **Discussion:** The results from the study imply that the criteria for estimating maximal effort in children using HR and RQ were not reliable in this sample. It was also found that the criteria were better applied to older individuals than younger individuals. Further research should be done in order to determine reliable measures of estimating maximal effort in children.

# ABSTRACTS – FREE COMMUNICATIONS, POSTER

## SATURDAY, AUGUST 13<sup>TH</sup>, 2016

### 1. The effect of three types of physical education instruction on whole-day sedentary time and moderate to vigorous physical activity in third grade students

Rebecca W. Moore, Kara K. Palmer, & Leah E. Robinson, Eastern Michigan University, University of Michigan

**Background:** The purpose of this study was to determine the effect of three types of physical education (PE) instruction on whole-day sedentary time and moderate to vigorous physical activity (MVPA) in third grade students.

**Methods:** Forty-five participants (22 M, 23 F;  $8.4 \pm 0.8$  yrs) from three 3<sup>rd</sup> grade classrooms were combined into 1 PE class as part of the schools normal schedule. Students were then randomly assigned to one of three types of PE instruction: motor skill (MS), physical activity (PA), or motor skill and PA (MS+PA). The PE instruction took place for 10 weeks, 3 times a week, for 30-40 minutes each day. Objective PA was measured using an Actigraph GT3X+ accelerometer. Participants wore the accelerometer during weeks 1 and 10 on the right hip for seven days at each time point. Epoch length was set to 15 seconds. Evenson cut-points were used to determine sedentary time and MVPA. Sedentary time and MVPA were then divided by total wear time to determine percent time spent in each category. Wear time criteria was 600 minutes per day for 4 days. Paired samples t-tests were used to determine differences in percent sedentary time and MVPA at weeks 1 and 10 from the three PE instruction groups. **Results:** Five participants were excluded at week 1 for not meeting wear time criteria. For week 10, 10 participants were non-compliant and did not wear the accelerometer and 9 participants were excluded due to insufficient wear time. A significant difference in percent sedentary time was found for the MS ( $52.75 \pm 6.1\%$ ;  $54.4 \pm 7.5$  mean  $\pm$  S.D.), PA ( $53.14 \pm 6.9$ ;  $54.27 \pm 6.1$ ) and PA+MS ( $60.21 \pm 6.8$ ;  $56.4 \pm 9.4$ ) instruction groups. A significant difference was further found in MVPA for the MS ( $13.7 \pm 2.6$ ;  $14.2 \pm 2.8$ ), PA ( $14.3 \pm 3.1$ ;  $13.8 \pm 2.8$ ), and PA+MS ( $12.02 \pm 5.1$ ;  $13.4 \pm 5.6$ ) groups. **Discussion:** The MS and MS+PA groups showed a decrease in sedentary time and an increase in MVPA following 10 weeks of PE instruction. Unexpectedly, the PA group showed a decrease in MVPA, which could be due to examining the entire day instead of only time spent in PE. A limitation to this study was low accelerometer compliance at week 10.

### 2. Is bodyweight affecting posturography in children aged between 9 and 11 years? Evidences of a pilot intervention.

*Antonino Bianco<sup>1</sup>, Giuseppe Messina<sup>2</sup>, Francesco Martines<sup>3</sup>, Jessica Brusa<sup>\*4</sup>, Salvina Di Miceli<sup>4</sup>, Valentina Garraffo<sup>4</sup>, Cristina Milazzo<sup>4</sup>, Marilisa Sardisco<sup>4</sup>, Antonino Patti<sup>1</sup>, Antonio Paoli<sup>5</sup>, Angelo Iovane<sup>1</sup>, Antonio Palma<sup>1</sup>, University of Palermo, POSTURALAB Italia*

**Aim:** The present investigation aimed at the evaluation of the posturographic parameters in a sample of children of both sexes with the aim to better understand if posturography can be adopted and useful during school age period.

**Methods:** A number of 74 children ( $10.2 \pm 0.7$  yrs;  $145.7 \pm 8.7$  cm;  $42.2 \pm 9.9$  kg;) attending 6<sup>th</sup> grade school have been involved during one week data collection period (October, 2015). All children were invited to participate at static baropodometric and stabilometric analyses carried out through a force platform freeStep<sup>®</sup> and a computer software freeMed<sup>®</sup> provided by Sensor Medica<sup>®</sup> (Guidonia, Montecelio, Roma, Italy). The following variables were recorded: 1) Anthropometric characteristics; 2) Baropodometric parameters and stabilometric parameters. The data were analyzed with STATISTICA 8.0 software and the One-way ANOVA analysis and/or T-test analysis were adopted when appropriate. **Results:** Participants were categorized first in Males (N 51;  $10.2 \pm 0.7$  yrs;  $145.6 \pm 9.0$  cm;  $41.9 \pm 9.0$  kg) and Females (N 23;  $10.3 \pm 0.8$  yrs;  $145.9 \pm 8.3$  cm;  $43.0 \pm 11.8$  kg). Baropodometric parameters comparison showed a left forefoot plantar surface significantly different (0.03) in males ( $44.5 \pm 17.1$  cm<sup>2</sup>) compared to females ( $35.6 \pm 13.0$  cm<sup>2</sup>). No differences were found in total left (males  $49.8 \pm 7.9\%$ ; females  $49.1 \pm 6.0\%$ ) and right (males  $50.2 \pm 7.9\%$ ; females  $50.9 \pm 5.9\%$ ) plantar pressure distribution; the data were normalized according with the participants' foot length in centimeters ( $24.4 \pm 1.1$  in males vs  $23.5 \pm 1.7$  in females – 0.001). The stabilometric analysis did not showed significant differences between genders (CoP - Latero/Lateral Oscillations  $15.5 \pm 3.1$  mm in males; CoP - Latero/Lateral Oscillations  $14.8 \pm 2.1$  mm in females; CoP - Antero/Posterior Oscillations  $17.6 \pm 2.5$  in males; CoP - Antero/Posterior Oscillations  $17.3 \pm 2.1$  in females). In a second time, participants were categorized in weight status categories according

to the international cut off points for children's body mass index provided by Cole et al, (BMJ volume 320, 6 may 2000). From underweight category up to obese category (including so also normalweight and overweight) the One-way analysis of variance was performed for all posturographic parameters. In stabilometric analysis, we found no significant differences between categories, but interestingly in baropodometric evaluations we found one completely different load distribution (left-right) while watching from underweight category up to obese category. In addition, during the t-tests comparisons we found a significant difference (0.003) between right rearfoot plantar surface in underweight children (M/F 36,7±7,4 cm<sup>2</sup>) when compared with rearfoot plantar surface of obese children (M/F 44,4±10,3). This last result confirms the interesting trend already shown by the analysis of variance (1 x 4). **Conclusions:** The posturographic evaluation (plantar pressure and centre of pressure oscillations) seems to be feasible and useful even at early age of 9-11 yrs. We found interesting the fact that there are intra-categories variances. Those results can help professionals to better understand underweight and obese children ontogenesis and can contribute to proper intervention plans in order to prevent musculoskeletal disorders and chronic diseases in adult age. This pilot intervention needs to be confirmed by further investigations with a larger sample and a proper investigation able to provide normative values and standardized operating procedures (SOPs) for children.

### 3. An Interactive Gym Game to Assess Physical Activity Adequacy and Predilection: The CSAPPA Questionnaire for Children Unable to Read and Write

**A. Blais, P.E. Longmuir**, Children's Hospital of Eastern Ontario Research Institute and University of Ottawa

**Background:** The Children's Self-Perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) questionnaire assesses motivation to engage in physical activity. However, CSAPPA completion is difficult for younger children and those with disabilities who are unable to read or write. Verbal CSAPPA administration is time consuming, and difficult with groups of children. The purpose of this study was to investigate whether an interactive game format could be used to enable autonomous responses to the CSAPPA items among groups of children unable to independently read the questions and record their responses. **Methods:** Children (n=26), 6 to 11 years of age, recorded their response to each CSAPPA question with the assistance of a leader. Each class then completed the interactive game during one gym session. From the centre of the gym children chose the statement "most like me" by running to the side of the gym designated for their preferred response. A second run allowed children to respond "really sure" or "sort of sure". Leaders recorded the final location of each child as the child's response. The adequacy and predilection sub-scores from the CSAPPA questionnaire and interactive game were compared using paired t-tests to examine whether there were significant differences in the responses obtained. Statistical significance was set at  $p > 0.05$ . **Results:** There was a positive and moderately strong association between the verbal and interactive gym game responses for the adequacy ( $r = .47, p < .05$ ) and predilection ( $r = .53, p < .01$ ) sub-scores of the CSAPPA. Mean adequacy scores were not significantly different (95% CI of the difference: -2.35, 2.18;  $p = 0.94$ ), whether obtained verbally ( $M = 19.9, SD = 5.29$ ) or via the interactive gym game ( $M = 20.0, SD = 5.10$ ). There were also no significant differences (95% CI of the difference: -2.24, 2.31;  $p = 0.97$ ) between the predilection scores from the verbal questionnaire ( $M = 25.9, SD = 6.00$ ) and the interactive game ( $M = 25.88, SD = 5.56$ ).

**Discussion:** The CSAPPA gym game may be an appropriate method of evaluating physical activity adequacy and predilection among children unable to autonomously complete a written questionnaire. Further research should evaluate equivalency of the verbal and game responses in a larger group of young children and those with learning disabilities.

#### 4. Effect of a 12-Week Summer Break on Health-Related Fitness in Disadvantaged Children from Low-Income Schools

Ryan D. Burns, Timothy A. Brusseau, Yi Fang, James C. Hannon, University of Utah, West Virginia University

**Background:** Disadvantaged children from low-income schools have significant barriers to optimize health-related fitness levels. It is currently unknown if a summer vacation in this pediatric population negatively influences health-related fitness, consisting of body composition and cardio-respiratory endurance. The purpose of this study was to examine the effect of a 12-week summer break on health-related fitness in a large sample of elementary school-aged children from low-income schools receiving Comprehensive School Physical Activity Programming. **Methods:** Participants were 1,212 school-aged children (Mean age =  $9.5 \pm 1.8$  years; 624 girls, 588 boys) recruited from three low-income schools receiving Comprehensive School Physical Activity Programming. Health-related fitness measures were collected during the end of Spring semester 2015 and again during the beginning Fall semester 2015. The specific measures consisted of body mass index (BMI) to estimate body composition and the Progressive Aerobic Cardiovascular Endurance Run (PACER) to estimate cardiorespiratory endurance. All measures were collected during physical education class. A  $6 \times 2 \times 2$  doubly MANCOVA test was employed to examine the effect of grade level (1<sup>st</sup> – 6<sup>th</sup>), sex (girl, boy), and time (Spring, Fall) on BMI and PACER, adjusting for school and classroom-level clustering. The omnibus MANCOVA test was followed by separate mixed-design ANCOVA tests with a Bonferroni alpha level adjustment. **Results:** Results from the MANCOVA analysis indicated that BMI significantly increased from Spring to Fall semesters (Mean difference =  $0.5 \text{ kg/m}^2$ ,  $p < 0.01$ , Cohen's  $d = 0.40$ ) and PACER laps decreased from 31.2 laps in the Spring to 25.8 laps in the Fall (Mean difference =  $-5.4$  laps,  $p < 0.001$ , Cohen's  $d = 0.33$ ). Children in the sixth grade had significantly greater decreases in the number of PACER laps completed at the Fall time-point compared to all other grade levels ( $p < 0.01$ ). **Discussion:** Children from low-income schools receiving Comprehensive School Physical Activity Programming had higher BMI and lower PACER scores following a 12-week summer break. Practitioners and teachers working within school-based physical activity programming models need to be aware of the potential declines in health-related fitness over summer break order to devise preventative strategies.

#### 5. From early years to school-aged years: compliance with Canadian physical activity guidelines

H.A.T. Caldwell, N.A. Di Cristofaro, N.A. Proudfoot, S. King-Dowling, and B.W. Timmons. McMaster University

**Background:** Canadian Physical Activity Guidelines recommend preschoolers accumulate 180 min of total physical activity (TPA) daily with a progression towards 60 minutes of moderate-to-vigorous physical activity (MVPA) by 5 years of age and that school-aged children accumulate 60 minutes of MVPA daily. As children transition from preschool to school-age, it is unknown if and how physical activity behaviours change. The objective of this study was to determine the importance of meeting physical activity guidelines at different stages of childhood. **Methods:** 55 children (24 girls) who participated in the Health Outcomes and Physical activity in Preschoolers (HOPP) Study as preschoolers (3-5 years old; average age:  $4.4 \pm 0.8$  years) and in the School-age Kids health from early Investment in Physical activity (SKIP) Study  $4.2 \pm 0.8$  years later at age  $8.6 \pm 1.1$  years were included. Seven-day physical activity was assessed with accelerometers, and analyzed with 3-sec epochs and age-appropriate cut-points. Only children who wore the accelerometer  $\geq 10$  hrs on  $\geq 3$  days were included in the analyses. We calculated the proportion of children meeting the different guidelines at different ages. **Results:** At preschool age, 69% met the 180 min TPA guideline and 47% met the 60 min MVPA guideline. At school-age, 24% met the 60 min MVPA guideline. Of these children who met the school-age guideline, 77% met the 60 min MVPA guideline as preschoolers. Compared to children who did not meet the 60 min MVPA guideline at preschool age, those who did had significantly higher odds of meeting the 60 min MVPA guideline at school-age (OR= 5.4, 95% CI: 1.3-22.7). In contrast, meeting the 180 min TPA guideline as preschoolers did not significantly increase the odds of meeting the 60 min MVPA guideline at school-age (OR=7.4, 95% CI: 0.9-62.2). **Discussion:** Engaging in sufficient MVPA, but not necessarily TPA, as a preschooler increased odds of meeting the recommended physical activity guideline as a school-aged child. Initiatives and health promotion efforts should encourage energetic play over physical activity of any intensity to increase children's chances of maintaining PA levels throughout childhood.

## 6. Physical Inactivity in Very Young Children with Congenital Heart Defects Cannot be Explained by Motor Development, Hospitalization or Cardiopulmonary Bypass Exposure

Natasha Cinanni, Natascia A. Di Cristofaro, Emily Ertel, Suzie Lee, Ganesh Shanmugam, Kristi Adamo, Nicholas Barrowman, Mark S. Tremblay, Rejane Dillenburg, Brian W. Timmons, Patricia E. Longmuir  
Children's Hospital of Eastern Ontario Research Institute, University of Ottawa, McMaster University, McMaster Children's Hospital

**Background:** Motor development delays among children with complex congenital heart defects have been attributed to cardiopulmonary bypass exposure. In healthy children, motor skill deficits are associated with sedentary lifestyles. This study evaluated the associations between motor development and physical activity among young children with simple and complex heart defects. **Methods:** Children 12 to 47 months were recruited through two tertiary pediatric cardiac clinics. Assessments were the Peabody Motor Development Scale and daily physical activity via omnidirectional accelerometer. Children  $\geq 36$  months also completed the Test of Gross Motor Development-2. Medical chart review determined total days of hospitalization and cardiopulmonary bypass exposure. **Results:** 141 toddlers (75 males (53%)), varying from 12 to 51 months in age (mean  $30.9 \pm 11.0$  mos) were enrolled in 5 study groups: innocent murmur ( $n=30$ ), congenital heart defect (CHD) not requiring treatment ( $n=40$ ), CHD repaired without surgery ( $N=20$ ), surgical repair of CHD without cardiopulmonary bypass ( $n=15$ ), or surgical CHD repair with bypass ( $n=36$ ). Peabody object manipulation scores were significantly below (95% CI of difference:  $-0.4, -1.1$ ;  $p<.001$ ) and visual motor scores above (95% CI of difference:  $0.1, 1.1$ ;  $p=0.02$ ) normative values. TGMD locomotor (95% CI of difference:  $0.7, 2.3$ ;  $p<0.001$ ) and object manipulation (95% CI of difference:  $0.4, 1.8$ ;  $p=0.001$ ) scores were above published norms ( $n=58$ ). Children performed  $135 \pm 48$  minutes of physical activity, any intensity, daily (range: 8 to 289 mins). Visual motor scores were higher in CHD without repair and surgery without bypass groups (Model  $R^2 = 0.32$ ,  $p<.001$ ). No other between group differences occurred. No significant associations occurred between hospital length of stay (none,  $\leq 10$  days,  $> 10$  days), daily physical activity and motor development. **Discussion:** Children treated in the current surgical era are not at risk for motor development delays from cardiopulmonary bypass exposure or extended hospital stays. Overall measures of motor development are similar to published norms. Low object manipulation scores among all study participants (Peabody) were not apparent when older children were assessed on more complex motor skills (TGMD-2). Young children with CHD have the skills needed for physical activity. The reason for their limited participation remains unknown.

## 7. Inactive Matrix Gla Protein is Associated with Cardiometabolic Risk Markers in Overweight Children

Mary Ellen Fain, Norman K. Pollock, Celestine F. Williams, Jacob Looney, BA Gower, H Zhu, Jerry D. Allison, Catherine L. Davis, Georgia Prevention Institute, University of Alabama-Birmingham, Medical College of Georgia, Augusta University

**Background:** Overweight children are at cardiometabolic risk, and tend to show poor aerobic capacity, thus, may especially benefit from modifiable factors for prevention and treatment. Matrix Gla-protein (MGP) is a vascular calcification inhibitor that needs vitamin K to be activated, and recent evidence suggest that higher circulating levels of inactive MGP, known as dephospho-uncarboxylated MGP (dp-ucMGP), are linked to cardiovascular disease (CVD) events and mortality. Higher inactive MGP signifies lower vitamin K level. To date, no studies have investigated the relationship between inactive MGP and markers of cardiometabolic risk in a pediatric population likely to incur CVD in adulthood. This study explored associations of vitamin K level with cardiometabolic health in an overweight pediatric population. **Methods:** In 64 overweight children (8-11 years old, 63% female, 88% black, 70% obese), associations of log-transformed inactive MGP with markers of cardiometabolic risk were determined, adjusted for sex and race. Fasting blood samples were measured for plasma dp-ucMGP, lipid profile, insulin resistance (log HOMA2-IR), leptin, adiponectin, and C-reactive protein. Adiposity measurements included percent body fat *via* dual-energy X-ray absorptiometry and visceral and hepatic fat *via* MRI. Aerobic fitness was determined using a multistage treadmill protocol. **Results:** Sex ( $r=.54$ ) and race ( $r=.43$ ) were strongly associated with dp-ucMGP (each  $p<.001$ ). After adjusting for sex and race, dp-ucMGP was inversely related to aerobic fitness ( $r = -0.27$ ,  $p=.04$ ) and HDL-cholesterol ( $r = -0.27$ ,  $p=.03$ ), and directly related to percent body fat ( $r=.29$ ,  $p=.02$ ). No significant associations were observed between dp-ucMGP and insulin resistance, lipid profile, adiponectin, leptin, C-reactive protein, visceral or hepatic fat after adjusting for sex and race. **Discussion:** In overweight children, a marker of vitamin K level is associated with markers of cardiometabolic risk. While these associations might be confounded by constitutional factors or general health behavior

(e.g., genetics, healthy diet, physical activity), these results suggest that vitamin K levels may be a modifiable determinant of cardiometabolic health in overweight and obese children. Experimental trials are needed in overweight children to determine whether vitamin K supplementation reduces progression of CVD development by increasing MGP carboxylation. HL087923, DK056336

#### **8. Process Evaluation of FitKids360: A Pediatric Weight Management Program**

K. Yee, K. Pfeiffer, L. Weatherspoon, J. Tucker, Grand Valley State University, Michigan State University, Helen DeVos Children's Hospital

**Background:** The purpose of the study was to evaluate the reach, dose, and fidelity of FitKids360, a pediatric weight management program designed to improve the health of overweight/obese children and their families. **Methods:** A total of 25 ninth grade overweight/obese students and their parent(s)/guardian(s) participated in the FitKids360 program across two separate cohorts (Fall 2014, Spring 2015). The program ran for 7 weeks and consisted of two-hour weekly sessions, which involved physical activity and nutrition education as well as behavioral counseling for participants and their families. In addition, age-appropriate physical activities were performed at each session for a total of 20-30 minutes. Process evaluation data were collected by an independent evaluator via attendance records, program observation, and surveys completed by program staff and families. Dose was determined by documenting if specific lesson components were delivered each week and whether lesson objectives were accomplished. Reach was determined from program attendance logs. Fidelity was evaluated using a 23-item survey (scored on a four-point Likert scale; 1=None, 4=All), which evaluated instructor quality and participant engagement. **Results:** Of the original 25 participants, 16 completed the entire FitKids360 program (64% retention). In total, participants attended 118 out of 185 class sessions. In terms of dose, all lessons were delivered across both cohorts with more than 90% of lesson objectives met. The process evaluator determined that the program was delivered with high fidelity and quality in both cohorts (Fall:  $3.4 \pm 0.8$ ; Spring:  $3.6 \pm 0.6$ ). Feedback from surveys completed by FitKids360 staff and volunteers as well as participating families showed high satisfaction with the program and its delivery; however, several areas for program improvement were also highlighted, including creation of an adolescent version of the curriculum. **Discussion:** Although FitKids360 has been in existence for five years, no formal process evaluation of the program was done prior to this study. The evaluation showed that this program has merit, but feedback from participants and their families will be used to enhance the future success of FitKids360. Specifically, evaluation data will be important in continued development and implementation of FitKids360 and future pediatric weight management programs.

## 9. Comparing Physical Activity and Sedentary Time among Overweight and Non-Overweight Preschoolers Enrolled in Early Learning Programs: A Cross-Sectional Study

P. Tucker, A. M. Maltby, S. M. Burke, L. M. Vanderloo, & J. D. Irwin

School of Occupational Therapy, University of Western Ontario

**Background:** Establishing appropriate physical activity and sedentary behaviours during early childhood is important to ensure children accrue the many associated health benefits. While physical activity levels have been reported as low within early learning programs, little research has explored the physical activity and sedentary time of Canadian preschoolers classified as overweight within these facilities. The purpose of this study was to compare objectively measured physical activity and sedentary time among preschoolers classified as overweight and non-overweight in early learning programs. **Methods:** Direct assessment of physical activity and sedentary time of 216 preschool-aged children (2.5-5 years) was collected via Actical accelerometers during early learning hours for 5 consecutive days, while BMI percentile was calculated based on preschoolers' objectively measured height and weight. Three, 3-way analyses of variance were run to explore the influence of weight status, sex, and childcare environment on physical activity (i.e., MVPA, TPA) and sedentary time. **Results:** Non-overweight preschoolers engaged in 40.58 mins/hr, 2.48 mins/hr, and 19.38 mins/hr of sedentary time, MVPA, and TPA respectively, while overweight preschoolers engaged in 39.91 mins/hr, 3.00 mins/hr, and 20.14 mins/hr of sedentary time, MVPA, and TPA respectively. Results of three, 3-way ANOVAs suggest that rates of sedentary time, MVPA, and TPA did not significantly ( $p > .05$ ) differ based on weight status, sex, and type of early learning facility. **Discussion:** This study is one of few that has examined differences in overweight and non-overweight preschoolers' sedentary time, and adds to the limited research exploring physical activity levels among overweight and non-overweight preschoolers during early learning hours. Surprisingly, overweight preschoolers engaged in more MVPA and TPA than their non-overweight counterparts, although these differences were not significant. Given the high rates of sedentary time reported, programming within early learning facilities is necessary to support preschoolers, regardless of weight status, to achieve increased physical activity levels and decreased sedentary time.

## 10. Associations between Physical Activity and Health-Related Quality of Life in Overweight and Obese 8-11 Year Old Children

J. Sirard, B. Masteller, M. Hawkins, M. Kubik, University of Massachusetts, University of Minnesota

**Background:** Overweight (OW) and obese (OB) children often exhibit lower health-related quality of life (HRQOL) than their normal-weight counterparts. Previous studies have reported a positive association between physical activity (PA) levels and HRQOL in OW and OB children. However, there is a lack of data using community-based samples and results have varied by methods of PA assessment, child age, and HRQOL domain (physical, emotional, social and school functioning). This analysis examines the association between HRQOL and PA among a community-based sample of OW and OB 8-11 year old children. **Methods:** The study sample included 42 children participating in baseline assessments for a community-based healthy weight management study for children with BMI-for-age  $\geq 75^{\text{th}}$  percentile. PA was measured for seven days using ActiGraph accelerometers. The PA data was processed using ActiLife software and participants were excluded for excessive non-wear time ( $\geq 30$  minutes of consecutive zeros,  $< 8$  hours/day of wear time, and  $< 4$  days of acceptable wear time). Evenson et al. cut points were used to classify PA into intensity categories. Child self-reported HRQOL was measured using the Pediatric Quality of Life Inventory (PedsQL 4.0). The associations between child self-reported HRQOL and measures of PA were examined using Spearman rank correlations. **Results:** Children ( $N=42$ ) were 9.3 (1.0) years and 60% male. Mean BMI-for-age percentile was 91.7 (8.3), 52% obese (BMI $\geq 95^{\text{th}}$  percentile). The average percent of time spent in moderate-to-vigorous PA (MVPA) was 6.0% (2.3) and was similar between OW and OB children. Significant positive associations were observed between percent of time spent in MVPA and physical functioning, ( $r=0.39$ ,  $p=0.01$ ) and social functioning ( $r=0.33$ ,  $p=0.03$ ). For the OB children, there was a significant positive association with percent of time spent in MVPA and physical functioning ( $r=0.32$ ,  $p=0.04$ ) and social functioning ( $r=0.32$ ,  $p=0.03$ ). In OW participants ( $\leq 95^{\text{th}}$  percentile BMI-for-age), no significant relationships were observed between percent of time in MVPA and any HRQOL metrics. **Discussion:** Results from our study suggest that for OB children, the percent of time spent engaging MVPA is positively associated with physical and social functioning quality of life. Funding: R01NR013473-01A1

### 11. Understanding the gender gap in physical literacy among peri-adolescent children

MC Rodriguez, K Nair, J Graham, S Veldhuizen, D Mitchell, J Cairney, McMaster University, Canadian Sport for Life

**Background:** Research has shown that by peri-adolescence (~8 to 14 years), participation in physical activity (PA) declines drastically in girls and this decline is largely maintained throughout adulthood. One of the core domains of physical literacy (PL) – fundamental movement skills - has been shown to be associated with PA in childhood through to early adulthood: children with proficient movement skills are more likely to participate in PA than are those with poor movement skills. Recent work has demonstrated that there is also a gender gap in PL during the peri-adolescent/adolescent period. **Methods:** A 3-phase, sequential, explanatory mixed-design study to examine (1) the association between PL and PA; (2) why girls have lower PL than boys during the peri-adolescent period; and (3) if we can effect positive change in PL in girls using a gender-enhanced program. Phase 1: PL will be assessed in children aged 8-14 years attending a stratified, random sample of Ontario afterschool programs using the Physical Literacy Assessment for Youth (PLAY) Fun tool developed for children and youth. Phase 2: children will be divided into tertiles based on their PL scores. A random subsample of children stratified by gender and PL score will be selected to participate in a semi-structured interview to understand the contextual factors related to the gender gap in PL and to wear a pedometer to assess their level of PA. Phase 3: Information from the interviews will be used to modify the afterschool programs in order to target the positive development of PL in girls. The 12-week modified program will be tested using a randomized, pre-post test control design of 10 randomly selected afterschool programs. PL and PA will be assessed using PLAYFun and pedometers, respectively. **Results:** Data collection for Phase 1 is currently underway: testing at 9 of 15 sites has been completed; all site visits are scheduled to be completed by April 2016. Phase 2 interviews and pedometer wear will occur in May-June 2016. **Discussion:** This study will be among the first to examine potential gender differences in physical literacy from the perspective of child and youth themselves.

### 12. Normalizing exercise capacity test for unbiased comparison of peak aerobic capacity and work rate responses between groups of different body morphology, gender, and puberty status in children.

E. Rivas, H. Huynh, P. Galassetti, University of California, Irvine School of Medicine, UCI Institute for Clinical and Translational Science, Irvine, CA

**Background:** In adults, low cardiorespiratory fitness and aerobic exercise capacity ( $VO_{2peak}$ ) are strong predictors of all-cause mortality. However, in children, this assessment is confounded by the rate of biological maturation, which makes interpretation difficult when comparing between groups (i.e., body size, gender). Our objective was to isolate the independent effects of biological maturation by normalizing oxygen uptake ( $mLO_2 \cdot kg^{LBM}$ ), external and internal work-rate ( $W \cdot kg^{LBM}$ ) to lean body mass (DXA). We hypothesized that obesity would attenuate  $VO_{2peak}$ , peak internal ( $Int_{Work-rate}$ , watts) and external ( $Ext_{Work-rate}$ , watts) work-rate independent of gender and age in children. **Methods:** To test this, we examined  $VO_{2peak}$  tests (cycle ergometer) of 92 children grouped into lean ( $27 \pm 4\%$  body fat) and obese ( $44 \pm 4\%$  body fat), young ( $n=46$ ,  $9.9 \pm 1y$ ) and older ( $n=46$ ,  $15.4 \pm 2y$ ), boys and girls (48/52%).  $VO_{2peak}$ , peak respiratory exchange ratio (RER), and peak heart rate (HR) were averaged as the final 15 sec of breath-by-breath indirect calorimetry. Metabolic energy expenditure (M) was calculated from RER data.  $Int_{Work-rate}$  was calculated as  $M - W (Ext_{Work-rate})$ . **Results:** No difference for was found for test time ( $9.6 \pm 1.5$  min), peak HR ( $188 \pm 11$  bpm), or peak RER ( $1.1 \pm 0.1$ ) between groups for the  $VO_{2peak}$  test. A factorial ANOVA resulted in only main effects for fat mass ( $P < 0.0001$ ) for each:  $VO_{2peak}$ ,  $Ext_{Work-rate}$  and  $Int_{Work-rate}$ . Holm-Sidak multiple comparison *post hoc* test reported no difference for any lean group on  $VO_{2peak}$  ( $49.5 \pm 8$   $mLO_2 \cdot kg^{LBM} \cdot min$ ), peak  $Ext_{Work-rate}$  ( $4.0 \pm 1$   $W \cdot kg^{LBM} \cdot min$ ), and peak  $Int_{Work-rate}$  ( $14.0 \pm 3$   $W \cdot kg^{LBM} \cdot min$ ). However, with the exception for younger obese girls, obesity caused significant ( $P < 0.05$ ) reductions in  $VO_{2peak}$  ( $41.2 \pm 7$   $mLO_2 \cdot kg^{LBM} \cdot min$ ), peak  $Ext_{Work-rate}$  ( $3.1 \pm 0.7$   $W \cdot kg^{LBM} \cdot min$ ), and peak  $Int_{Work-rate}$  ( $11.7 \pm 2$   $W \cdot kg^{LBM} \cdot min$ ). **Discussion:** These data indicate that age, puberty and gender do not affect peak oxygen uptake, internal or external work rates in lean children. However,  $>40\%$  fat mass in boys attenuates peak aerobic capacity. In girls, obesity does not seem to affect oxygen consumption in young compared to the older. These data support the concept that obesity in children reduces aerobic capacity, which may have later life consequences in regards to cardiorespiratory fitness and all-cause mortality. We also highlight that this analysis is able to compare between pediatric groups independent of biological maturation.

### 13. The relationship between body fat percentage and physical activity in school-aged children.

K. K. Palmer, R. W. Moore, E. K. Webster, L. E. Robinson, University of Michigan, Eastern Michigan University, Louisiana State University

**Background:** This study examined the relationship between body fat percentage (BodyFat%) and physical activity (PA) in school-aged children. Secondly, this study examined if this relationship differed according to sex. **Methods:** A total of 31 children ( $M_{age}=8.4 \pm .8$  years; 14 girls) served as participants. PA was assessed using Actigraph GT3X+ accelerometers worn on the right hip for four days. To be included in the analysis, wear time criteria was set as 600 minutes per day for 3 days with an epoch length of 15 seconds. Evenson cut-points were used to determine sedentary, light, and moderate to vigorous PA (MVPA). All PA measures were divided by total wear time, and percentage of daily wear were used in analysis. BodyFat% was measured using a TANITA SC-331S scale (Arlington Heights, IL). The relationships between BodyFat% and PA (sedentary, light, MVPA) were examined using Pearson's correlations followed by regression analyses. Sex differences were examined by comparing the coefficients from regression models fit separately for boys and girls. **Results:** Findings revealed a significant negative correlation between BodyFat% ( $22.32 \pm 9.91\%$ ) and MVPA ( $13.38 \pm 4.62\%$ ;  $r=-.46$ ,  $p=.01$ ). A step-wise regression model found a significant effect when MVPA was predicted by BodyFat% alone ( $p<.05$ ) as well as by BodyFat% and sex ( $p<.01$ ). Both models demonstrated a negative relationship between BodyFat% and MVPA ( $\beta=-.458$ ,  $p<.01$  and  $\beta=-.401$ ,  $p<.05$ ; respectively). The second model revealed that boys engaged in significantly more MVPA than girls ( $\beta=.397$ ,  $p<.05$ ). To examine sex differences, all variables were standardized and the same regression model was fit separately for boys and girls. Results revealed a significant negative relationship between body fat percentage and MVPA in girls ( $b=-.59$ ,  $p<.05$ ). The model for boys was not significant. Independent *t*-tests comparing regression coefficients failed to find a significant sex differences in the relationship between BodyFat% and MVPA. **Discussion:** A negative relationship between BodyFat% and MVPA exists across all children. Interesting, when divided by sex this relationship was only significant for girls. A larger sample size is needed to better understand the relationship between BodyFat% and MVPA especially in regards to potential sex differences.

### 14. Aerobic Fitness as a Predictor of Glucose Regulation in Young Adults Born with Very Low Birth Weight

P.A. Nixon, L.K. Washburn, T.M. O'Shea, Wake Forest University

**Background:** Persons born prematurely with very low birth weight (VLBW) have been shown to have reduced aerobic fitness compared to term-born normal birth weight peers, and some evidence suggests they may have impaired glucose regulation and increased risk for type 2 diabetes. To date no study has examined if aerobic fitness is predictive of later glucose regulation and diabetes risk in this at-risk population. Therefore the purpose of this study was to determine if aerobic fitness in adolescence was predictive of impaired glucose regulation and diabetes risk in VLBW young adults. **Methods:** One hundred twenty participants underwent exercise testing at 14 years of age during which expired gases were measured to determine peak oxygen uptake ( $VO_{2pk}$ ) expressed in ml/kg/min and % of predicted. Approximately 5 yrs later, blood samples were obtained after an overnight fast and 2 hours post oral glucose load, and plasma glucose levels were used to identify, normal, prediabetes, and diabetes (based on ADA criteria). Fasting glucose and insulin levels were measured using radioimmunoassay and HOMA2 model used to calculate insulin resistance (IR), insulin sensitivity (%S), and  $\beta$ -cell function (% $\beta$ ). Body mass index was determined from weight/height<sup>2</sup>. Log transformations were made to improve distributions. Mean  $\pm$  SD or n (%) are reported. Pearson correlations were used to examine univariate correlations, and multiple regression analysis was used to examine the independent association between fitness and markers of glucose regulation.

**Results:** Mean  $VO_{2pk}$  was  $36.8 \pm 10.0$  ml/kg/min and 42% had values  $< 80\%$  of predicted. Based on fasting or 2hr post load plasma glucose level, 19 (5 M) participants were considered prediabetic and 3 (1 M) were considered diabetic. IR, %B, and %S were  $1.43 \pm 0.84$ ,  $123.8 \pm 50.1$ , and  $93.9 \pm 7.9$  respectively.  $VO_{2pk}$  was significantly ( $p<.01$ ) related to HOMA-IR ( $r=-.28$ ), %S ( $r=.30$ ), and % $\beta$  ( $r=-.34$ ), and remained significant when adjusting for sex, race, and BMI percentile. Fasting and 2-hr post load glucose and insulin levels were not associated with fitness.

**Discussion:** Higher aerobic fitness in adolescence was associated with better insulin sensitivity and B-cell function in young adults born prematurely with VLBW.

### 15. Self-reported domain specific sedentary behaviours in a South Asian and White British sample of UK girls

S. Mughal, L.B. Sherar, P. Griffiths, D.H. Bodicoat, D.M. Harrington, R.T. Edwards, C.L. Edwardson, T. Gorely, K. Harrington, K. Khunti, T. Plekhanova, T. Yates, M.J. Davies, Loughborough University, Leicester University, University of Bangor, University of Stirling

**Background:** Evidence suggests that South Asian (SA) girls may be less active than White British (WB); however, little research has explored ethnic differences in sedentary behaviours in childhood. The aim of this study is to investigate the time spent in different self-reported domains of sedentary behaviours between SA and WB adolescent girls residing in Leicestershire in the UK. **Methods:** Data are taken from the baseline sample of the Girls Active cluster randomised controlled trial. Overall, 1753 girls aged 11-14 (recruited randomly from 20 schools) were asked to report their postcode, which was used to calculate the Index of Multiple Deprivation, date of birth, ethnicity. Time in different domains of sedentary behaviour (i.e. watching TV, using the computer for fun, homework, reading) in free time were self-reported for a typical weekday and weekend day using an adapted version of the Adolescent Sedentary Activity Questionnaire. MANCOVA, controlling for age and SES, was used to compare differences in time spent in different sedentary behaviour domains between SA and WB girls. **Results:** 1041(59%) participants (89% WB; average age 12.8 years) had complete data and were included in the analysis. Overall, the greatest self-reported sedentary behaviours across the whole sample was using a mobile phone/tablet (252 mins/weekend day and 194 mins/week day) and watching TV (192 mins/weekend day and 125 mins/week day). After controlling for covariates, WB girls self-reported more computer use (66 vs 39 mins/weekday; 99 vs 71 mins/weekend day;  $p<0.05$ ); mobile phone/tablet use (201 vs 136 mins/weekday; 259 vs 197 mins/weekend day;  $p<0.05$ ); travel on a weekend day (73 vs 51 minutes) and sitting around chatting (127 vs 95 mins/week day; 170 vs 136 mins/weekend day;  $p<0.05$ ). SA girls self-reported more time spent in sedentary religious activities (48 vs 3 mins/weekday; 28 vs 5 mins/weekend day;  $p<0.05$ ). **Discussion:** Adolescent UK girls spend a large proportion of their time on screen time sedentary behaviours and the types of sedentary behaviours differ between SA and WB girls. Interventions targeting sedentary behaviours in adolescent girls need to consider ethnicity/culture.