Physical Activity During the Early Years: Research Evidence and Practice Implications

Dr. Trish Tucker

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Overview

- Health benefits of physical activity (PA) & detriments of sedentary activity
- Canadian PA & sedentary guidelines
- PA levels of preschoolers
- PA and early learning facilities
- Environmental influences on PA behaviours
- Strategies to encourage PA among children
- Barriers to PA – small group activity
- PA Resources
Background

• Preschool population (2.5-5 years) is an important group of interest:
  o Increased rates of obesity (Shields, 2006)
  o Rates of Physical Activity (PA) decrease as children age (Taylor et al., 2009)

• Want children to develop strong physical activity habits early in life – many benefits as children age in ↑ PA and ↓ sedentary behaviors (LeBlanc et al., 2012; Timmons et al., 2012)
Benefits of Physical Activity

• Physical Health:
  – Increasing PA levels by \(~60\ \text{min per week}\) (e.g., 20 minutes/day, 3x week) can lead to improved bone properties, motor skills, and aerobic fitness

• Psychosocial Health:
  – As little as \textit{20 additional minutes} of aerobic activity/day may improve self-esteem

(Timmons et al., 2007)
Benefits of Physical Activity

• Recent systematic review found \( n = 22 \):
  – Infants
    • ↑ PA associated with improved adiposity, motor skill development, & cognitive developments
  – Toddlers
    • ↑ PA associated with bone and skeletal health
  – Preschoolers
    • ↑ PA associated with improved adiposity, motor skill development, psychosocial health, & cardiometabolic health indicators

(Timmons et al., 2012)
Detriments of Sedentary Behaviour

- Recent systematic review found ($n = 23$):
  - ↑ screen-viewing associated with unfavourable measures of adiposity, psychosocial health, and cognitive development
  - Proxy measure of sedentary time used, therefore, likely an underestimation

(Le Blanc et al., 2012)
Current Guidelines – 0-4 years

- **Physical activity:**
  - 180 mins/day, *any* intensity
  - 1-4 years

- **Sedentary behaviours:**
  - Limit prolonged periods of sitting and screen time to 60 mins/day

Canadian Society for Exercise Physiology
Current Guidelines – 5-11 years

Canadian Physical Activity Guidelines

FOR CHILDREN - 5 – 11 YEARS

Guidelines

- For health benefits, children aged 5-11 years should accumulate at least 60 minutes of moderate-to-vigorous physical activity daily. This should include:
  - Vigorous-intensity activity of at least 3 days per week, such as running, jumping rope, or playing a sport.
  - Moderate-intensity activity on the remaining days of the week.

- More daily physical activity provides great health benefits.

Let’s Talk Intensity!

Moderate intensity physical activity will cause children to sweat a little and to breathe harder. Activities include:
- Bike riding
- Walking
- Dancing

Canadian Sedentary Behaviour Guidelines

FOR CHILDREN - 5 – 11 YEARS

Guidelines

- For health benefits, children aged 5-11 years should minimize the time they spend being sedentary each day. This can be achieved by:
  - Limiting static screen time to no more than 2 hours per day, lower levels are associated with additional health benefits.
  - Limiting sedentary (motor-free) transport, extended sitting and time spent indoors throughout the day.

Let’s Talk Sedentary!

Sedentary behaviour is time when children are doing very little physical movement. Some examples are:
- Sitting for long periods
- Using motorized transportation (such as a bus or a car)
- Watching television
- Playing video games

Canadian Society for Exercise Physiology

Western HealthSciences
Measuring Physical Activity

- Accelerometers
Preschoolers’ PA Levels

• Canadian Health Measures Survey (2009-2011)
  – Nationally representative sample \((n = 459)\)
  – Actical accelerometers, 7 days, Adolph cut-points
  – Early Years (3-4 years)
    • 84\% met PA guidelines (180 mins/day)
    • 18\% met sedentary guidelines < 1 hr/day of screen time
  – Children (5 years)
    • 14\% met PA guidelines (60 mins/day of MVPA)
    • 85\% met sedentary guideline of < 2 hr/day of screen time

(Colley et al., 2013)
Preschoolers’ PA Levels

- Obeid et al., 2011
  - 30 preschoolers
  - Actigraph accelerometers, 7 days, Pate cut-points
  - 219.7 mins of total PA /day
    - 144.3 mins of LPA, 75.4 mins of MVPA / day
  - More light PA (LPA) than MVPA, 95% of MVPA was in < 15 sec bouts

Majority of preschoolers meeting 180 mins guideline
Early Learning Environments in Ontario

1. Centre-based childcare
2. Home-based childcare
3. Full-day kindergarten (FDK)

Variation exists across: governing legislation, child-educator ratio, time spent in care/school, and outdoor play opportunities
Variation in Childcare Practices in Canada

- PA regulations and practices vary across provinces

- 8 of 13 provinces/territories have PA recommendations, none provide specific PA requirements

- Many provinces currently undergoing policy modifications, or have recently implemented revised legislation

(Vanderloo et al., 2012; van Zandvoort et al., 2010)
Preschoolers’ PA in Childcare

• Temple et al., 2009
  – 65 preschoolers in family/home-based childcare
  – Actical accelerometers, 1-4 days, Pfeiffer cut-points
  – 20.51 mins/hr of total PA (TPA) in childcare
    • 1.76 mins/hr of MVPA
  – 39.49 mins/hr of sedentary time in childcare

Low levels of MVPA during childcare hours
Communication

The Influence of Centre-Based Childcare on Preschoolers’ Physical Activity Levels: A Cross-Sectional Study

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Preschoolers’ PA in Childcare

• Vanderloo et al., 2014
  – 31 preschoolers in centre-based childcare
  – Actical accelerometers, 1 day, Pfeiffer cut-points
  – Environment and Policy Assessment and Observation (EPAO)
  – 17.42 mins/hr of TPA in childcare (132.60/day)
    • 1.45 mins/hr of MVPA
  – 40.64 mins/hr of sedentary time in childcare (305.37/day)
Vanderloo et al. 2014

• EPAO instrument: regression analyses revealed that:

1. Active Opportunities
2. Sedentary Opportunities
3. Sedentary Environment
4. Portable Play Environment
5. Fixed Play Environment
6. Staff Behaviours
7. PA Training and Education
8. PA Policies

accounted for 49.3% of the variability in time spent in MVPA

Accounted for 26.7% and 26.2% of variability
Preschoolers’ PA in Childcare

• Learning Environments Activity Potential in Preschoolers (LEAPP) Study
  – 218 preschoolers in:
    • Centre-based childcare ($n = 10$)
    • Home-based childcare ($n = 9$)
    • FDK ($n = 8$)
  – Actical accelerometers, 5 days, Pfeiffer cut-points
  – EPAO

(Tucker et al., 2013; Vanderloo et al. under review)
### Results & Findings (mins/hr)

- $M_{\text{age}} = 4.18$ years

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Centre-Based Childcare</th>
<th>Home-Based Childcare</th>
<th>FDK</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVPA</td>
<td>1.58</td>
<td>1.75</td>
<td>3.33</td>
</tr>
<tr>
<td>TPA</td>
<td>18.36</td>
<td>19.28</td>
<td>20.31</td>
</tr>
<tr>
<td>Sedentary</td>
<td>41.62</td>
<td>40.72</td>
<td>39.68</td>
</tr>
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*Note: TPA = total physical activity (light, moderate, and vigorous)*
Results & Findings

• TPA:

1. Active Opportunities
2. Sedentary Opportunities
3. Sedentary Environment
4. Portable Play Environment
5. Fixed Play Environment
6. Staff Behaviours
7. PA Training and Education
8. PA Policies
Results & Findings

• Sedentary behaviours:

  1. Active Opportunities
  2. Sedentary Opportunities
  3. Sedentary Environment
  4. Portable Play Environment
  5. Fixed Play Environment
  6. Staff Behaviours
  7. PA Training and Education
  8. PA Policies

FDK centres homes
How Do We Compare Internationally?

Review

The physical activity levels of preschool-aged children: A systematic review

Patricia Tucker*

Bmi 222, Austin, Texas, USA

Keywords:
Physical activity
Preschoolers
Children
Measurement
Play

This systematic review presents research on the physical activity levels of preschool-aged children (aged 2–6 years). Thirty-nine primary studies (published 1986–2007) representing a total of 10,316 participants (5236 male and 5080 female), from seven countries are described and the physical activity behaviors of this population are considered in accordance with the National Association for Sport and Physical Education (NASPE) physical activity guidelines for preschoolers. Upon review of the evidence, it is apparent that nearly half of preschool-aged children do not engage in sufficient physical activity. Current recommendations suggest a minimum of 60 min of physical activity per day; only 54% of participants throughout the studies achieved this. Furthermore, as with other age groups, boys participate in considerably more physical activity than girls. It is clear from this systematic review that nearly half of children studied are not meeting the recommended guidelines for physical activity. Therefore, effective interventions that promote and foster physical activity in children are necessary, especially in females. However, a more objective physical activity guideline for preschoolers is necessary: measurement of activity needs to become more unified to compare and track activity more effectively.

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Preschoolers’ PA Levels

• A clear picture of preschoolers’ PA levels is lacking, but evolving

• What we do know is:
  – PA in childcare and kindergarten settings is very low
  – Boys tend to be more active than girls, PA level with age
  – Preschoolers are more active outdoors than indoors
  – Preschoolers with active parents tend to be more active themselves
  – Measurement technique influences PA observed
  – Majority of preschoolers’ time is sedentary

(Hinkley et al., 2008; Hinkley et al., 2012; Tucker, 2008, Vanderloo et al., under review)
Strategies to Increase PA

• Review of Effective PA Interventions
• Early Childhood Education students
• Supporting Physical Activity in the Childcare Environment (SPACE study)

(Tucker et al., 2013; Gordon et al., 2014; Martyniuk & Tucker, 2014; Tucker, 2014)
Strategies to Increase PA

- Review of Effective PA Interventions \( (n = 19) \)
- Examined different influential factors of the intervention:

![Table 3](image)

**(Gordon et al., 2013)**
Strategies to Increase PA

- PA interventions had a *small-to-moderate effect* on preschoolers’ TPA levels and a *moderate effect* on their level of MVPA

- Intervention characteristics found to have the **greatest** effects:
  - Take place in early learning centres
  - Led by teachers
  - Involve outdoor play
  - Unstructured activity
  - Environmental modifications

(Gordon et al., 2013)
The Role of Early Childhood Educators (ECEs)

• Role models

• Can influence PA levels, play quality, and opportunities for outdoor play

• Can ↑ PA among young children in their care

(Brown et al., 2009; Gubbels et al., 2011; Pate et al., 2008; Vanderloo et al., 2014)
An exploration of Early Childhood Education students’ knowledge and preparation to facilitate physical activity for preschoolers: a cross-sectional study

Ollivia JM Martyniuk and Patricia Tucker

Abstract

Background: Early childhood educators play an important role in influencing preschoolers’ physical activity levels. The current study sought to explore Early Childhood Education (ECE) students’ physical activity-related knowledge and educational experience during their formal training in Ontario.

Methods: A total of 1,113 ECE students from 20 Ontario Colleges completed the study survey (online or on paper), which examined students’ physical activity course content; awareness of physical activity guidelines; understanding of health-related benefits of physical activity; self-efficacy to facilitate physical activity for preschoolers; self-reported physical activity levels; as well as physical activity-related resource needs. Descriptive statistics and independent samples t-tests were used to analyze the quantitative findings.

Results: Survey results identified that 72.1% of ECE students had not completed any physical activity/physical education specific courses, while only 28.7% were familiar with, and 2.0% accurately reported, the Canadian Physical Activity Guidelines for the Early Years. Only 10.5% of ECE students reported personal physical activity behaviors consistent with national recommendations for adults (150 minutes/week). ECE students’ mean overall task self-efficacy to facilitate physical activity was 7.37 (SD = 1.64). Self-efficacy was significantly higher (p < .05) when students had taken one or more courses devoted to physical activity/physical education, as well as when students engaged in sufficient physical activity to meet the national guidelines for adults (p < .05).

Conclusions: The results indicate that the current ECE college curriculum represents an excellent opportunity to provide future childcare providers with enriched physical activity-related training and support, such as physical activity guidelines, workshops, and new ideas for activities. Emphasizing the health benefits of physical activity for adults might be important in light of ECE students’ low self-reported physical activity levels.

Keywords: Physical activity, Early childhood education students, Training, Preschool-aged children
Physical Activity Training for ECEs

- PA-related training and resources appears to be limited (Derscheid et al., 2010; Larson et al., 2011)

- Childcare providers’ desire for additional resources and training (Tucker et al., 2011)
Methods – Data Collection

• 24-item survey designed for this study
  1. ECE students’ knowledge and college training re PA
  2. Self-Efficacy to support PA
  3. Environmental influences on PA
  4. Role modeling
  5. Resources/knowledge that would aid them in facilitating PA

• Method of data collection chosen by each college
  - Online survey \((n = 9)\)
  - Paper survey \((n = 9)\)

**2 schools opted to use both survey formats – classroom dependent**
Results – Participants

• 20 of 23 colleges agreed to participate

• $N = 1,113$ ECE students
  – $n = 229$ online survey
  – $n = 884$ paper survey

• Mostly female, Caucasian, enrolled full-time

• Mean age = 23.92 years

• 52% Year 1 of program
Results

PA Training

PA Documents

Number of PA Courses Completed

- No Courses: 72.1%
- 1 course: 15.6%
- 2 courses: 2.4%
- 3+ courses: 4.4%

FAMILIARITY WITH PA-RELATED DOCUMENTS

<table>
<thead>
<tr>
<th>Document</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario's Day Nurseries Act</td>
<td>92.70%</td>
</tr>
<tr>
<td>Canadian PA Guidelines for the Early Years</td>
<td>28.70%</td>
</tr>
<tr>
<td>Active Healthy Kids Canada Report Card</td>
<td>8.40%</td>
</tr>
<tr>
<td>Canadian Sedentary Guidelines for the Early Years</td>
<td>16.30%</td>
</tr>
</tbody>
</table>

2.0% accurately reported
Results – Self-Efficacy

ECE Students' Confidence to Facilitate PA Based on the PA Courses Completed

Self-Efficacy

No Courses

One or more courses
Results – Self-Efficacy

**ECE Students' Confidence to Facilitate PA Based on their Weekly MVPA Levels**

- Not meeting Canadian PA Guidelines
- Meeting Canadian PA Guidelines
Results – Student Reflections

• “Instating a mandatory ECE class that is solely based on physical activity.”

• “I think it is important to have specific guidelines on training for gross motor activities and more workshops on it. I think that if we can inspire adults (teachers and parents alike) to be more active it will help in the classroom.”

• “Time built into courses for workshops.”
Study Implications

• The ECE curriculum is a **unique opportunity** to support future early learning professionals with comprehensive PA-related knowledge and training

• Highlights need for **improved/modified** PA curriculum in the ECE program
Supporting Physical Activity in the Childcare Environment: The SPACE Study
The SPACE Study

• Randomized Control Trial
  – Investigators from UWO and McMaster University

• **GOAL:** improve preschoolers’ PA in centre-based childcare

• **Intervention:** 1) environmental modifications; 2) curriculum changes; 3) staff training/education

• **Sample size:** 22 centres – 11 in control and 11 in test group (~328 preschoolers)

• LOTS of data!
1. Environmental Modifications

• Portable play equipment for use both indoors and out (e.g., tricycles, hula hoops, balls)

• Pavement markings outdoors
2. Curriculum Modifications

- Four 30-min outdoor play periods
- Unstructured free play
- Use of portable play equipment to facilitate gross motor activity
- Guest PA teachers (i.e., dance, gymnastics instructors)
3. PA-Related Staff Training

- Childcare staff and directors
- Led by members of the research team
- Four sessions with information on:
  1. PA guidelines for preschoolers
  2. The need for shorter bouts of activity
  3. Incorporating activity into indoor curriculum
  4. Overcoming challenges to PA, and resources available to improve PA in childcare centres
Recommendations & Suggestions

• Use more **portable play equipment** (e.g., balls, hula hoops, tunnels, tricycles, etc.)

• More **outdoor play** opportunities

• Incorporate PA in **indoor curriculum**

• Limit **screen time** during care/school hours

• Encourage more **unstructured free play**

• Re-evaluate creative use of children’s **play space**

• Lobby for **PA policies** within your organization

• Ensure childcare staff and ECE students are **trained and confident to facilitate PA**

(Dowda et al., 2009; Finch et al., 2012; Vanderloo et al., 2014)
Barriers to PA in Childcare

• Childcare staff report challenges of encouraging PA in childcare:
  – Inadequate equipment; insufficient space; daycare requirements and safety concerns; and weather
  – Injury concerns, financial, and a focus on “academics”

• When asked what would help support children being active:
  – Staff training/workshops; guest physical activity instructors; additional equipment and resources; and increased funds for physical activity

(Tucker et al., 2011; Copeland et al., 2012)
Group Activity – Interactive Cases

• Poor weather – therefore, no outdoor time
• Minimal equipment
• Minimal space for indoor/outdoor play
• Parents/childcare staff who are unsupportive of PA programming
• No PA policies
Available Resources

• **Ontario Physical Health and Education Association (OPHEA)**  [www.ohea.net](http://www.ohea.net)
  – Health and physical education curriculum supports
  – Safety guidelines
  – Physical literacy

• **Canadian Society of Exercise Physiology (CSEP)**  [www.csep.ca](http://www.csep.ca)
  – Physical activity guidelines
  – Sedentary behaviour guidelines

• **Active Healthy Kids Canada**  [www.activehealthykids.ca](http://www.activehealthykids.ca)
  – Annual report cards
Available Resources (con’t)

• Best Start Resource Centre  www.haveaballtogether.ca
  – Have a ball together! Campaign
  – PA resources and manuals

• Preschooler Focus Newsletter – McMaster University
  – Evidence-informed tips for enhancing physical activity in the early years

• Childcare Research & Resource Unit
  www.childcarecanada.org

• Good for Kids, Good for Health or Munch and Move Resource Material
  http://www.goodforkids.nsw.gov.au
THANK YOU!

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