

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

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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
  - ↑ rates of obesity
  - Rates of Physical Activity (Taylor et al., 2009)



- Want a **strong physical activity** in life – many benefits as well as **↑ PA and ↓ sedentary behavior** (LeBlanc et al., 2012; Timmons et al., 2012)

**Lack of Data on Infants and Toddlers**

# Benefits of Physical Activity

- **Physical Health:**
  - Increasing PA levels by **~60 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 **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)

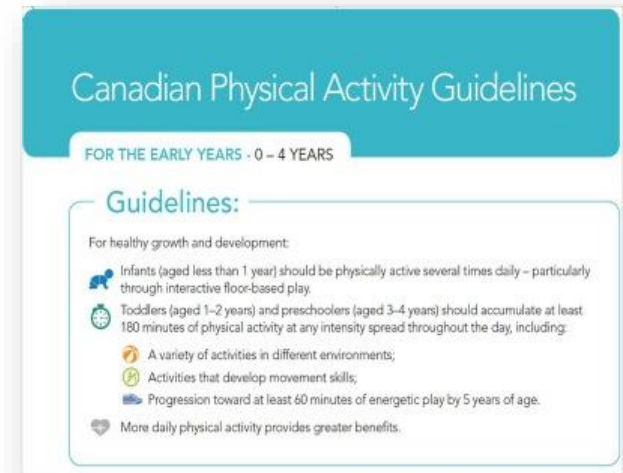
# Detriments of Sedentary Behaviour

- 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-intensity physical activity daily. This should include:



Vigorous-intensity activities at least 3 days per week.



Muscle-strengthening activities that strengthen muscle and bone at least 3 days per week.



More daily physical activity provides greater health benefits.

### Let's Talk Intensity!

Moderate-intensity physical activities will cause children to sweat a little and to breathe harder. Activities like **active play** can help children:

- Improve their health
- Do better in school

60 mins/day of moderate-to-vigorous PA [MVPA]

## 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 is recommended by:



Limiting recreational screen time to no more than 2 hours per day; lower levels are associated with additional health benefits.



Limiting sedentary (motorized) transport, extended sitting and time spent indoors throughout the day.

### Slowdown on the slowdown: what counts as being 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

### Spending less time being sedentary can help children:

- Maintain a healthy body weight
- Do better in school
- Improve their self-confidence
- Have more fun with their friends
- Improve their fitness
- Have more time to learn new skills

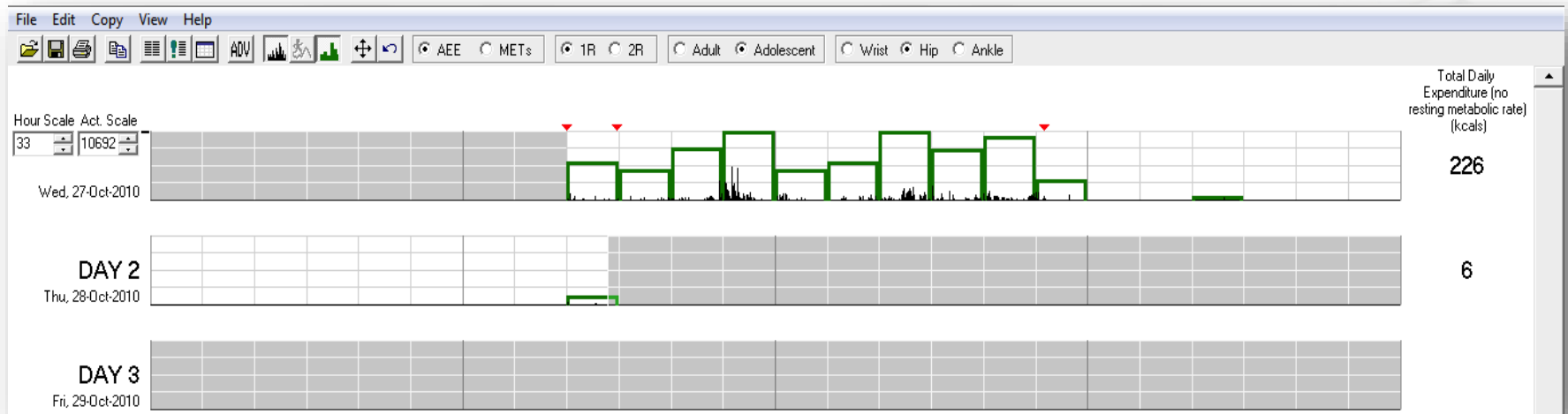
<= 2 hrs/day of screen viewing

Canadian Society for Exercise Physiology



# 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

Intensity	Centre-Based Childcare	Home-Based Childcare	FDK
MVPA	1.58	1.75	3.33
TPA	18.36	19.28	20.31
Sedentary	41.62	40.72	39.68

*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

**FDK**

**centres**

# 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**
- 
- The diagram consists of eight numbered items on the left. Arrows point from these items to three target labels on the right: 'FDK' (blue), 'centres' (green), and 'homes' (purple). Item 2 points to 'FDK'. Item 3 points to 'FDK'. Item 4 points to 'centres'. Item 5 points to 'centres'. Item 6 points to 'homes'. Item 7 points to 'homes'. Item 8 has no arrow.

# How Do We Compare Internationally?

Early Childhood Research Quarterly 23 (2008) 547–558



Contents lists available at ScienceDirect

Early Childhood Research Quarterly



Review

The physical activity levels of preschool children: A systematic review

Patricia Tucker\*

Rm 222, Arth

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**23% achieved 2 hours**

ABSTRACT

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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Keywords:  
Physical activity  
Preschoolers  
Children  
Measurement  
Play

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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  
Effectiveness of Physical Activity Interventions on General Physical Activity and Moderate-to-Vigorous Physical Activity (MVPA) and Effect of Moderator Variables on MVPA

	<i>Number of Effect Sizes</i>	<i>Mean Effect Size (Hedges g)</i>	<i>SD</i>	<i>95% CI</i>	<i>Fail Safe N</i>
<i>Dependent Variable</i>					
General Physical Activity	73	0.44	0.86	0.24, 0.65	569
MVPA	39	0.51	0.88	0.23, 0.80	358
<i>Moderator Variable</i>					
<i>Intervention length (weeks)</i>					
<4.00	16	1.28	0.76	0.88, 1.68	393
4.01–12.00	8	0.28	0.52	-0.15, 0.72	
12.01–26.00	9	-0.18	0.43	-0.51, 0.15	
<i>Intervention location</i>					
Early-learning environment	33	0.66	0.86	0.35, 0.96	402
Home-based component	6	-0.28	0.51	-0.82, 0.26	
<i>Intervention leadership</i>					
Teacher	20	0.24	0.50	0.01, 0.48	76
Parent	4	-0.42	0.60	-1.37, 0.53	
<i>Intervention type</i>					
Physical activity	12	0.43	0.55	0.08, 0.78	91
Education	4	-0.42	0.60	-1.37, 0.53	
Environmental changes	18	0.92	1.00	0.42, 1.42	313
Physical activity + education	5	0.01	0.02	-0.01, 0.03	
<i>Protocols for assessing physical activity</i>					
Accelerometry	36	0.47	0.90	0.17, 0.78	302
Heart rate	3	0.99	0.18	0.54, 1.45	56
<i>Location of play</i>					
Indoor	8	0.28	0.52	-0.15, 0.72	311
Outdoor	19	0.87	1.00	0.38, 1.35	
<i>Nature of physical activity</i>					
Structured	16	0.33	0.50	0.06, 0.60	89
Unstructured	13	1.36	0.83	0.85, 1.84	339

*Note.* MVPA = moderate-to-vigorous physical activity; *SD* = standard deviation.

(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)

RESEARCH ARTICLE

Open Access

# An exploration of Early Childhood Education students' knowledge and preparation to facilitate physical activity for preschoolers: a cross-sectional study

Olivia JM Martyniuk<sup>1</sup> and Patricia Tucker<sup>2\*</sup>

## 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)

ECED-1001	Foundations of ECE	2.00
ECED-1003	Emotional Development & Early Relations	3.00
ECED-1049	Observing Early Development	2.00
ECED-1050	Child Development 1	3.00
ECED-1070	Field Practicum 1	3.60
PSYC-1009	Personal Development	3.00
ECED-1005	Health Safety & Nutrition in ECE	2.00

Level 2		Credits
Gen Ed - Take a 3 credit General Education elective course		
Take all of the following Mandatory Courses:		
COMM-3058	Adv. Professional Comm. for ECE	3.00
ECED-1052	Curriculum Design & Implementation	3.00
ECED-1053	Promoting Pro-Social Behaviour	3.00
ECED-1054	Child Development 2	3.00
ECED-1055	Field Practicum 2	5.60

Level 3		Credits
Take all of the following Mandatory Courses:		
ECED-3003	Educational Perspectives	2.00
ECED-3018	Inclusion-Issues & Implementation	3.00
ECED-3025	Early Development & Relationships	3.00
ECED-3020	Infant/Toddler Curriculum	3.00
ECED-3023	Field Practicum 3	5.60
SOCI-3003	Canadian Families:Change & Diversity	3.00

Physical Activity?

# 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

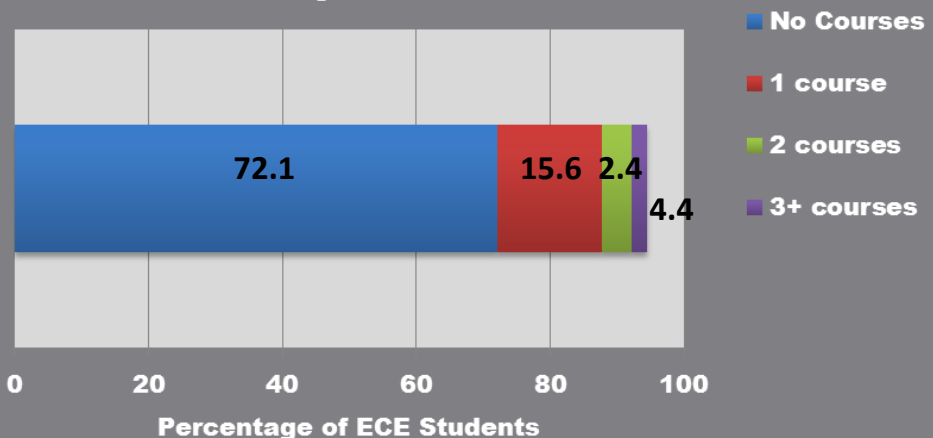


# Results

## PA Training

## PA Documents

Number of PA Courses Completed



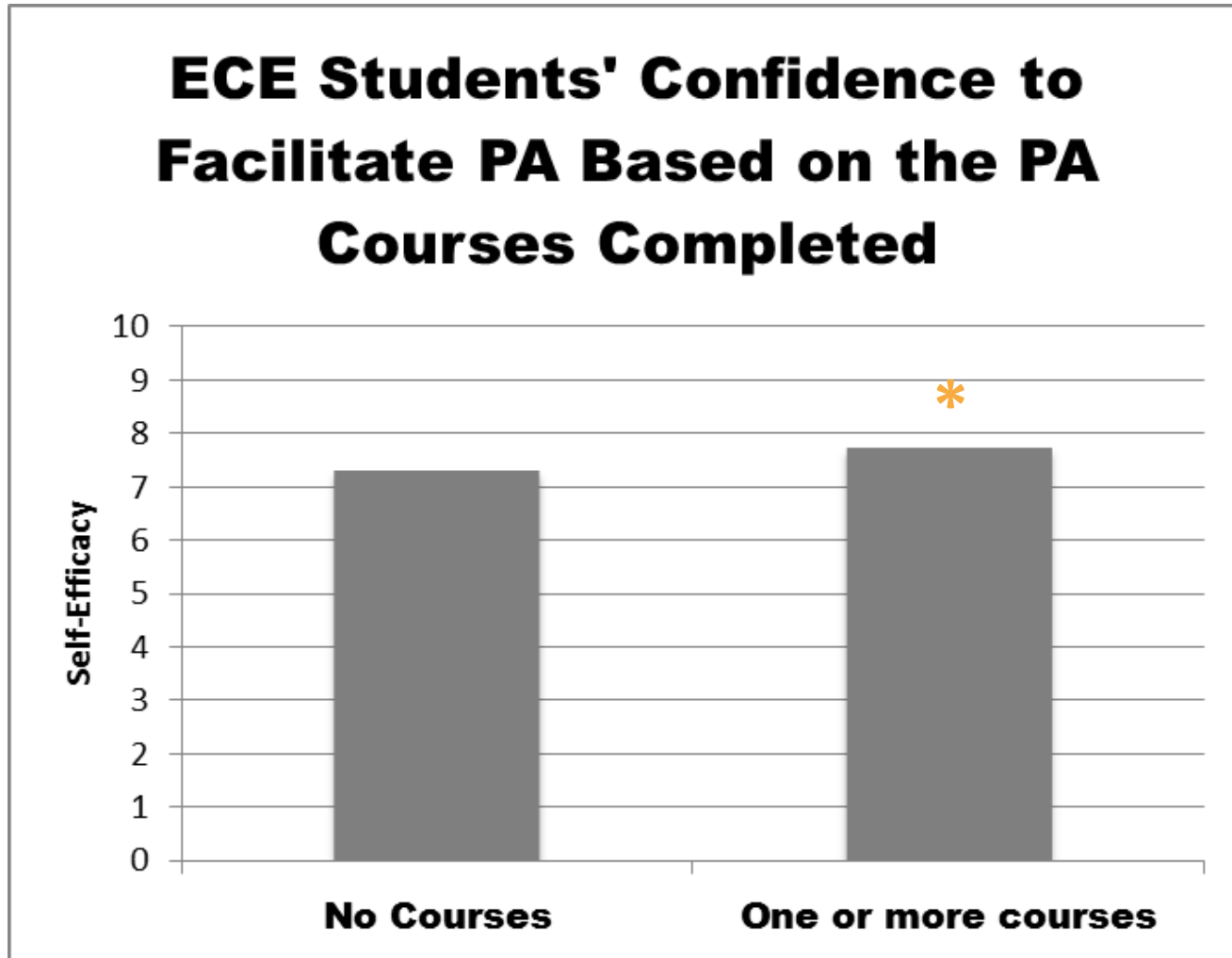
### FAMILIARITY WITH PA-RELATED DOCUMENTS

Ontario's Day Nurseries Act	92.70%
Canadian PA Guidelines for the Early Years	28.70%
Active Healthy Kids Canada Report Card	8.40%
Canadian Sedentary Guidelines for the Early Years	16.30%

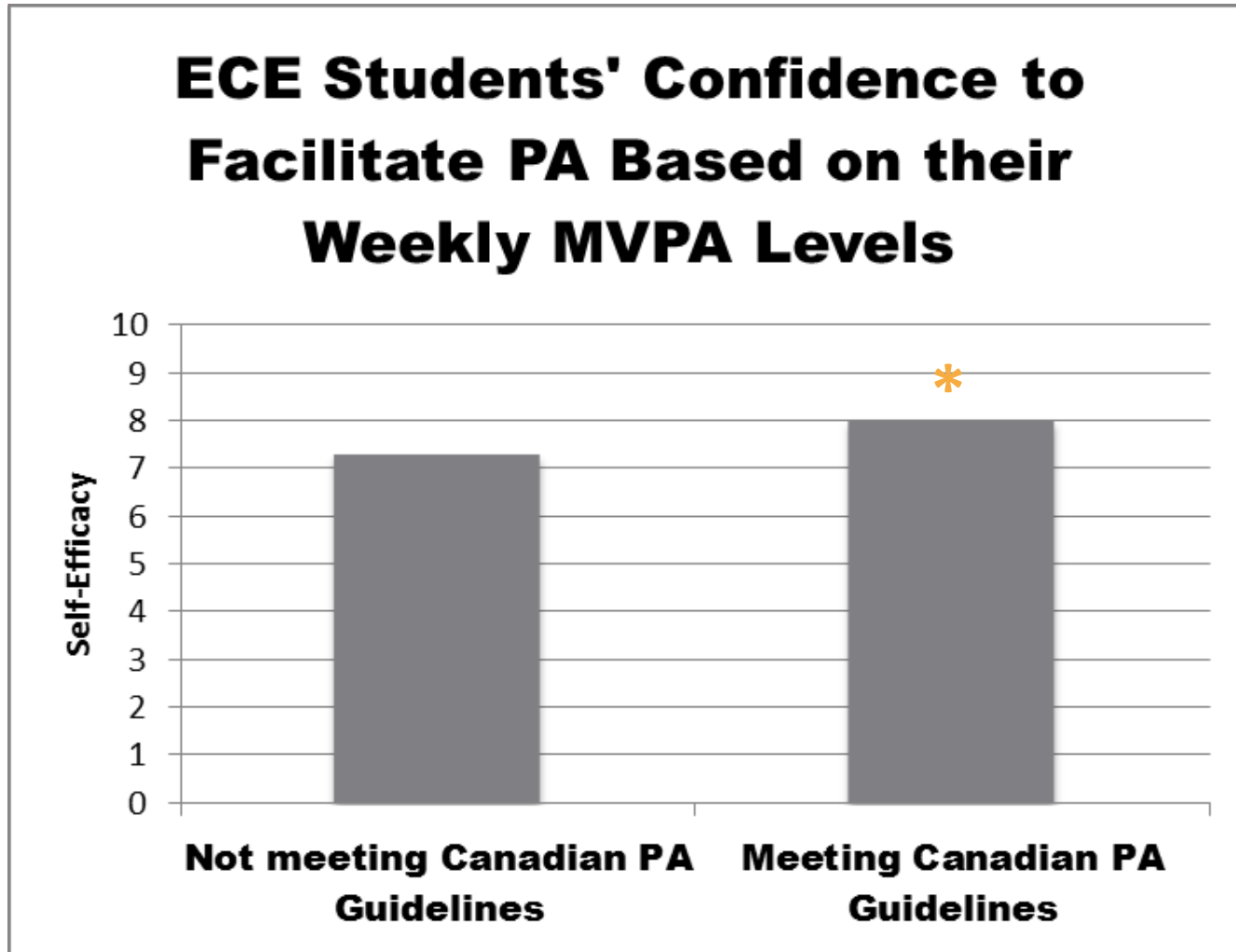
**2.0%** accurately reported



# Results – Self-Efficacy



# Results – Self-Efficacy



# 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





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# 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](http://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](http://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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