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Physical Activity and Its Contexts during Preschool Classroom Sessions

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Abstract

Physical activity (PA) is important for young children in achieving positive health outcomes and there is growing evidence suggesting that PA and fitness play an important role in children's brain development and academic performance. Studies of preschool children typically show that few meet recommended daily PA levels. Meanwhile many preschoolers worldwide attend preschools, but little is known about their on-campus PA or the factors that influence it, especially during classroom sessions. The purpose of this study was to use a validated instrument to conduct a micro-analysis of student PA levels, lesson contexts, and teacher prompts for PA during classroom sessions. We assessed these factors during 165 classroom sessions taught by 25 teachers in four preschools. The sessions occurred prior to (PRE-PE) or following the PE lessons (POST-PE) that we described in an earlier paper (Chow et al., 2015). Children spent classroom time primarily sitting (76%) and standing (13%), while engaging in PA (mostly of low or moderate intensity) 11% of the time. PA occurred mostly during lesson transitions and music time. Overall, boys were more active than girls (MVPA% = 12.1 vs. 8.8), and teachers rarely promoted either in-class or out-of class student PA. The study contributes to the limited literature on PA and its related contexts in preschools. The results have implications for providing pre-service and in-service teacher education related to the importance of PA and how to implement it. Expanded surveillance studies are recommended. In addition to using questionnaires and accelerometers or pedometers to assess PA, the studies should include observation methods so that important on-site and potentially modifiable contexts can be assessed directly.

Keywords

Academic Lessons, Education, Physical Activity, Preschool, Hong Kong

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1. Introduction

Physical activity (PA) engagement is important for young children in achieving positive health outcomes including enhanced bone growth, improved blood lipids and blood pressure, and reduced risk of overweight and obesity (Janssen & Leblanc, 2010). Additionally, there is a growing body of evidence suggesting that PA and physical fitness play an important role in children's brain development and academic performance (e.g., Castelli, Glowacki, Barcelona, Calvert, & Hwang, 2015; IOM, 2013).

PA guidelines for early care and preschool children have been established in several countries. In Australia, Canada, and the United Kingdom, for example, there are recommendations that preschool children should participate in a minimum of 3 hours of daily PA at various intensity levels (Li, Kwan, King-Dowling, & Cairney, 2015; Tremblay et al., 2012a). The US Physical Activity Guidelines (USDHHS, 2008) suggest that children should engage in at least one hour of moderate-to-vigorous-intensity PA (MVPA) each day and the Institute of Medicine (IOM, 2011) recommends that preschool children should participate in 15 or more minutes of PA per hour for approximately 3 hours per day. More specifically, in addition to recommending preschoolers to engage in at least 60 minutes and up to several hours of unstructured PA per day, NASPE (2009) recommends that they accumulate at least 60 minutes daily in structured PA. With so many diverse PA recommendations, it is challenging to identify the proportion of children that are sufficiently active (Beets, Bornstein, Dowda, & Pate, 2011). Nonetheless regardless of which guidelines are used for comparisons, the evidence is fairly consistent that preschool children generally engage in low levels of PA (Cardon & De Bourdeaudhij, 2008; Hinkley, Salmon, Okley, Crawford, & Hesketh, 2012; Hnatiuk, Salmon, Hinkley, Okely, & Trost, 2014; Pate, O'Neill, Brown, McIver, Howie, & Dowda, 2014; Reilly, 2008) and high levels of sedentary behavior (Hnatiuk et al., 2014; Reilly, 2008; Tucker, 2008).

Pate et al. (2014) recently provided an overview of studies related to PA in preschool children while highlighting the most important research needs. Among other relevant considerations, they identified the importance of investigating social and environmental factors that might influence PA behaviors in this age group. Many children worldwide attend preschools and child-care centers, and promoting PA in these settings has been identified as an important means for contributing to their growth and development and potentially to population health (e.g., IOM, 2013; Pate, Davis, Robinson, Stone, McKenzie, & Young, 2006). Research conducted in preschools, however, indicates that many children accrue limited amounts of PA while in this setting (e.g., Reilly, 2010; Sugiyama, Okely, Masters, & Moore, 2012). Meanwhile, reviews (e.g., Dowda, Pate, Trost, Almedia, & Sirard, 2004; IOM, 2013; Sugiyama et al., 2012; Tremblay, Boudreau-Larivière, & Cimon-Lambert, 2012; Trost, Ward, & Senso, 2010; Ward, Vaughn, McWilliams, & Hales, 2010) suggest that school level policies and practices, teacher behavior on the playground, structured indoor and outdoor activities, modifying play ground structures and markings, and providing small or portable play equipment all can influence children's MVPA at preschools.

In alignment with the NASPE (2009) recommendation that preschool children should participate in substantial amounts of structured PA, we recently described child PA levels, lesson context, and teacher behavior during structured physical education (PE) lessons taught by 25 teachers in 4 Hong Kong preschools (Chow, McKenzie, & Louie, 2015). There were differences in the proportion children's moderate-to-vigorous PA (MVPA%) during PE lessons among the schools, by lesson context, and by teacher behavior, but there were no significant differences in MVPA% between indoor and outdoor lessons or among three different preschool grade levels. Overall the children were active enough during PE to meet the intensity standard of 50% MVPA identified by U.S. Healthy People 2010 (USDHHS, 2000) and the Institute of Medicine (IOM, 2013). PE, however, averaged only about 20 minutes in length, so these preschoolers accrued only 9.9 MVPA minutes during their structured lessons.

With the exception of structured PE and recess, preschoolers spent most of their time at school doing academic pursuits in classrooms. A few studies have been conducted (e.g., Kirk, Vizcarra, Looney, & Kirk, 2014), but there is a scarcity of information on preschoolers' PA levels and factors that may influence them during academic lessons in classrooms. Li et al. (2015) recently conducted a systematic review of studies of the determinants of PA in early childhood and called for additional research to better understand the salient factors related to PA in this age group. Examining PA during academic sessions at school is particularly relevant to preschoolers in Hong Kong, a densely populated city that has limited PA space, including in family residences which are typically in high-rise towers.

The current paper adds to the limited amount of literature on PA that occurs during academic sessions in preschools. To do so, we conducted a micro analysis of student PA levels, lesson contexts, and teacher prompts for PA during 165 classroom sessions that were held prior to (PRE-PE) or following the PE lessons (POST-PE) that we described in an earlier paper (Chow et al., 2015).

2. Methods

2.1. Background

Over 90% of preschool-aged children in Hong Kong attend preschools, all which are privately run and charge tuition (Hong Kong Government Census and Statistics Department, 2006). The Curriculum Development Council of Hong Kong (2006) recommends preschool education provides six learning areas (arts, early mathematics, language, physical fitness and health, science and technology, and self & society) that target our developmental aspects: physical, cognitive and language, affective and social, and aesthetic.

Most preschools in Hong Kong occupy part of a floor inside a multi-level residential building. There is a minimum floor space requirement of 1.8 m^2 per child that is inclusive of all indoor areas, but there is no requirement for outdoor PA areas (Hong Kong Government Education Bureau, 2006). Previous findings have shown that the lack of plays pace, particularly outdoor areas, may affect preschooler's PA (Louie & Chan, 2003).

2.2. Schools and Setting

Based on their structural and educational program differences, four preschools in Hong Kong were selected to participate; three had both indoor and outdoor PA areas and one had an indoor activity space only. **Table 1** presents information on the preschools, including the length of school day and size of the indoor and outdoor activity areas. All preschools offered daily PE lessons, scheduled from 20 to 30 minutes in half-day session. In each preschool, five to six classes across three preschool grade levels (nursery, lower grade, upper grade) were randomly selected for observation.

The observed lessons involved 23 different intact preschool classes that were led by 25 different teachers (24 females; 1 male). The teaching experience of lead teachers ranged from 2 - 28 years (mean, 13.4 ± 7.4); all had degrees or diplomas and were certified in Early Childhood Education. Each lead teacher had one assistant. The study was approved by the University Ethics Committee, and written consent was obtained from the preschool principals and the parents of the observed children.

2.3. Data Collection

Observation Schedule. Observations in each preschool included four different week days spread over two to four weeks during summer season, 2012. Teachers were informed of the days their schools were to be visited, but not about the precise behaviors to be coded. They were asked not to modify either their original lesson content or their instructional methods. The majority of observation days consisted of observing a sequence of three sessions: a PRE-PE classroom session (n = 85), a PE lesson (n = 90), and a POST-PE (n = 80) classroom session (total = 255 observed sessions).

Table 1. Characteristics of four selected preschools.

School	Total Enrollment (no.)	Total Land Area (m^2)	Total Play Area (Indoor, Outdoor) (m^2)	Total Classes (no.)	Mean Area of Classroom (m^2)	Classroom Sessions Observed (no.)	Mean Observed Class Size (no.)
1[ad]	300	1486	456 (96, 360)	9	41	38	20.7 ± 2.2
2[a]	555	940	510 (160, 350)	9	39	48	30.2 ± 2.6
3[b]	160	590	217 (67, 150)	8	32	48	23.3 ± 4.2
4[bc]	200	600	110 (110, 0)	6	33	44	20.0 ± 2.4

[a]Provided half-day sessions only; [b]Provided both half- and whole-day sessions; [c]No outdoor activity area; [d]Tuition was 2.5 to 2.6 times higher than other preschools for half-day session.

Observation Procedures. Observation procedures followed the technical descriptions of the SOFIT (System for Observing Fitness Instruction Time) training manual (McKenzie, 2012). Before the start of the PRE-PE classroom session four preschool children (2 boys, 2 girls) from a class were selected for observation throughout that day. Observers sequentially focused on one target child for 4 consecutive minutes before changing to the next child. An MP3 digital recording paced the coding of student activity, lesson context, and instructor behavior during a series of 20-second intervals (i.e., 10 seconds observe, 10 seconds record) that continued throughout the session.

Observation Codes. Student activity levels and instructor behavior were assessed using SOFIT codes. *Student activity levels*, which have been extensively validated (e.g., McKenzie, Sallis, & Nader, 1991) were coded as 1 to 4 based on bodily movements of lying down, sitting, standing, walking/moderate, and code 5 (vigorous) for movements requiring greater energy than normal walking. *Teacher interactions* were coded as to whether or not the teacher prompted or reinforced the children to engage in physical activity in-class (I), out-of-class (O), or not at all (N) during the interval. *Lesson context* codes for the classroom lessons were based on the Observational System for Recording Physical Activity in Children-Preschool (OSRAC-P) that has 12 categories (art, books/preacademic, gross motor, group time, manipulative, music, self care, snacks, sociodramatic, transitions, videos, others) (Brown, Pfeiffer, McIver, Dowda, Almeida, & Pate, 2006). "Others" included six additional categories that were originally specified in the OSRAC-P scale (i.e., large blocks, nap, teacher-arranged, time out, not applicable, can't tell). In addition, class size (i.e., number of children participating), lesson length, size of area used, density (preschoolers per 100 m^2), air temperature (˚C), and humidity (%) were recorded.

Observer Training. Five observers completed training sessions conducted by the criterion observer (lead author), an experienced SOFIT observer and trainer. The observers practiced coding using pre-coded videos of lessons and live observations in the field. Training procedures followed those specified by the SOFIT manual (McKenzie, 2012), and reliability assessments prior to data collection showed observer agreement to be well over the established 85% criterion.

2.4. Data Analyses

SOFIT is a lesson-level measure, and the 85 PRE-PE sessions and 80 POST-PE sessions were averaged for statistical analyses. The main dependent variable was session MVPA%, computed by summing the proportion of time students engaged in walking and being vigorous. Because the activity data were positively skewed, non-parametric Spearman correlations were computed to assess the relationships among MVPA% and lesson contexts.

3. Results

Of the PRE-PE and POST-PE classroom sessions observed, 20%were coded independently by two observers. Intra class reliability coefficient averages between the assigned observer and the criterion observer were 96.7% for student activity, 98.3% for lesson context, and 99.8% for teacher interaction, indicating very high inter-rater reliability (Baumgartner & Hensley, 2006).

Table 2 shows the observed length of the PRE-PE and POST-PE classroom sessions was 25.8 ± 6.8 minutes and 21.8 ± 8.2 minutes, respectively (overall mean = 24.6 min). **Table 2** and **Table 3** show that during these sessions students spent about three-quarters of their time sitting (PRE-PE, 74.0%; POST-PE, 78.6 %; overall 76.1%) and while engaging in very little MVPA (PRE-PE, 12.4%;POST-PE 8.7%; overall, 10.6%). This equates to an average of 2.2 minutes of walking (moderate) and 0.4 minutes of vigorous PA per classroom session.

Table 2 shows there were only small differences in proportion of time allocated to lesson contexts of the PRE-PE and POST-PE lessons. **Table 3**, which combines the data for the 165 sessions, indicates overall how much time was allocated to the different contexts and how physically active children were during them. The majority of session time (49.3%) was allocated to "books/academic learning," and children engaged in MVPA 13% of this time. The next most frequently occurring allocation was to "transitions" (i.e., changing from one context to another, and often from location to another) and children engaged in MVPA 41.7% of this time-the highest of all contexts. "Music" time was the next most frequently occurring context. It provided students with 17.7% MVPA, and was the main contributor (43.6%) to the children's vigorous PA. All other contexts were allocated less time during the observed periods (a total of 67.6 hours) and they provided only small amounts of MVPA.

Table 2. Lesson length and means (standard deviations) of proportion of observed intervals as well as ranges among preschools for student activity, lesson context, and teacher interactions during classroom sessions both prior to (PRE-PE) and following PE lessons (POST-PE).

	PRE-PE		By Preschool	POST-PE		By Preschool
	(*N* = 85 sessions) Mean (SD)		(*N* = 19-24 classes) Mean Range	(*N* = 80 sessions) Mean (SD)		(*N* = 19 - 24 classes) Mean Range
Lesson Length (min)	25.8	(6.8)	21.9 - 29.3	21.8	(8.2)	20.5 - 32.0
Student Activity (%)						
Lying down	<0.1	(0.2)	0.0 - <0.1	<0.1	(0.2)	0.0 - <0.1
Sitting	74.0	(18.7)	70.5 - 77.4	78.6	(19.2)	72.0 - 84.8
Standing	13.6	(11.9)	11.2 -15.9	12.7	(13.9)	8.5 - 20.4
Walking	10.8	(8.6)	6.7 - 12.9	7.4	(7.3)	5.7 - 9.8
Vigorous	1.6	(3.9)	<0.1 - 2.5	1.3	(3.3)	0.5 - 1.1
MVPA[a]	12.4	(10.0)	6.8 - 14.3	8.7	(8.6)	6.6 - 12.0
Lesson Context (%)						
Books/Academic	50.3	(36.5)	42.8 - 62.2	47.6	(39.7)	27.3 - 71.2
Music	9.6	(25.3)	0.8 - 20.3	10.2	(27.6)	0.8 - 19.5
Group Time	8.8	(22.0)	2.6 - 11.3	4.8	(19.2)	0.6 - 9.6
Snacks	5.4	(15.0)	0.0 - 16.6	8.6	(20.1)	2.3 - 16.5
Sociodramatic	5.4	(15.0)	0.0 - 16.6	8.6	(20.1)	2.3 - 16.5
Art	4.7	(12.6)	2.0 - 8.3	8.4	(17.1)	2.4 - 12.5
Manipulative	3.4	(9.4)	0.3 - 6.9	1.6	(6.5)	0.0 - 3.6
Self Care	1.3	(6.1)	0.0 - 2.5	1.4	(4.4)	0.7 - 1.9
Transitions	0.2	(1.4)	0.0 - 0.6	5.2	(19.2)	0.0 - 10.0
Videos	0.2	(1.4)	0.0 - 0.6	5.2	(19.2)	0.0 - 10.0
Gross Motor	0.2	(1.0)	0.0 - 0.3	0.2	(1.2)	0.0 - 0.1
Others	0.9	(8.9)	0.5 - 3.3	0.5	(3.5)	0.0 - 1.8
Teacher Interactions (%)						
Promotes In-Class PA	1.1	(3.3)	0.1 - 2.9	0.8	(2.0)	0.0 - 1.4
Promotes Out-of-Class PA	<0.1	(0.3)	0.0 - 0.1	0.1	(0.6)	0.0 - 0.3
None	98.8	(3.3)	97.1 - 99.8	99.2	(2.1)	98.6 - 100.0

[a]MVPA = moderate-to-vigorous physical activity (walking + vigorous).

Children's MVPA% was positively correlated with several session contexts, including "transitions" (PRE-PE: $r = 0.46$, $p < 0.00$; POST-PE: $r = 0.33$, $p < 0.00$); "music" (PRE-PE: $r = 0.45$, $p < 0.00$; POST-PE: $r = 0.43$, $p < 0.00$); and "sociodramatic" time (PRE-PE: $r = 0.22$, $p = 0.04$). Overall during the classroom sessions, boys were more physically active than girls (MVPA% = 12.1 ± 11.9 vs. 8.8 ± 10.1, $t = 2.70$, $p = 0.007$) [data not shown]. Teacher interactions related to promoting or reinforcing either in-class or out-of class student PA were rare, occurring during only about 1% of the observed intervals (**Table 2**).

4. Discussion

In a previous paper (Chow et al., 2015) we reported on student PA, lesson contexts, and teacher promotion of

Table 3. Proportion of time children spent in physical activity categories overall and in specific contexts during classroom sessions (N = 165 sessions; mean length = 24.6 min; total observed time = 4055 min).

	Child Physical Activity Levels %					
Lesson Context (Mean min and %)	**MVPA[a]%**	**Lying Down %**	**Sit %**	**Stand %**	**Walk %**	**Vig %**
Books/Academic [12.1 min, 49.3%]	13.0	33.3	59.8	18.1	11.4	22.9
Transitions [2.9 min, 11.9%]	41.7		4.9	28.1	45.9	15.6
Music (2.2 min, 9.1%)	17.7	66.7	7.0	14.4	13.5	43.6
Group Time [2.0 min, 8.1%]	6.9		8.2	8.5	7.7	2.2
Art [1.7 min, 7%]	4.3		6.6	11.7	4.4	3.4
Snacks [1.4 min, 5.6%]	3.9		6.0	4.4	4.0	3.4
Manipulative [0.8 min, 3.2%]	2.2		2.9	5.6	2.5	0.0
Videos [0.6 min, 2.3%]	0.0		3.1	0.0	0.0	0.0
Sociodramatic [0.3 min, 1.3%]	2.2		0.9	2.8	2.3	1.1
Self Care [0.3 min, 1.3%]	6.9		0.4	2.2	7.4	3.9
Gross Motor [<0.1 min, 0.2%]	0.3		0.1	0.9	0.3	0.6
Others [0.1 min, 0.6%]	1.0		0.2	3.2	0.7	3.4
Total Overall %	10.6	< 0.1	76.1	13.3	9.1	1.5

[a]MVPA = moderate-to-vigorous physical activity (walking + vigorous).

PA during physical education lessons. The current paper extends that study by focusing on the children's PA, lesson contexts, and teacher promotion of PA during the classroom sessions that both preceded and followed those PE lessons. The study is the first to use systematic observation to do a microanalysis of children's PA levels during different lesson contexts within academic sessions in preschool classrooms. Additionally, it is one of the very few to assess teacher promotion of PA behavior during the classroom sessions of young children.

Results of the present analysis show that the children spent very little classroom time engaged in MVPA (about 11%), while sitting and standing 76% and 13% of the time, respectively. This finding is similar to those of Brown, Pfeiffer, McIver, Dowda, Addy, & Pate (2009), who used different PA codes to study children in US preschools but found that children were engaged in sedentary behaviors during indoor activities 84% of the time. Of particular unease, given the concerns and emerging guidelines relative to prolonged amounts of sedentary behavior (e.g., Tremblay et al., 2012b) is the large amount of time that the Hong Kong children spent sitting inactively.

It is important to notethat there were differences in how the Hong Kong and USA classroom times were allocated. In our study, the most prominent time allocation was to "books/academic" (about 49%), followed by "transitions" (12%), "music" (9%), and "group time" (8%) (**Table 2** and **Table 3**). In contrast, the most frequent five session contexts in the Brown et al. (2009) study were nap, group time, transition, snack, manipulative, and sociodramatic; and in each of these categories children were sedentary over 90% of the time. These differences in time allocations could be due to numerous factors including the time of day observations were made and how preschool curricula are structured in the two locations. The samples form both studies are small, and currently there are no national surveillance studies of PA in preschools in any country.

Nearly all the children's MVPA in the current study occurred during "transition" and "music" time, 42% and

18%, respectively. Additionally the POST-PE classroom sessions were less active than the PRE-PE ones (8.7 vs. 12.4 MVPA%), perhaps because the teachers tended to provide more passive activities after PE or that the children were tired from the lessons.

During the classroom sessions, teachers rarely promoted either in-class or out-of-class PA. This finding was similar to Brown et al. (2009) study that found preschool teachers rarely prompted students to engage in PA. One possibility for such a low level of promoting PA in the current study is that the children had a PE lesson scheduled on the same day. On the other hand, the teachers may not have realized the importance of promoting PA in either classroom contexts or beyond the school curricula. All the observed teachers were certified in Early Childhood Education, but it is not known whether information on the importance of PA and how to promote it with preschoolers was part of their training. Given the significance of PA to young children's growth and development and its potential for improving academic behavior, it would be valuable for pre-service and in-service education programs to ensure teachers become aware of the value of PA to children and how to promote it.

Similar to our finding that girls were less active than boys (MVPA% = 52.8 vs. 46.6) during their PE lessons in these preschools (Chow et al., 2015), girls were also less active during these classroom sessions (MVPA% = 8.8 vs. 12.1). While it is not unusual for girls as young as four and five to be less active than their male peers at preschool (e.g., McKenzie, Sallis, Nader, Broyles, & Nelson, 1992), it is important that educational institutions take steps to ensure girls have equitable opportunities to engage in PA and to become physically fit and motorically skilled.

Approximately 95% of eligible children in Hong Kong attend preschools, usually for a half-day (i.e., 3-hours) (Rao & Li, 2009). During this time, children typically have one 20 to 30 minute PE period, but no recess time. Our previous study showed that children engaged in MVPA nearly 50% of PE time, or about 10 MVPA minutes per lesson (Chow et al., 2015). Based on the observed PA levels during classroom sessions in the current study, children would accrue an additional 13.6 moderate (walking) and 2.3 vigorous minutes during their non-PE time at school (i.e., of the remaining 150 minutes). Thus, the preschoolers would accrue a total of about 26 minutes of PA (most of it at a low or moderate level) at school, far short of the typical recommendations for young children

In light of these low levels, designing and implementing interventions to increase preschoolers' PA at school-is warranted. One approach is to provide short PA breaks during the school day, a strategy shown to increase PA in elementary schools that also having the potential benefits of improving student on-task behavior and some measures of health (Whitt-Glover, Porter, & Yancey, 2013). In particular, one classroom-based PA curriculum was shown to be successful in creating favorable changes in body mass index and improving academic achievement (Donnelly & Lambourne, 2011). One preschool study has also shown that incorporating PA into the teaching of academic content can result in greater PA at the school (Kirk et al. 2014). Other potential interventions for increasing PA at preschool are to increase the frequency, duration, and intensity of PE lessons and to ensure that children have recess periods.

5. Summary, Limitations, and Recommendations

Physical activity is important for children's growth and development and health, and the inability of preschool children to meet acceptable PA guidelines is an international problem (Li et al., 2015). This micro-analytic study of student PA levels, lesson context, and teacher promotion of PA during preschool classroom sessions indicated that the young children spent most of their time in sitting and rarely engaged in PA, especially at a high intensity level. This is disconcerting, especially relative to the growing negative concerns about prolonged sitting being a contributor to metabolic diseases and to obesity (IOM, 2011) as well as the potential positive effect PA has on academic performance (Castelli et al., 2015; Donnelly & Lambourne, 2011). Physical activity, when it did happen, occurred mostly during transitions between academic lessons and time allocated for music.

During PE at their preschools, children in the current study accrued about 9.9 minutes of MVPA, but only about 3.8 minutes of it was of vigorous intensity (Chow et al., 2015). Thus, combined with their low levels of PA in the classrooms, their overall engagement in PA fell short of recommendations. A concerning factor related to these low levels of PA was that the teachers rarely prompted or reinforced children to engage in PA outside of school during either their PE lessons or classroom sessions. This suggests that modifications to teacher pre-service and in-service programs are needed if improving PA in children is to rise to importance.

During the study, observations were confined to 165 classroom sessions taught by 25 different teachers in 4 selected preschools in Hong Kong. Thus, a limitation is the small sample size and potential generalizability.

Nonetheless, the study does contribute to the scarce literature on PA and its related contexts in preschools. Policies and practices related to PA and sedentary behavior vary widely and there are currently no national or even US state surveillance samples; thus, additional PA studies in preschools are warranted. These should include both surveillance studies to determine what is actually happening at preschools and intervention studies to determine if and how conditions can be improved. Studies should not be limited to using only questionnaires to assess policies and practices and accelerometers or pedometers to assess PA, but should also include the use observation methods (i.e., use "ground truthing" strategies), so that important on-site and potentially modifiable contexts can be assessed directly (McKenzie & Van der Mars, 2015).

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