

Physical Activity of Young Children in Hong Kong Preschools 香港幼兒的體能活動

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Abstract

Are preschool children physically active? A bulk of research evidence indicates that most preschool children engage mainly in sedentary behavior and have little physical activity (PA) time. Recent reviews show that physical environment such as outdoor play, equipment, and toys as well as the type of preschool can affect children's PA. In Hong Kong, most children ages 3 to 6 years attend preschools of half-day or whole-day sessions. The purpose of this paper was to present summarized results showing the amount of daily step counts taken by a sample of 240 preschool children (137 boys, 103 girls) in Hong Kong. The study participants came from five preschools. The data included four consecutive days of two weekdays and two weekend days. Findings showed that boys had significantly higher mean daily step counts (15,221 steps) than girls (12,208 steps) and children were significant more active during weekends compared with weekdays.

摘要

近期愈來愈多文獻指出，幼兒整體的體能活動，逐漸下降，不利健康成長。本文以步行計儀器量度香港幼兒的體能活動情況，資料顯示：以一連四天計算，男童和女童的整天活動量分別為15,221步及12,208步，而且周末的活動量明顯較平日為多。

Introduction

There has been an increasing trend of childhood obesity in both developed and developing countries in recent years (Lobstein, Baur, & Uauy, 2004). According to the World Health Organization, the number of overweight children under the age of five is estimated to be over 4 million globally in 2010 (WHO, 2014). Accompanying this world trend is a rising childhood obesity rate in Hong

Kong. Obesity rates of primary students have increased from 16.1% in 1995-1996 to 20.9% in 2011-2012 (Department of health, 2012). Lam (2007) reported an overall prevalent of obesity of 7.7% in 1,437 Hong Kong children aged 3-5 years.

The obesity epidemic constitutes to a significant and growing worldwide public health problem and overweight status during childhood has been associated with

cardiovascular disease risk factors (Riddoch & Boreham, 2000). Past research has shown that high level of sedentary behaviors such as TV viewing are independently associated with metabolic risk in children (Ekelund et al., 2006; Hardy, Denney-Wilson, Thrift, Okely & Baur, 2010). Increasing physical activity (PA), on the other hand, reduces cardiovascular disease risk factors (Saakslahti et al., 2004) by improving cardio-metabolic profile in children (Janssen & LeBlance, 2010) and may prevent childhood obesity (Hawkins & Law, 2006; Trost, Sirard, Dowda & Pfeiffer, 2003). Other benefits of PA include improvements in bone health (Janz et al., 2004), gross motor skill development and psycho-social development (Timmons, Naylor, & Pfeiffer, 2007) of young children.

In line with the importance of PA for young children, PA guidelines have been developed in different countries. For example, in US, the National Association for Sport and Physical Education (NASPE, 2009) recommends that preschoolers should accumulate at least 60 minutes of structured PA and up to several hours of unstructured play time each day. In addition, NASPE guidelines state that preschoolers should not be sedentary for more than 60 minutes at a time (except when sleeping). More recent guidelines from the governments of Australia (Department of Health and Ageing, 2013), Canada (Tremblay M. S. et al., 2012) and UK (Department of Health, 2013) recommend at least 3 hours of PA spread throughout the day.

In the past 10 years, there has been an exponential increase of research as well as review papers focusing on PA of preschool children. The focus of this paper is to present summarized findings from one study targeting Hong Kong preschool children. Furthermore, when reviewing research papers, we also place more emphasis on environmental influences, particularly the school environments that may influence preschoolers' PA.

Are Preschool Children Physically Active?

Most people tend to assume preschool children are, by nature, very active. However, most research evidence suggests the opposite. Tucker (2008) in her reviews concluded that nearly half of the 39 selected studies reported that preschoolers did not meet the recommended NASPE (2002) PA guidelines. Majority of the research evidence has illustrated that preschool children have low levels of moderate-to-vigorous physical activity (MVPA)

and engage mostly in sedentary activities when assessed by direct observation (Pate, McIver, Dowda, Brown & Addy, 2008), accelerometry (Cardon & De Bourdeaudhuij, 2008, Kelly, Reilly, Grant & Paton, 2005; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004; Reilly et al., 2004), pedometry (Reznik, Wylie-Rosett, Kim, & Ozuah, 2013), and doubly labeled water as energy expenditure measures (Reilly et al., 2004). For example, Cardon and De Bourdeaudhuij (2008) collected accelerometry data on 2 weekdays and 2 weekend days consecutively from 76 Belgium children (4 to 5 years of age). Their results showed that children were sedentary for 9.6 hours daily with only 34 minutes being engaged in MVPA. They concluded that PA levels in this sample of preschool children were far below than recommended. Other studies based on different sampling frame (e.g., 1-minute vs. 15-second accelerometry sampling intervals) and cut-off values of accelerometry data in the determination of MVPA also reported preschool children had low percentage of time engaged in MVPA (e.g., Kelly et al., 2005; Reilly et al., 2004).

In addition to measuring preschool children's total daily PA, researchers have focused on the PA levels of children during preschool hours. Pate et al. (2004) used 15-second intervals of accelerometry data to measure preschool children's PA levels. Their result showed that children engaged in only 7.7 minutes of MVPA per hour of preschool. When PA levels were assessed based on a PA observation scale (Observation System for Recording Physical Activity in Children – Preschool [OSRAC_P]) for preschool children, similar findings were shown with children spent the majority of observational intervals in sedentary activity (>80% intervals) with less than 3% of observation intervals in MVPA (Pate et al., 2008). Also using an observation scale (System for Observing Fitness Instruction Time, SOFIT), Van Cauwenberghe, Labarque, Gubbels, De Bourdeaudhuij, and Cardon (2012) assessed preschoolers' PA levels, lesson context and teacher behaviors in 35 video-taped physical education (PE) lessons from 35 preschools. Findings indicated that preschool children had 33% (12 minutes out of PE class length of 37.8 minutes) of MVPA during PE lessons. Other research has focused on preschoolers' PA during recess. Nicaise, Kahan, and Sallis (2012) used observation scale (OSRAC_P) to determine PA levels of preschoolers during unstructured outdoor play periods. Their results revealed that children had less than 21% of intervals being spent in MVPA overall.

Factors Associated with PA levels of Preschool Children

Consistent research findings generally indicate that active children spend more time outdoors, boys are more active than girls, and parental PA is related to preschoolers' PA (see reviews: Hinkley, Crawford, Salmon, Okely, & Hesketh, 2008; Timmons et al., 2007). Although time spent in sedentary behavior is found to be related to PA, the relationship between TV watching and PA is unclear for the preschool population (Timmons et al., 2007).

In terms of the school environmental variables, open spaces located in playgrounds and grass fields, and activity-generic portable equipment, manipulative objects, and riding vehicles are some design and equipment features that appear to foster MVPA (Nicaise et al., 2012). In other words, the types of equipment and toys available can help to increase PA levels (Bower et al., 2008; Hinkley et al., 2008). Recent evidence also suggests that preschools' practices and policies can affect children's PA. Researchers have found that the type of preschool a child attending was a significant predictor of PA (Finn et al., 2002; Pate et al., 2004). For example, staff education and training as well as staff behavior on the playground can influence preschool children's PA (Troost, Ward, & Senso, 2010). In a recent review paper, Tremblay L. et al. (2012) advocated the necessity for providing inexpensive as well as easy-to-implement and effective strategies to increase activity levels for preschool children.

In Hong Kong over 90% of children ages 3 to 6 years attend preschools (Hong Kong Government Census and Statistics Department, 2006). They spend approximately 20 hours and 35 hours per week in half-day and whole-day sessions, respectively. At most preschools those attending a half-day session receive from 25 to 30 minutes of PE time daily, based on the recommendation to "offer 45-60 minutes and 60-105 minutes of physical fitness/music/arts activities in half-day and full-day sessions, respectively" (Hong Kong Government Education and Manpower Bureau, 2006, p. 49). PE is the only opportunity most preschoolers have for vigorous PA because most preschools do not offer recess periods. Activity levels during PE can contribute significantly to children's daily activity because it is mandatory and children usually spend their PE time learning gross motor activities or engaging in free play and game play.

Specific to the very high density population of Hong Kong, preschools typically have limited space (e.g., occupy part of a floor inside a multi-level residential building) and most do not have outdoor playground space because there is no mandatory requirement for it (Hong Kong Government Education Bureau, 2009). In contrast, many foreign cities have mandatory requirements for minimum outdoor space for preschoolers (e.g., Australia standard: 5 m² per child; Taiwan standard: 3 m² per child). The authors of the present paper believe that the absence of outdoor play area coupled with limited indoor play area of Hong Kong preschools may have negatively impacted on the preschoolers' PA levels. On the other hand, we found very limited research based on samples of Hong Kong preschoolers. In a smaller scale study on teachers' effectiveness in promoting physical activities of preschool children during playtime, local researchers found that preschool teachers were passively involved in the class. And preschool teachers were over-emphasized the discipline issues than the active involvement of the children (Cheung & Wong, 2004). In another study on Hong Kong preschoolers, Louie and Chan (2003) found that urban children had significantly less pedometer counts than rural children. They proposed that preschools located in metropolitan areas with smaller physical play areas for children appear to be a potential influencing factor affecting preschoolers' PA levels.

Summarized Findings of Study on Hong Kong Preschoolers' Physical Activity

We collected pedometry and accelerometry data in a sample of preschoolers in Hong Kong. The purpose of the study was to determine the daily PA levels of preschoolers. For this paper, we only present summarized results based on the pedometer step counts. A total of 240 children (137 boys, 103 girls) aged 3-6 years from five preschools participated in the study. Among the five preschools, three offer whole-day schooling (n=173, children stay in school for about 8 hours with nap time during midday) and two (n=67, children stay in school for about 4 hours in either morning or afternoon sessions) offer half-day schooling. Each selected preschool child was helped to clip on a pedometer (Yamax Digiwalker, S700 model, Yamax, Japan) onto the left side of the waist at the preschool and was given a log book for parents/caregivers to record the time clipping on/taking off the pedometer before and after sleeping or bathing

or swimming. Parents were asked to record the daily total steps into the log book for four consecutive days including two week days and two weekend days.

Findings

Data were collected in three months of December, March, and June with average temperature of 19.9 0C (range from 13.2 to 28.1) and average humidity of 81.3% (range from 66.5 to 93.5%) with two days out of 28 days of data collection were rainy days. There were no significant mean differences in daily step counts between children attending whole day schools (14,325 steps) and children attending half-day schools (12,904 steps). And there was

no significant mean difference in daily step counts of children among five preschools. Hence, all data were computed without schooling differentiation.

The average daily steps taken by the sample of preschool children (n=240) were 13,155.8 (SD=10,372) steps in weekdays and 14,701 (SD=10,711) steps in weekend days. When comparing for sex difference, results showed that boys were more physically active than girls by having a mean of 14,383 (SD=13,295) steps in weekdays and 16,060 (SD=13,673) steps in weekend days as opposed to girls' mean of 11,522 (SD=3,415) in weekdays and 12,893 (SD=3,713) in weekend days (see Table 1 as shown below).

Table 1. Mean Daily Step Counts of Hong Kong Preschool Children (137 boys, 103 girls).

Day		Mean Daily Step Counts	SD	t	p
Two Weekdays:	Boys	14,383.4	13,295.9	2.41	0.02*
	Girls	11,522.9	3,415.1		
Two Weekends:	Boys	16,060.1	13,673.1	2.59	0.01*
	Girls	12,893.4	37,12.9		
Daily:	Boys	15,221.7	13,393.3	2.54	0.012*
	Girls	12,208.1	3,227.0		

*Significant mean difference at p<0.05

To conclude, we found large variability in pedometer data in this sample of children. Children seem to be more physically active during weekends than weekdays. And boys are more physically active in terms of the number of daily steps taken. However, the following limitations are noted. First, this study involved children from five preschools in which these preschools have differences in terms of school physical size, types of schooling and they might have different policies and practices in promoting PA. Although each preschool offers 30 minutes of daily PE lesson, different lesson curriculum might have resulted in children having lower or higher PA levels. Second, although we attempted to

select preschools that admit children from different socio-economic background, we had no factual data to verify it. Third, although we limited data collection in three months, the measurement period covered different seasons which might have affected children's PA participation. Furthermore, a major limitation of activity data based on pedometer is that pedometer cannot provide intensity levels of PA. Nevertheless, this study involved a relatively large sample size of preschool children. It gives informative data on children's PA.

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