

Association of After-school Physical Activity Level and
Organized Physical Activity Participation in Hong Kong Children

Abstract

The aims of this study were to 1) describe the children's physical activity (PA) pattern during the after-school period and 2) to compare the type and intensity of activity during the after-school period of children with or without participation in organized PA programs. The participants were 456 children from four primary schools in Hong Kong. Self-administered questionnaires were used to measure the PA pattern and intensity level of the children during after-school period. Independent t-test and factorial ANOVA was used for data analysis. Results indicated that children engaged substantial time in light intensity PA during the after-school period. Children who participated in organized PA programs spent fewer time blocks on light intensity PA and more time blocks in vigorous PA. The boys spent more time blocks on high intensity PA than the girls. A structured PA program during the after-school period is a potential intervention strategy to increase children's PA participation without using up the time intended for children's homework.

Keywords: sedentary activity, academic, structured activity

Introduction

Despite many research findings suggesting the benefits and importance of regular physical activity (PA), studies indicate that a quarter of the children in the US do not meet the recommended level of PA participation (Centers for Disease Control and Prevention, 2008). Similarly, only 15.7 percent of children in Hong Kong have been reported to have adequate PA, with an average of at least 60 minutes per day (Department of Health, 2009). Children spend long hours in school; thus, schools tend to be a good venue to promote their PA participation. School-based physical education intervention although enjoyed some success in promoting children's PA (McMurray *et al.*, 2002; Rudolf *et al.*, 2001), was pressured to reduce the school time allocated to physical education (DuBose *et al.*, 2008) and children are also reported to have low PA during school hours (Johns and Ha, 1999).

Recent studies suggest that after-school program is an ideal channel for promoting children's PA because it is in a structured environment (Trudeau and Shephard, 2005) and can be carried on during one of the largest blocks of discretionary time in a child's day (Pate *et al.*, 2006). Moreover, the after-school period is described as a "critical hour," and activities within this period have been reported to be representative of the overall activity level of young people (Hager, 2006; Mota *et al.*, 2003). Even more, children are reported to engage in more PA during the after-school period (Sirard *et al.*, 2005; Prochaska *et al.*, 2002).

Regarding the type of activity performed during after-school period, Mota and Esculcas (2002) indicated that organized sports activities are an important component of the total weekly activity level of participants. Santos and colleagues (2004) identified organized physical activities as "sports activities guided by a trainer or other sports authority" and the non-organized ones as "non-guided activities." Although the participation of PA in after-school period (i.e., PA time) and the participation in organized PA format (i.e., PA type) was known to be important on children's overall PA level, their relationship is not

well-documented. The purpose of this study is 1) to describe the children's activities during the after-school period and 2) to compare the level of after-school PA of children with or without participation in organized PA program in Hong Kong.

Methods

This study used a cross-sectional, self-report survey design to test the relationship of PA participation between children with or with organized PA participation. Data were collected from students studying in four elementary schools in Hong Kong.

Participants

There are 516 elementary schools located in three different regions in Hong Kong (Education and Manpower Bureau, 2006). Invitation letters were sent to 4 randomly selected schools among the regions to obtain their voluntary participation in the study. By informing the schools on the purpose of the study, each school was instructed to randomly select 120 children, without setting any criteria, from four classes of the selected age group to participant in the study. The targeted participants were children aged 10-12, in which schools might offer them with different forms of after-school activities. After received consent from principals of the four elementary schools to conduct the research in their schools, parental informed consent was sent to the children's parents to explain the purpose of the study and its procedure, and to obtain their voluntary participation in the study. Ethical approval for using human participants was obtained from the Research Committee.

Data Collection Procedure

The data collection session was conducted between April to June during a normal school day. A researcher conducted each data collection session in a group of 30 children. The participants were required to complete a self-administered questionnaire. During the school visit, the anthropometric measures of the participants were also collected, including their body height (measured by a measuring tape), and body weight (measured by a measuring

scale: BF-531, Tanita, Japan), from which their body mass index (BMI) was derived. The participants' waist circumference (measured midway between the lowest rib and the top of the iliac crest at the end) and hip circumferences' (measured by over the great trochanters) measurement, derived their waist-to-hip ratio (WHR). The measurement of the circumferences was made by the Gulik Tape Measure with the participants standing with gentle expiration.

Measuring Instruments

Organized PA Participation. A dichotomous variable was adopted to assess if the children had participated in organized PA. They were asked the following question: "Did you participate in any sports or exercise program after school in the last three days?" The sports or exercise program referred to organized PA was defined as regular course that delivered with the presence of a coach or instructor. The respondents who answered yes were denoted as those with organized PA participation, whereas the respondents who answered no were denoted as those without organized PA participation.

Measurement of Physical Activity. The children's PA level was measured using a Three-Day Physical Activity Recall (3DPAR) (Lee and Trost, 2005) questionnaire. Since children's PA level might be varied between school days and non-school days, the 3 days recall of PA levels were standardized on one non-school day (i.e., Saturday or Sunday), and two school days (i.e., Monday to Friday). The 3DPAR questionnaire required the children to recall their PA participation from 7 a.m. to 12 midnight in the last three days. Each day was segmented into 34 thirty-minute time blocks. For every 30-minute time block, the children were instructed to record their main activities by choosing from a list of 55 common activities (e.g., eating, after-school spare time, after-school study groups, watching TV, other hobbies, and transportation). They were asked to identify the intensity level for each activity by choosing light, moderate, hard or very hard, describing how much they engaged in each

activity with a graphic illustration presented to express the meaning of relative intensity.

The validity of the 3DPAR was supported in previous studies through an objective measure of PA derived from accelerometry (Pate *et al.*, 2003) and pedometers (Lee and Trost, 2005), with a correlation coefficient of 0.46 and 0.40, respectively. The after-school period was identified as the time block from 3–7 p.m. each day after the children left school but before the parents arrive home from work. The 3-day 30-min time blocks in the after-school period (total of 8 time blocks from 3–7 pm) were averaged for analysis.

Data Analysis

All data collected were analyzed using the Statistical Package for the Social Sciences, version 18.0. The mean and standard deviations were calculated between different groups (children with versus children without organized PA participation). A sample t-test was used to determine if there was significant difference in the activity time blocks in terms of 1) activity type, include screening activities (i.e., watching TV and computer usage) and study group activity ; 2) activity intensity (i.e., light, moderate, hard and very hard) between the children with or without organized PA participation. Factorial ANOVA (2x2) was used to examine the effect of organized PA participation and gender on the children after-school period activity type and intensity. The statistical significance was set to 0.05.

RESULTS

Participants

A total of 475 primary school children were recruited to participate in the study. There were 19 cases without presentation of parental consent and were excluded from the study. The remaining 456 cases with completed data were analyzed. The participants were 456 school children (230 boys, 226 girls; mean age = 11.4, SD =.97) in grades five and six from four local primary schools in Hong Kong. In total, 131 children (28.7 percent) participated in organized PA, whereas 325 children (71.3 percent) did not participate in organized PA. No

significant differences were observed in the physiological variables, such as age, BMI, and WHR among groups with different organized PA participation statuses (Table 1).

Participants' after-school period activity pattern

Of the eight 30-minute after school time blocks, children spent certain time blocks on sedentary activities during the after-school period. These sedentary activities include screening activities (2.55 time blocks) and after-school study groups (1.06 time blocks). Regarding the activity intensity, children spent the most time in light intensity PA (6.07 time blocks) and the least time in higher intensity PA (moderate=1.19; hard= 0.53; very hard= 0.11).

Analysis from t-test indicated that the children with organized PA participation were found to engaged in fewer sedentary screening activities (with =2.0; without =2.7, $p<.00$). However, no significant difference was found in their study group activity. Regarding the activity intensity, children with organized PA participation were found to spend more time blocks in high intensity PA (i.e., hard level : with = .79; without =.42, $p<.00$; very hard level : with =.25; without =.05, $p<.00$) but fewer time blocks in light intensity PA (with = 5.5; without =6.3, $p<.00$).

Relationships of organized PA participation and gender on children after-school period activity type and intensity

Descriptive statistics of children activity time blocks during after-school period by gender and organized PA participation was presented on table 2. A factorial ANOVA was conducted to examine the effects of organized PA participation and gender on the activity type (i.e., screening activity and study group activity) and intensity (i.e., light intensity and very hard intensity). For the screening activity, the interaction effect was significant $F(1, 452) = 8.17, p < 0.05$, suggesting that effect of organized PA participation depended on gender. For the study group activity, the main effect of organized PA participation, the main effect of

gender and the interaction effect were all non-significant. Regarding the light intensity level activity, the interaction effect was significant $F(1, 452) = 9.897, p < 0.05$, suggesting that effect of organized PA participation depended on gender. The interaction effect of organized PA participation and gender was not significant on very hard intensity PA (Table 2).

Discussion

This study examined the pattern and relationship of after-school PA among children with or without organized PA participation. The findings provided information about the after-school PA participation of Chinese children in Hong Kong. An organized PA program was found to be important in enhancing the intensity and participation of children's PA without sacrificing their time on after-school study work.

After-school sedentary activity pattern

The result indicates that children spent a substantial time block (2.55 time block, i.e. 31.9 percent of the eight after-school time blocks) on watching TV and computer usage. Moreover, the intensity level of the children's after-school PA was primarily light (76 percent). The findings were consistent with those in previous studies indicating that technology-based sedentary behavior (i.e., TV viewing, computer, and video game use) and homework are the most prevalent activities of young people (Atkin *et al.*, 2008; Rushovich *et al.*, 2006). Watching TV was reported to be the reason for the low activity level (Pate *et al.*, 1997; Robinson, 2001) and was presumed to not be promoted as the major activity in the after-school period.

The certain time spent on participation in the after-school study groups (1.06 time blocks, i.e., 13 percent of the eight after-school time block) revealed that parents often place higher priority on academic achievement than on recreational pursuits (Yu *et al.*, 2006). Some parents arrange non-physical activities, such as tutorial classes and music groups, as the major after-school activities, or impose a household rule that homework should be completed

immediately after school, thus limiting the time children have to be physically active. The perception that PA adversely affects academic achievement influences the type of activities that parents arrange for their children for the after-school period. Faced with academic pressure, children in Hong Kong are obliged to do homework and join after-school study groups activity. According to a local study, 50.8 percent of the children respondents are required to join private after-school study groups during after-school period (Democratic Party, 2007). During the unsupervised time that parents are not directly monitoring their children, parents would pre-arrange academic activities for their children. It is also possible for parents to set guidelines and add organized PA to their children's activities to balance the domination of sedentary behavior among children during the after-school period. In addition, recent studies show that there is a positive relationship between academic achievement and sports participation (Stegman and Stephens, 2000; Field *et al.*, 2001). This is significant information in promoting the after-school PA program.

Relationships of organized PA participation and gender on children's after-school period activity type and intensity

One of the most important findings in this study is that the children's participation in organized PA is associated with lower sedentary screening activities (e.g., watching TV and computer usage) without decreasing the time spent on after-school study groups. Yasmin and colleagues (2007) also reported that the increase in PA among students does not affect their academic performance. Children with organized PA are presumed to manage their time better in their after-school period. This finding has a significant implication with regards to the parents' concern about their children's PA competing with the time spent on academic pursuits. This positive finding is essential for the promotion of after-school PA.

This study found that children who participated in organized PA spent more time blocks in vigorous PA (with =.79; without = .42) and fewer time blocks in sedentary screening

activities (with = 2.0; without=2.7) and light intensity PA (with=5.5; without=6.3). The result is consistent with that of past research conducted by Mota and Esculcas (2002), which reveals that organized sports activities are an important component of the participants' total weekly activity level. Santos, Esculcas, and Mota (2004) further pointed out that the total PA level of adolescents could be accrued through organized activities. Organized PA has a structured activity plan to perform a substantial amount of PA. Parents do not have direct supervision during the after-school period, and an organized PA conducted within this time frame would assure children's PA level. Therefore, encouraging organized PA participation is a practical means to increase children's PA levels.

This study shows a gender difference in the PA activity participation intensity. Boys were reported to spend more time blocks in high intensity level PA than girls during the after-school period. This corroborates previous studies that gender difference exists in children's PA levels in Hong Kong (Department of Health, 2009), in the US (Troost *et al.*, 2002; Schaben *et al.*, 2006) and Europe (Riddoch *et al.*, 2004; Riddoch *et al.*, 2007), with boys reported to have higher levels of PA than the girls. Gender stereotyping is common in PA programs, wherein boys are expected to be more interested in vigorous activities and girls in aesthetic activities. Based on a study on the activity level of girls during the unsupervised after-school period, girls engage in fewer structure activities but are more active when left alone (Rushovich *et al.*, 2006). The results indicated the difference between their preference on activity type, thus, a gender-specific design of the after-school program should consider variety and intensity in the activities to suit different needs.

This study used self-reported questionnaire to measure children's PA level and pattern. A written instrument in the form of a self-reporting questionnaire was widely used in studies with a large sample size because of practicability and cost-effectiveness. The advantages of self-reporting measures also included the convenience of administration, low cost, and ability

to collect a variety of PA variables over time (Sallis, 1991). The precision of children's self-reporting measures about their PA level had been questioned, however, Sallis (1991) supported the idea that PA were events where children could remembering the specifics of these events sufficiently. Among the various types of self-report measures, the recommendation from previous researches was to carefully consider the objectives of the study and the hypotheses being tested to determine the appropriate type of self-report for measuring PA. This study used a cross-sectional design to determine the relationships among the variables, and data were collected over a single time frame. However, a cause-and-effect relationship among variables could not be drawn. The sample in the present study only included children from the upper classes in primary schools. Therefore, the results could not be generalized for children of other age groups in the primary schools.

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Table 1.

Characteristics of the participants presented by Gender and PA Participation (Mean \pm SD)
(N=456)

Variables	With organized PA participants			Without organized PA Participants		
	Boys (N=76)	Girls (N=55)	Total (N=131)	Boys (N=154)	Girls (N=171)	Total (N=325)
Age (year)	11.5 (1.18)	11.5 (.77)	11.4 (.94)	11.4 (.95)	11.4 (.94)	11.5 (1.03)
Height (cm)	150.6 (11.46)	150.5 (6.91)	149.5 (8.22)	149.2 (9.29)	149.9 (7.13)	150.6 (9.8)
Weight (kg)	41.9 (11.12)	40.0 (7.76)	41.6 (9.94)	41.6 (10.32)	41.6 (9.62)	41.1 (9.86)
BMI	18.2 (3.30)	17.5 (2.5)	18.4 (3.34)	18.5 (3.37)	18.4 (3.32)	17.9 (2.99)
WHR	0.83 (.05)	0.79 (.04)	0.81 (.05)	0.84 (.05)	0.80 (.05)	0.81 (.05)

Notes : Participants total number by gender - boys = 230; girls =226;
BMI= Body Mass Index; WHR = Waist to Hip Ratio;
Standard Deviations appear in parentheses below mean

Table 2.

Activity Time Blocks During After-School Period by Gender and Organized PA Participation
(Mean \pm SD) (N=456)

		With Organized PA Participants	Without organized PA Participants
Activity Type			
Screening Activity	Boys	1.87 (1.85)	3.15 (2.37)
	Girls	2.35 (1.80)	2.36 (2.08)
	Total	2.07 (1.83)	2.74 (2.25)
Study Group Activity	Boys	1.27 (1.80)	1.18 (1.88)
	Girls	0.95 (1.27)	0.91 (1.49)
	Total	1.13 (1.60)	1.04 (1.69)
Activity Intensity			
Light Intensity PA	Boys	5.05 (2.07)	6.31 (1.89)
	Girls	6.23 (1.90)	6.26 (1.76)
	Total	5.55 (2.07)	6.28 (1.82)
Moderate Intensity PA	Boys	1.41 (1.69)	0.93 (1.37)
	Girls	0.99 (1.18)	1.40 (1.55)
	Total	1.24 (1.51)	1.18 (1.48)
Hard Intensity PA	Boys	1.10 (1.66)	0.55 (1.08)
	Girls	0.35 (0.65)	0.31 (0.72)
	Total	0.79 (1.38)	0.42 (0.92)
Very Hard Intensity PA	Boys	0.37 (1.05)	0.08 (0.45)
	Girls	0.09 (0.59)	0.02 (0.13)
	Total	0.25 (0.89)	0.05 (0.33)

Note : Standard Deviations appear in parentheses.

Table 3.

Interaction Between Organized PA Participation And Gender On Type And Intensity Of After-School PA Time Blocks (N=456)

Source of Variation	Sum of Square	df	F	Sig.
Screening Activity				
Organized PA Participation	38.33	1	8.57	.004*
Gender	2.32	1	0.52	.472
Interaction	36.55	1	8.17	.004*
Study Group Activity				
Organized PA Participation	.36	1	0.13	.718
Gender	7.95	1	2.88	.090
Interaction	0.07	1	0.03	.874
Light Level Activity				
Organized PA Participation	37.87	1	10.77	.001*
Gender	29.34	1	8.35	.004*
Interaction	34.75	1	9.89	.002*
Very Hard Intensity Activity				
Organized PA Participation	2.87	1	9.60	.002*
Gender	2.71	1	9.09	.003*
Interaction	1.14	1	3.82	.051

Note. * = $p < .05$.