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Peggy PY Cheung

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What is This?
Association of after-school physical activity levels and organized physical activity participation in Hong Kong children

Peggy PY Cheung
Hong Kong Institute of Education, Hong Kong

Abstract
The aims of this study were to 1) describe the children’s physical activity (PA) patterns 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 programmes. 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 the 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 programmes 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 programme 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 USA do not meet the recommended level
of PA participation (Centers for Disease Control and Prevention, 2008). Similarly, only 15.7% 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 enjoying 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 an after-school programme 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). Furthermore, 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 the 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 the after-school period (i.e. PA time) and the participation in organized PA format (i.e. PA type) was known to be important for 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 programmes 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 without 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 four randomly selected schools among the regions to obtain their voluntary participation in the study. Informing the schools of 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 participate in the study. The targeted participants were children aged 10–12 years, at which schools might offer them different forms of after-school activities. After consent was received from the principals of the four elementary schools to conduct the research in their schools, parental informed consent material 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 and June during normal school days. 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 with a measuring tape) and body weight (measured with a measuring scale: BF-531, Tanita, Japan), from which their body mass index (BMI) was derived. The participants’ waist-to-hip ratio (WHR) was derived from their waist circumference (measured midway between the lowest rib and the top of the iliac crest at the end) and hip circumference (measured by over the great trochanters) measurements. The measurement of the circumferences was made with a Gulick tape measure with the participants standing with gentle expiration.

Measuring instruments

Organized PA participation. A dichotomous variable was adopted to assess whether the children had participated in organized PA. They were asked the following question: ‘Did you participate in any sports or exercise programme after school in the last three days?’ The sports or exercise programme referred to organized PA defined as a regular course delivered in 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 PA. 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 three day 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 between 07:00 and 24:00 (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 15:00 to 19:00 each day after the children left school but before the parents arrived home from work. The three-day 30-min time blocks in the after-school period (total of eight time blocks from 15:00 to 19:00) 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 whether 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; and 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 they 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 = 0.97 years) in grades 5 and 6 from four local primary schools in Hong Kong. In total, 131 children (28.7%) participated in organized PA, whereas 325 children (71.3%) 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 in 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).

Table 1. Characteristics of the participants presented by gender and physical activity (PA) participation (N=456).

<table>
<thead>
<tr>
<th>Variables</th>
<th>With organized PA participants</th>
<th>Without organized PA Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys (N=76)</td>
<td>Girls (N=55)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>11.5 (1.18)</td>
<td>11.5 (1.77)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>150.6 (11.46)</td>
<td>150.5 (6.91)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>41.9 (11.12)</td>
<td>40.0 (7.76)</td>
</tr>
<tr>
<td>B:M</td>
<td>18.2 (3.30)</td>
<td>17.5 (2.5)</td>
</tr>
<tr>
<td>WHR</td>
<td>0.83 (0.05)</td>
<td>0.79 (0.04)</td>
</tr>
</tbody>
</table>

Notes: Participants’ total number by gender: boys = 230, girls = 226; Standard deviations appear in parentheses below mean; BMI: body mass index; WHR: waist to hip ratio;
Analysis from $t$-test indicated that the children with organized PA participation were found to engage in fewer sedentary screening activities (with $t = 2.0$; without $t = 2.7$, $p < 0.00$). 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 $t = 0.79$; without $t = 0.42$, $p < 0.00$; very hard level: with $t = 0.25$; without $t = 0.05$, $p < 0.00$) but fewer time blocks in light intensity PA (with $t = 5.5$; without $t = 6.3$, $p < 0.00$).

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

Descriptive statistics of children’s activity time blocks during the after-school period by gender and organized PA participation is presented in 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 the 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 the effect of organized PA participation depended

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**Table 2. Activity time blocks during after-school period by gender and organized physical activity (PA) participation ($N=456$).**

<table>
<thead>
<tr>
<th>Activity type</th>
<th>With organized PA participants</th>
<th>Without organized PA participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Screening activity</td>
<td>1.87 (1.85)</td>
<td>3.15 (2.37)</td>
</tr>
<tr>
<td>Study-group activity</td>
<td>1.27 (1.80)</td>
<td>1.18 (1.88)</td>
</tr>
<tr>
<td>Total</td>
<td>2.07 (1.83)</td>
<td>2.74 (2.25)</td>
</tr>
<tr>
<td>Light intensity PA</td>
<td>5.05 (2.07)</td>
<td>6.31 (1.89)</td>
</tr>
<tr>
<td>Moderate intensity PA</td>
<td>1.41 (1.69)</td>
<td>0.93 (1.37)</td>
</tr>
<tr>
<td>Hard intensity PA</td>
<td>1.10 (1.66)</td>
<td>0.55 (1.08)</td>
</tr>
<tr>
<td>Very hard intensity PA</td>
<td>0.37 (1.05)</td>
<td>0.08 (0.45)</td>
</tr>
<tr>
<td></td>
<td>0.25 (0.89)</td>
<td>0.05 (0.33)</td>
</tr>
</tbody>
</table>

Note: Standard deviations appear in parentheses after mean
on gender. The interaction effect of organized PA participation and gender was not significant on very hard intensity PA (Table 3).

**Table 3. Interaction between organized physical activity (PA) participation and gender on type and intensity of after-school PA time blocks (N=456).**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of square</th>
<th>df</th>
<th>F</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organized PA participation</td>
<td>38.33</td>
<td>1</td>
<td>8.57</td>
<td>0.004*</td>
</tr>
<tr>
<td>Gender</td>
<td>2.32</td>
<td>1</td>
<td>0.52</td>
<td>0.472</td>
</tr>
<tr>
<td>Interaction</td>
<td>36.55</td>
<td>1</td>
<td>8.17</td>
<td>0.004*</td>
</tr>
<tr>
<td>Study-group activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organized PA participation</td>
<td>0.36</td>
<td>1</td>
<td>0.13</td>
<td>0.718</td>
</tr>
<tr>
<td>Gender</td>
<td>7.95</td>
<td>1</td>
<td>2.88</td>
<td>0.090</td>
</tr>
<tr>
<td>Interaction</td>
<td>0.07</td>
<td>1</td>
<td>0.03</td>
<td>0.874</td>
</tr>
<tr>
<td>Light intensity activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organized PA participation</td>
<td>37.87</td>
<td>1</td>
<td>10.77</td>
<td>0.001*</td>
</tr>
<tr>
<td>Gender</td>
<td>29.34</td>
<td>1</td>
<td>8.35</td>
<td>0.004*</td>
</tr>
<tr>
<td>Interaction</td>
<td>34.75</td>
<td>1</td>
<td>9.89</td>
<td>0.002*</td>
</tr>
<tr>
<td>Very hard intensity activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organized PA participation</td>
<td>2.87</td>
<td>1</td>
<td>9.60</td>
<td>0.002*</td>
</tr>
<tr>
<td>Gender</td>
<td>2.71</td>
<td>1</td>
<td>9.09</td>
<td>0.003*</td>
</tr>
<tr>
<td>Interaction</td>
<td>1.14</td>
<td>1</td>
<td>3.82</td>
<td>0.051</td>
</tr>
</tbody>
</table>

Note: *p < 0.05

**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 programme was found to be important in enhancing the intensity and participation of children’s PA without sacrificing their time spent on after-school study work.

**After-school sedentary activity pattern**

The result indicates that children spent a substantial time block (2.55 time blocks, i.e. 31.9% 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%). 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% of the eight after-school time blocks) 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 group activity. According to a local study, 50.8% of the children respondents are required to join private after-school study groups during after-school period (Democratic Party Hong Kong, 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 (Field et al., 2001; Stegman and Stephens, 2000). This is significant information in promoting the after-school PA programme.

**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 $= 0.79$; without $= 0.42$) 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 et al. (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 USA (Schaben et al., 2006; Trost et al., 2002) and in Europe (Riddoch et al., 2004, 2007), with boys reported to have higher levels of PA than the girls. Gender stereotyping is common in PA programmes, wherein boys are expected to be more interested in vigorous activities and girls in aesthetic activities. Based on a study of the activity level of girls during the unsupervised after-school period, girls engage in fewer structured activities but are more active when left alone (Rushovich et al., 2006). The results indicated the difference between their preferences of activity type, thus, a gender-specific design of the
after-school programme should consider variety and intensities in the activities to suit different needs.

This study used a 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 PAs were events where children could remember 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 included only children from the upper classes of primary schools. Therefore, the results could not be generalized for children of other age groups in primary schools.

References

Biography

Peggy PY Cheung is a Lecturer in the Department of Health and Physical Education at the Hong Kong Institute of Education, Hong Kong.