Activity Levels During Physical Education and Recess in Two Special Schools for Children With Mild Intellectual Disabilities

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This study compared physical education (PE) and recess in two markedly different special schools for children with mild intellectual disabilities; one school had a reputation for focusing on sports (High Sport Focus-HSF) and the other did not (Low Sport Focus-LSF). Data were collected in 24 PE classes and 48 recess periods using a validated observation system. During both PE and recess, HSF students engaged in physical activity (PA) at greater intensity levels, but LSF students accrued more total activity min. Differences in PA during PE between the schools were associated with both lesson context and teacher behavior. The results suggest written (e.g., scheduling) and unwritten policies within schools affect children’s activity levels.

Regular physical activity (PA) is associated with reduced risk for secondary conditions in individuals with disabilities (Rimmer & Braddock, 2002). The Surgeon General’s Call to Action to Improve the Health and Wellness of Persons with Disabilities (United States Department of Health and Human Services, USDHHS, 2005) and Strong and colleagues (2005) recommend that children with and without disabilities should receive 60 min or more PA daily.

Children with disabilities, including those with intellectual impairments (Obrusnikova, Valkova, & Block, 2003), have been identified as being insufficiently active for health purposes (Hogan, McLellan, & Bauman, 2000; Longmuir & Bar-Or, 2000; Sit, Lindner, & Sherrill, 2002). Among those with disabilities, children with intellectual disabilities have been shown to be less active than peers with hearing impairment and social development needs (Sit et al., 2002). To aid the development of effective interventions, there is a need for improved understanding of the environments in which children with disabilities accrue PA.
Schools are an important environment for promoting PA (Armstrong & Welsman, 2000; Pate et al., 2006), and they help children meet recommended PA standards through structured (e.g., PE) and unstructured periods (e.g., recess). Environmental factors at schools such as space size, equipment, and supervision are closely linked with the PA levels (McKenzie, Hardung, Baquero, Arredondo, & Elder, 2006b; McKenzie, Marshall, Sallis, & Conway, 2000; Sallis et al., 2001). Current PA guidelines recommend that (a) PE be offered daily and that students engage in moderate-to-vigorous intensity physical activity (MVPA) at least 50% of the class time (USDHHS, 2000) and (b) schools provide elementary school children with at least one daily recess period of at least 20 min.

Direct observational studies have shown that children with disabilities typically engage in MVPA far less than the recommended 50% of PE lesson time (Lieberman, Dunn, van der Mars, & McCubbin, 2000; Stanish & Mozzochi, 2000). Faison-Hodge and Porretta (2004) also found that children with intellectual disabilities accrued relatively less MVPA during PE than they did during unstructured recess periods (i.e., 23% vs. 65% of observed time). None of these studies fully explored the curricular context or instructor behavior during the sessions, which directly affect MVPA (McKenzie et al., 1995, 2006a).

In Hong Kong, Special Education Resource Centers of the Education Bureau are responsible for placing into special schools those children with a disability who have been judged not able to benefit fully from mainstream settings (Education Bureau, 2007). Special schools in Hong Kong mainly serve Chinese children. In 2005, 7,697 children were enrolled in 61 special schools, with 5,135 children with mild, moderate, or severe/profound intellectual disabilities being enrolled in 41 of these schools (Education Bureau, 2006). Special schools follow the standard school curriculum framework (Education Bureau, 2007), and the PE curriculum for children with intellectual disabilities is aimed toward promoting their physical and perceptual motor development as well as developing an interest in physical activities (Curriculum Development Council, CDC, 2007). No specific guidelines for how to teach PE exist, but children with intellectual disabilities have limited communication, attention, and memory abilities (Li, Tse, & Lian, in press; Poon-McBrayer & Lian, 2002) and teachers use numerous behavioral approaches such as modeling, task analysis, and prompting (CDC, 2007; Phillipson, 2007).

Little information on the PA levels of Hong Kong children with intellectual disabilities in special schools exists. A recent study, however, reported that children in special schools accrued little MVPA during PE and recess across disability types, and that differences in PA during PE could be attributed to lesson context and teacher behavior (Sit, McManus, McKenzie, & Lian, 2007). To advance the understanding of children’s PA and the contexts within which it occurs, the present investigation was designed to extend that study by assessing PA in both PE and recess in two distinctly different special schools for children with mild intellectual disabilities. It addresses two specific questions: (a) Are there differences in PA in PE and recess between two schools with distinct levels of sport performance, and (b) Do lesson context and teacher behavior exert significant influences on activity levels during PE at these schools?
Method

Participants and Setting

The primary participants were 80 Hong Kong-Chinese children (26 girls; 54 boys) with mild intellectual disabilities enrolled in Grades 4–6 in two special schools in Hong Kong. Children having a range of intelligence quotient (IQ) from 50 to 55 to about 70 are classified as mild intellectual disabilities (Rehabilitation Division, 1999), and there were 25 in Grade 4, 20 in Grade 5, and 35 in Grade 6.

In Hong Kong, there are 11 schools for students with mild intellectual disabilities (Education Bureau, 2007) and two of these schools (representing 18.2% of total schools for students with mild intellectual disabilities) were selected for study based on school levels of sport performance. One school was well known for focusing on sports (labeled as the “high sport focus,” HSF, school), and each year had approximately two students representing Hong Kong at international competitions. In 2006, two students captured three medals (two gold, one silver) at the German Open Swimming Championships, three earned medals (two gold, one bronze) at the third INAS-FID Open European Championships in Swimming, and HSF students won 59 medals in swimming at the Hong Kong Special Olympics. The focus on sport at the other school (labeled as the “low sport focus,” LSF, school) was substantially lower, with no student representing Hong Kong at international levels.

Both schools scheduled two 35-min PE lessons per week, but their scheduled recess periods differed in number and length. The HSF school had two 15-min recesses per day (i.e., 150 min per week) while the LSF school had three 15-min recesses per day (i.e., 225 min per week).

The HSF school employed two female and one male PE teachers, ranging in experience from 2 to 32 years, and the LSF school had one female and three male PE teachers, ranging in experience from 6 to 37 years. All seven were Hong Kong-Chinese and held PE teacher training certificates. Class size ranged from 12 to 15 children in the HSF school and 8–20 in the LSF school. Except for Grade 6 students in the LSF school, children were asked to leave their classrooms during recess periods. The facilities for PE and recess were mainly covered playgrounds (HSF, 363 m²; LSF, 175.76 m²), but occasionally the LSF school also used a vacant parking lot (145.6 m²). Recess periods were supervised by several teachers.

Observations were made during PE and two separate recess periods in each school during four days over a 2-week period. Approval for the study was granted by the institutional ethics committee, and only children with written parental consent were observed.

Observation System

SOFIT (McKenzie, Sallis, & Nader, 1991) was used to assess student PA, lesson context, and teacher behavior during PE and to assess student PA during recess. SOFIT activity codes have been validated with heart rate and accelerometry (Heath,
Coleman, Lensegrav, & Fallon, 2006; McKenzie et al., 1991; Pope, Coleman, Gonzalez, Barron, & Heath, 2002; Rowe, van der Mars, Schuldheisz, & Fox, 2004), and the instrument has been used widely for measuring PA in children with and without disabilities (e.g., Faison-Hodge & Porretta, 2004; McKenzie et al., 2000, 2001, 2006a). SOFIT uses a 3-phase decision system that involves time sampling during which a separate code for student PA, lesson context, and teacher behavior is entered every 20 s. The PA (active engagement level) of the targeted student is scored by entering one of five codes: lying down (code 1), sitting (code 2), standing (code 3), walking (code 4), or vigorous (code 5). Walking and vigorous are combined to form moderate to vigorous physical activity (MVPA), a description often used in the health-related literature. The concurrent lesson context (i.e., how PE is being delivered) was coded based on whether lesson time was being allocated for management, PE knowledge, fitness, skill practice, game play, or free play. The teacher’s involvement in the lesson was coded using the following behavior categories: promotes fitness, demonstrates fitness, instructs generally, manages, observes, and off-task.

Six observers were trained to use SOFIT, with their initial training including memorizing coding definitions and conventions, assessing videotapes, and conducting live field practice at schools. Observers also learned the general procedures for coding and entering data and ways to reduce reactivity. Interobserver agreement (IOA) of 85% was used as the criterion for observers to begin to collect data. Reliability assessments were conducted during 3 PE lessons (13% of the total) and 6 recess periods (13% of the total). During reliability checks, two independent observers coded the same student simultaneously. IOA scores for student PA, lesson context, and teacher behavior were 95%, 90%, and 92%, respectively. During recess periods, IOA for child PA was 96%.

Procedure

All observations were completed according to standard SOFIT guidelines (McKenzie, 2002). Four students were randomly selected during each lesson and recess period, and they were observed on a rotation schedule. For easy identification, children wore different colored ribbons across their chests. All PE teachers, recess supervisors, and students were informed of the presence of observers for the purpose of data collection. Observers remained on the perimeter of the area to minimize reactivity, and teachers were asked to teach the content they had already planned and to instruct in their usual manner.

Dependent variables included student activity levels during PE and recess as well as lesson context and teacher behavior during PE. These variables were expressed both as number of min per session and proportion of the total session. The PE and recess periods were the unit of analysis, and a summary score for activity intensity and vigorous physical activity (min and percent of session) was obtained for each PE and recess. In addition, percent MVPA (intensity) and the number of MVPA min (dosage) were calculated by summing the walking and vigorous categories.
Data Analysis

Data were analyzed using SPSS 14.0. Descriptive statistics, including means, standard deviations, frequencies, and percentages were obtained for all variables. One-way MANOVAs and ANOVAs were used to test significant differences between the HSF and LSF schools for PA (i.e., the five coded levels, plus MVPA) during PE and recess, as well as lesson context and teacher behavior during PE. Dependent variables were SOFIT codes expressed in mean percentage of intervals. Alpha level was set at $p < .05$ for all statistical tests.

Results

PE Lessons

A total of 24 PE lessons were observed, and Table 1 shows the mean lesson length and the proportion of lesson time for each SOFIT variable in two schools. Although scheduled for 35 min, actual lesson length (i.e., time students spent in the instructional setting) was substantially shorter in both the HSF (15.9 min; 45.4%) and LSF (21.6 min; 61.7%) schools. Overall, students spent 50.4% of the lesson time sitting and standing, and accrued only 9.1 min of MVPA. The lesson context was primarily skill practice (36.6%), management (28.1%), and fitness activities (23.2%). Teacher time was primarily spent managing students or the environment (31.7%), providing general instruction (29.8%), promoting fitness (18.4%), and demonstrating fitness (15.8%).

The average lesson length was 18.3 min ($SD = 3.17$), but lessons in the LSF school were 5.7 min (35.9%) longer than lessons in the HSF school. School differences in the proportion of time for SOFIT variables appear large, but with the limited power (i.e., 12 lessons per school), few statistically significant differences emerged.

Results of the one way MANOVA showed no significant multivariate school effects on the proportion of PE lesson activity level, $\lambda = 0.40, F(4, 10) = 2.63, p > .05$; lesson context, $\lambda = 0.27, F(5, 18) = 3.22, p > .05$; and teacher behavior, $\lambda = 0.18, F(6, 17) = 3.45, p > .5$. Follow up ANOVAs indicated HSF students spent more time sitting, $F(1, 23) = 5.17, p < .05$ and less time standing, $F(1, 23) = 10.36, p < .01$. HSF lessons had relatively more time allocated for PE knowledge, $F(1, 23) = 8.83, p = .01$ and less time for class management, $F(1, 23) = 4.68, p < .05$ (see Table 1).

Figure 1 shows the average number of min for walking, vigorous activity, and MVPA during a lesson. Students in LSF accrued 1.6 more MVPA min (10.0 vs. 8.4 min) per lesson, but the intensity levels of lessons tended to be lower (45.9% vs. 52.4% MVPA, see Table 1).

Recess

Figure 2 shows the proportion of time and number of activity min per recess period in two schools. Although scheduled for 15 min, the actual average length of a recess
Table 1  Proportion of PE Lesson Time (%) and Actual Time in Minutes (in Parenthesis) for Activity Levels, Lesson Context, and Teacher Behavior in the High Sport Focus (HSF) and Low Sport Focus (LSF) Schools

<table>
<thead>
<tr>
<th>School Type</th>
<th>All (n = 24 Lessons)</th>
<th>HSF (n = 12 Lessons)</th>
<th>LSF (n = 12 Lessons)</th>
<th>F</th>
<th>ES *</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lying Down%</td>
<td>0.0 (0.0)</td>
<td>0.0 (0.0)</td>
<td>0.0 (0.0)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Sitting%</td>
<td>15.0 (2.5)</td>
<td>23.2 (3.7)</td>
<td>3.3 (0.7)</td>
<td>5.17*</td>
<td>1.43</td>
</tr>
<tr>
<td>Standing%</td>
<td>35.4 (6.8)</td>
<td>24.4 (3.9)</td>
<td>50.8 (10.9)</td>
<td>10.36**</td>
<td>-1.86</td>
</tr>
<tr>
<td>Walking%</td>
<td>29.7 (5.4)</td>
<td>31.0 (4.9)</td>
<td>28.0 (6.1)</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>Vigorous%</td>
<td>20.0 (3.6)</td>
<td>21.4 (3.4)</td>
<td>17.9 (3.9)</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>MVPA%</td>
<td>49.7 (9.1)</td>
<td>52.4 (8.4)</td>
<td>45.9 (10.0)</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td><strong>Lesson Context</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management%</td>
<td>28.1 (5.3)</td>
<td>24.4 (3.9)</td>
<td>33.3 (7.2)</td>
<td>1.51</td>
<td></td>
</tr>
<tr>
<td>PE Knowledge%</td>
<td>8.7 (1.5)</td>
<td>12.2 (1.9)</td>
<td>3.8 (0.8)</td>
<td>8.83*</td>
<td>1.80</td>
</tr>
<tr>
<td>Fitness Activity%</td>
<td>23.2 (4.4)</td>
<td>18.7 (3.0)</td>
<td>29.5 (6.3)</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td>Skill Practice%</td>
<td>36.6 (6.6)</td>
<td>42.6 (6.8)</td>
<td>28.1 (6.3)</td>
<td>1.65</td>
<td></td>
</tr>
<tr>
<td>Game Play%</td>
<td>3.4 (0.6)</td>
<td>2.1 (0.3)</td>
<td>5.3 (1.1)</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Other%</td>
<td>0.0 (0.0)</td>
<td>0.0 (0.0)</td>
<td>0.0 (0.0)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td><strong>Teacher Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promotes Fitness%</td>
<td>18.4 (3.3)</td>
<td>20.0 (3.2)</td>
<td>16.2 (3.4)</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Demonstrates Fitness%</td>
<td>15.8 (2.8)</td>
<td>17.0 (2.7)</td>
<td>14.0 (3.0)</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>General Instruction%</td>
<td>29.8 (5.4)</td>
<td>33.9 (5.4)</td>
<td>24.1 (5.3)</td>
<td>1.09</td>
<td></td>
</tr>
<tr>
<td>Manages%</td>
<td>31.7 (6.0)</td>
<td>25.8 (4.1)</td>
<td>39.8 (8.7)</td>
<td>4.68*</td>
<td>-1.28</td>
</tr>
<tr>
<td>Observes%</td>
<td>3.9 (0.7)</td>
<td>2.4 (0.4)</td>
<td>5.9 (1.3)</td>
<td>2.82</td>
<td></td>
</tr>
<tr>
<td>Other Task%</td>
<td>0.5 (0.1)</td>
<td>0.9 (0.1)</td>
<td>0.0 (0.0)</td>
<td>1.44</td>
<td></td>
</tr>
</tbody>
</table>

MVPA = moderate to vigorous physical activity (walking + vigorous); a ES = Effect Size: (Mean1—Mean2)/pooled SD; ** = p < .01; * = p < .05
Figure 1 — Walking, vigorous, and MVPA min per PE lesson in two schools. MVPA = moderate to vigorous physical activity (walking + vigorous).

Lying Down

<table>
<thead>
<tr>
<th>Activity</th>
<th>High Sport Focus School</th>
<th>Low Sport Focus School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting</td>
<td>0 min</td>
<td>0 min</td>
</tr>
<tr>
<td>Standing</td>
<td>1.2 min</td>
<td>1.7 min</td>
</tr>
<tr>
<td>Walking</td>
<td>1.6 min</td>
<td>2.3 min</td>
</tr>
<tr>
<td>Vigorous</td>
<td>3.8 min</td>
<td>4.1 min</td>
</tr>
<tr>
<td>MVPA</td>
<td>5.2 min</td>
<td>5.2 min</td>
</tr>
</tbody>
</table>

Percent of Recess Period

Figure 2 — Proportion of time and activity min for children’s physical activity per recess period in two schools. MVPA = moderate to vigorous physical activity (walking + vigorous).
period was only 8.0 min ($SD = 1.02$), during which students engaged in MVPA 57% of the time (i.e., 4.6 min). HSF students accrued 1.1 additional min of MVPA min per session (5.2 vs. 4.1), but this difference was not statistically significant.

**Intensity of Physical Activity (MVPA%) During PE and Recess**

Figure 3 shows students tended to be more vigorously active during recess than PE. In addition, the intensity levels (i.e., MVPA%) of students were higher in the HSF school than in the LSF school during both PE (52.4% vs. 45.9%) and recess (64.3% vs. 50.4%).

**Weekly Min of Physical Activity During PE and Recess**

Both schools offered students two PE lessons per week, but the LSF school provided 15 recess periods per week compared with 10 in the HSF school. Total weekly MVPA min accrued during PE and recess were obtained as follows: number of PE min per week × PE MVPA% + number of recess min per week × recess MVPA%. Using this formula, children in the LSF school accrued 11.6 more MVPA min per week than those in the HSF school (145.7 vs. 134.1 min; see Figure 4).
Activity Levels During Physical Education and Recess

With PE scheduled only twice per week and the actual length of PE and recess periods being only 52% and 53% of their scheduled lengths, respectively, students in these schools had few opportunities to accrue PA. Nonetheless, during PE, student activity levels fell just short of the Healthy People 2010 recommendation of 50% MVPA. This level exceeded those typically reported for both children with disabilities (Faison-Hodge & Porretta, 2004; Lieberman et al., 2000; Stanish & Mozzochi, 2000) and those without (McKenzie et al., 1995, 1996). While overall MVPA% in the schools did not differ significantly, HSF students spent more time sitting but less time standing than LSF students. This finding is associated with differences in lesson contexts and teacher behaviors. The extra time spent sitting in the HSF school can be attributed to teachers spending considerably more time transmitting PE knowledge. Increased standing in the LSF school resulted from teachers spending substantially more time managing students and the environment. The tendency for the HSF school to allocate a larger proportion of PE time for skill practice and knowledge is consistent with its priority for developing students’ physical skills for local and international sport competitions. Meanwhile, in the LSF school, the substantial amount of lesson (33.3%) and teacher time (39.8%) allocated to managing students reduced children’s opportunities to be physically active.

The HSF school (52.4%) met the Healthy People 2010 standard of 50% MVPA engagement, but the LSF school did not (45.9%). Consistent with previous research (Faison-Hodge & Porretta, 2004), however, children were more vigorous (i.e., higher MVPA%) at recess than during PE. Recess offers a nonstructured setting in which children can select their own activities (Horvat & Franklin, 2001). PE, on the other hand, is designed to achieve specific curriculum goals, which require PE teachers to allocate lesson time accordingly.

**Figure 4** — Total MVPA min per week by children during recess and PE in the High Sport Focus and Low Sport Focus schools.
to allocate time for managerial and instructional activities that are frequently inactive (McKenzie et al., 1995). Environmental barriers such as space and facilities influence the PA levels of children with disabilities (Mihaylov, Jarvis, Colver, & Beresford, 2004; Rimmer, Riley, Wang, Rauworth, & Jurkowski, 2004), and the larger playground at the HSF school may have allowed its students to engage in a wider range of unstructured physical activities.

While there were few significant school differences in the proportion of time for SOFIT variables, there were tendencies. Children in the HSF school tended to engage in more vigorous PA (i.e., greater MVPA%) during both PE and recess. In contrast, the LSF school provided more total MVPA min per week because it offered longer PE classes and one more recess period each day. These data suggest that the entire school environment should be considered when assessing schools for PA. Higher intensity activities are important for cardiovascular development, but low intensity activities still provide a health benefit such as controlling for weight gain. During PE and recess in these two schools, children received only 33.3% of the recommended total weekly min of MVPA (i.e., 139.9 of 420 min). This suggests that additional PA time and/or programs are needed on campus or in the community.

Hong Kong education has undergone substantial changes over the last few years (CDC, 2002), and special education is no exception. Schools are permitted to design a “school-based curriculum” to meet the educational needs of its own students (Education Bureau, 2007). There are no specific guidelines on the PE curriculum for children with special needs in Hong Kong (Sit, Chen, & Lian, 2006), and compared with several countries in Asia such as Japan and Korea, special or adapted PE is still underdeveloped.

**Implications**

The present study shows how children’s activity levels are influenced by both policy and environmental conditions, and it contributes to the understanding of how school environments may influence children’s PA during PE and recess. PE teachers can play an important role in cultivating a positive and supportive PA environment within schools (Pate et al., 2006) and can design suitable content to meet the capabilities and needs of individual students. From a public health point of view, teachers should consider also investigating how free time in unstructured settings such as lunchtime and before and after school can be used to provide more PA opportunities (Pate et al., 2006). In addition, it is important for the PE teachers to facilitate changes in the school environment to maximize students’ PA opportunities. They can, for example, serve in various roles including advocate, educator, supporter, or resource coordinator (Lytle & Hutchinson, 2004).

**Limitations of the Study**

The study is limited to only two schools for students with mild intellectual disabilities. These were selected because they offered distinct levels of focus on competitive sport and not as representatives of different models of instruction. Hong Kong special schools have high autonomy in planning their own PE curricula. The HSF school had a reputation for higher sport performance, and parents of children with
higher levels of athletic ability may have been more likely to select that school. We did not study children’s PA beyond the school day, and it is possible that children from the two schools had different levels of participation before or after school. In addition, the study is limited to observations of PE and recess to a total of four days at each school.

**Recommendations**

The study provides information on how opportunities during PE and recess may influence children’s accrual of health-related PA in Hong Kong special schools for children with mild intellectual disabilities. Future research should consider including more schools, observing more frequently, extending observations throughout the school year, and examining schools which might represent different models of PE. Examining children’s PA patterns in additional nonstructured settings such as at lunchtime and before and after school in both special and mainstreamed schools is also recommended.

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