

CHP Sit 薛慧萍  
 TL McKenzie  
 E Cerin 施綺芸  
 A McManus 麥雅麗  
 J Lian 連明剛

# Physical activity for children in special school environment

## Key Messages

1. We assessed children's physical activity (PA) in structured (physical education) and unstructured (recess, lunch, before and after school) periods in special schools and examined its association with modifiable area contextual characteristics.
2. Children with disabilities were not highly active, but were more active during recess and lunch periods than at other times including physical education classes.
3. Areas were often not accessible during unstructured settings. Children were more active in areas when supervision and organised activities were provided.
4. Providing an interactive game during free play did not significantly increase group's PA.
5. Children's PA accrual is influenced by contextual characteristics of the school environment. There is a need to make areas more accessible and to use social marketing and programming to attract more users. School and health professionals should modify contextual characteristics by providing more direct supervision and organised activities during free play.

## Introduction

Physical activity (PA) is an important part of healthful lifestyle for children. Most children with disabilities are insufficiently active.<sup>1</sup> To minimise health risks associated with sedentary living among children with disabilities, health professionals should know about the settings in which children with disabilities accrue PA.<sup>2</sup>

Schools are important settings for promoting PA during structured (physical education) and unstructured (recess, lunch, before and after school) periods. School environments such as space size, equipment, and supervision are closely linked with PA accrual by children.<sup>3</sup> Providing children with prompts for PA by supervisors and adding game equipment may be effective in increasing their PA levels at school.<sup>4</sup>

This study aimed to examine the special school environments in promoting PA among children with disabilities. Children's PA was measured throughout the school day, and its association with contextual variables determined. In addition, the influence of innovative electronic game equipment on children's activity levels was assessed in a small-scale intervention study.

## Methods

This study was conducted from December 2007 to December 2009. It consisted of an observational study and an interventional study.

The observational study was conducted on 5 normal school days in 10 special schools. Observations were delimited to schools for children with sensory impairment, physical disabilities, mild or moderate-to-severe intellectual disabilities, and impaired social development. Systematic observation was carried out throughout the day (ie during physical education, recess, lunch, before school, and after school). Each target area that permitted PA was observed periodically using a scanning technique. The activity level of each boy and girl was coded as sedentary (lying down/sitting/standing), walking, or vigorous, thereby energy expenditure could be estimated. The environmental characteristics of each target area were recorded in terms of accessibility (eg not locked), usability (eg not excessively wet or roped off for repair), and presence of equipment (eg balls and jump ropes provided by the school), supervision (ie closely monitored by school staff), and organised activities (eg a scheduled event or exercise class led by school staff). A total of 135 physical education lessons, 115 recess periods, 50 lunch periods, and 50 before- and 50 after-school periods (400 area observations and 7074 child observations) were made in 67 different activity areas on 5 normal school days over 3 months. Data were collected between mid February and April 2008.

For the intervention study, three special schools for children with mild intellectual disabilities were randomised to the intervention (n=2) and control (n=1) groups. Each intervention school received the J-mat running game (an interactive electronic game) for children to play in a predetermined target area. Children were allowed to use the game during free time. All schools had no extra game equipment at baseline. The control school received no game and continued with their usual programmes. A total of 150 area observations and 5335 child

*Hong Kong Med J* 2013;19(Suppl 4):S42-4

**Institute of Human Performance, The University of Hong Kong**  
 CHP Sit, E Cerin, A McManus  
**School of Exercise and Nutritional Sciences, San Diego State University, USA**  
 TL McKenzie  
**Centre for Advancement in Special Education, The University of Hong Kong**  
 J Lian

HHSRF project number: 05060651

Principal applicant and corresponding author:  
 Dr Cindy HP Sit  
 Institute of Human Performance, The University of Hong Kong, Pokfulam, Hong Kong SAR, China  
 Tel: (852) 2831 5260  
 Fax: (852) 2855 1712  
 Email: sithp@hku.hk

observations were made during 5 normal school days over a month at baseline and 3-month post-intervention.

The System for Observing Play and Recreation in Communities<sup>5</sup> (SOPARC) was modified to document children's PA in structured and unstructured settings. It is a reliable measure for assessing children's PA in diverse and open activity environments (target areas) in both indoor and outdoor settings. Six observers were trained to use the SOPARC guidelines. Prior to data collection, reliability tests were conducted on 1 normal school day in each participating school by multiple independent observers. Inter-observer agreement for the number of area users was 97% for both girls and boys, for characteristics of the target areas were 98% for girls and 97% for boys, and for activity levels were 97% for girls and 96% for boys.

## Results

A total of 1230 and 5844 child observations were made on 5 observation days during 135 physical education lessons and during free play periods, respectively. Overall, children were sedentary about half the time during physical education and free play (Fig 1). Children were less sedentary ( $P<0.0001$ ) and were more likely to engage in walking ( $P<0.0001$ ) during free play than physical education.

Some activity areas at lunch, as well as before and after school were vacant (data not shown). When summing the walking and vigorous categories, boys engaged in moderate-to-vigorous PA (MVPA) more often than girls before school ( $P<0.0001$ ) and during recess ( $P<0.0001$ ), but less often after school ( $P<0.05$ ). Children with sensory impairments and mild intellectual disabilities tended to engage in more MVPA during physical education than those with moderate-to-severe disabilities ( $P<0.01$ ) [data not shown].

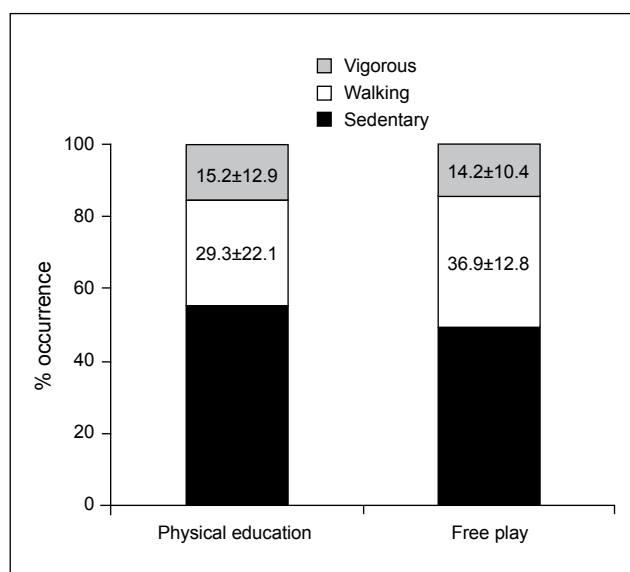


Fig 1. Proportion of children in three activity levels during physical education and free play settings

A total of 67 target areas in the 10 special schools were identified, and the contextual characteristics (ie accessibility, usability, and presence of supervision, activity organised, and equipment) of each area were assessed during each visit (ie 265 observations x 67 areas = 17755 area visits). Overall the target areas were accessible to students during 47.1% (standard deviation [SD], 23.9) of the area visits. Meanwhile, target areas were usable 92.3% (SD, 11.0) of the observations, whereas 18.1% (SD, 13.7) were supervised, 2.8% (SD, 4.8) provided organised activities, and 32.5% (SD, 30.7) were equipped. Figure 2 illustrates these characteristics for the four free play periods. Areas were more likely to be accessible and supervised during recess periods than others ( $P<0.01$ ).

A summary score for activity intensity—energy expenditure rate (EER)—was estimated for each unstructured setting using a standard calculation.<sup>5</sup> Overall, children were more physically active (ie had a higher mean EER) when the activity areas were supervised (and before and after school) and being organised (and at lunchtime and after school) [Table].

The mean EER during overall free play periods was significantly higher in children in intervention schools than in the control school ( $P<0.01$ ). Overall, children had a significant reduction in mean EER during free play periods ( $P<0.01$ ), before school ( $P<0.05$ ), and during recess ( $P=0.001$ ), indicating the minimal effects of the interactive electronic game on children's activity accrual.

## Discussion

In unstructured settings, children's PA behaviour is voluntary, spontaneous, and intermittent in nature. Their participation in PA is therefore highly related to the

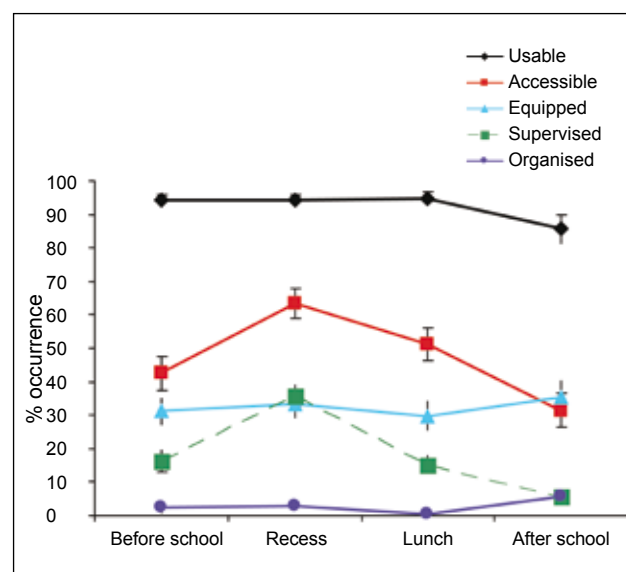


Fig 2. Contextual characteristics of 67 activity areas during free play times

**Table. Associations (Spearman's rho) of contextual characteristics of activity areas with activity levels (mean estimated energy expenditure rate [kcal·kg<sup>-1</sup>·min<sup>-1</sup>]) in unstructured settings**

Contextual characteristics	Overall	Before school	Recess	Lunch	After school
School size (m <sup>2</sup> )	0.01	-0.31*	-0.33*	0.08	0.35*
% Accessibility	-0.03	0.26	0.15	0.01	-0.24
% Usability	-0.12	-0.06	0.46 <sup>†</sup>	-0.20	-0.26
% Supervision	0.72 <sup>‡</sup>	0.64 <sup>‡</sup>	-0.01	0.47 <sup>†</sup>	0.32*
% Activity organised	0.49 <sup>†</sup>	0.02	-0.15	0.36 <sup>†</sup>	0.58 <sup>†</sup>
% Equipment	0.12	0.08	0.03	-0.12	-0.13

\* P&lt;0.05

† P&lt;0.01

‡ P&lt;0.0001

surrounding environments, especially when opportunities and prompts for PA are immediately available.<sup>4</sup> Potentially modifiable contextual characteristics varied greatly during unstructured settings. Despite usable about 90% of the time, the activity areas were far less often accessible, equipped, supervised, and provided organised activities. Children with disabilities were more active in the areas when supervision and organised activities were provided. Teachers or playground supervisors should promote children's active behaviour by providing more choices of organised activities to facilitate their MVPA while ensuring safety. However, provision of an innovative game session was not effective in facilitating active behaviour during free play periods. The J-mat running game only involved one child completing a game in a 5-minute interval. Only a limited number of children could play in such a short period, while others were mere observers. A more sophisticated intervention design and providing more game equipment in several activity areas might result in a greater impact on children's activity levels. Other forms of PA interventions at school, in particular those involving the family, need to be further explored.

Children's activity accrual is influenced by school contextual characteristics. In special schools, areas are often not accessible, for which policy changes should be implemented to enhance accessibility. In addition, areas are frequently vacant and it is important for school policy makers to attract more users through social marketing and programming. There is room for modifying programming to provide more active games and for teaching playground supervisors to promote PA. Future research could consider

including more special schools and extending longer observation periods. Studies to examine the PA level of children with special needs attending inclusive/mainstream schools are also needed.

### Acknowledgements

This study was supported by the Health and Health Services Research Fund, Food and Health Bureau, Hong Kong SAR Government (#05060651). We thank all participating schools and students for their support for the project. We are grateful to Mr Simon Tsang, Ms Kitman Cho, Ms Jessica Lam, Ms Michelle Ma, Ms Candy Sun, and Ms Jenny Siu for their data collection.

### References

1. Hogan A, McLellan L, Bauman A. Health promotion needs of young people with disabilities—a population study. *Disabil Rehabil* 2000;22:352-7.
2. Hutzler Y, Sherrill C. Disability, physical activity, psychological well-being, and empowerment: a life-span perspective. In: Lidor R, Bar-Eli M, editors. *Sport psychology: linking theory and practice*. Morgantown, WV: Fitness Information Technology; 1999:281-300.
3. Sallis JF, Conway TL, Prochaska JJ, McKenzie TL, Marshall SJ, Brown M. The association of school environments with youth physical activity. *Am J Public Health* 2001;91:618-20.
4. Verstraete SJ, Cardon GM, De Clercq DL, De Bourdeaudhuij IM. Increasing children's physical activity levels during recess periods in elementary schools: the effects of providing game equipment. *Eur J Public Health* 2006;16:415-9.
5. McKenzie TL, Cohen DA, Sehgal A, Williamson S, Golinelli D. System for Observing Play and Recreation in Communities (SOPARC): reliability and feasibility measures. *J Phys Act Health* 2006;3(Suppl 1):S208-22.