

An Empirical Study to Analyze the Effectiveness of the Physical Education or Games Classes to Promote Physical Activity in the Girls' School of West Bengal

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Abstract

Background: School physical education (PE) and playtime provide important opportunities for physical activity (PA). However, little research has assessed PA during primary school PE using accelerometry or compared PA during different lesson types. There is also a lack of research comparing PA during PE and playtime, despite suggestions that playtime promotes more PA. The primary aim of this study was to determine which types of PE lesson are most facilitative of PA. The secondary aim was to determine whether children are more active during PE or playtime.

Methods: Descriptive and fitness data were assessed in 20 girls aged 7-11 years from a single school. Over eight consecutive weeks PA was assessed during PE lessons, which were classified as either team games or movement activities. At the mid-week of data collection playtime PA was also assessed. PA was assessed using accelerometry and the percentage of time spent in moderate to vigorous PA (MVPA) calculated. Paired t-tests were used to compare MVPA during movement lessons and team games lessons and during PE and playtime.

Results: Children spent 9.5% of PE lessons in MVPA and engaged in significantly more MVPA during team games ($P < 0.001$). MVPA was also significantly higher during PE than playtime ($P < 0.01$).

Conclusions: Children do not engage in sufficient PA during PE, but are most active during team games lessons; whilst PA during playtime is lower than PE. Interventions to increase PA during both PE and playtime are therefore required. PE interventions should target games lessons as they dominate the curriculum, encourage most PA and present the greatest potential for change. Playtime interventions should encourage participation in active games through the provision of playground equipment and markings.

KEYWORDS: Physical activity, Playtime, Physical education, Team games, MVPA: Moderate to vigorous physical activity.

Introduction: Physical activity (PA) during childhood is important for physical and mental health and may track into adulthood where it is important to protect against many chronic diseases. However, despite the importance of PA for health, only meager percentage of girls aged 5–15 years in the Govt. girls' school meet the recommendation of sixty minutes of daily moderate to vigorous physical activity. The aim of PE is to encourage children to take part in appropriate amount of PA and gain the skills and knowledge to be active outside school and throughout life. The diverse aims of PE present a pedagogical challenge to balancing provision of a positive experience for children whilst keeping pupils physically active and providing a 'physical education.'

Fairclough and Stratton suggested that children should spend a minimum of 50% of PE lessons engaged in MVPA (Moderate to Vigorous Physical Activity), however evidence suggests that children spend less than 40% of lesson time in MVPA and the

majority of PE lessons and activities are comparatively less intense than walking. Furthermore, Sallis et al. found that PE throughout the world only provide 17.8 minutes of MVPA per week, contributing less than 5% to overall activity requirements. Thus, while PE may provide an opportunity for children to develop skills, evidence suggests that it is not achieving its aim of keeping pupils physically active. In addition to low levels of PA during PE, evidence suggests that MVPA may significantly vary according to the type of PE lesson. As PE is concerned with providing a 'physical education' in addition to promoting PA; it may not be surprising that some lessons are less facilitative of PA than others. Fairclough and Stratton [10] found that adolescents aged 11–14 years engaged in most MVPA during team games (e.g. volleyball) and individual activities (e.g. athletics) and the least during individual games (e.g. badminton) and movement activities (e.g. dance). During team games pupils spent 43% of lesson time engaged in MVPA, a figure which was significantly greater than the 22% of movement activities lessons spent in MVPA.

Accelerometers have been demonstrated to be a reliable and valid measure of PA in children, the output of which is highly correlated with oxygen consumption and energy expenditure. In addition, studies have primarily focused on adolescents; very few studies have assessed PA during PE or rather no study have been conducted selecting govt. girls' primary school children.

Despite the fact that playtime might provide a more effective opportunity for PA than PE, comparisons to confirm this hypothesis are lacking. The primary aim of this study was therefore to determine how active govt. primary school girls are during PE and which types of PE lesson are most facilitative of PA. The secondary aim was to determine whether children are more active during PE lessons or school playtime.

METHOD: Participants from local government school girls were recruited to take part in the study. The school holds 567 girls aged 7–11 years. Twenty children from one class volunteered. This class and their generalist class teacher were selected by the school itself as it was felt that participation in the research would not interfere with preparations for exams or assessment. All participants provided individual assent and parental consent to take part in the study.

PROCEDURE: Initially participants' basic anthropometric data were collected comprising stature to the nearest 0.1 cm with the participant barefoot and mass to the nearest 0.1 kg. Body mass index and BMI Z-scores relative to the individuals' age were also calculated. Participants also completed a version of the fitness gram pacer test, which is a valid method by which to assess aerobic fitness in this age group. Following the collection of anthropometric data participants' PA was assessed during their PE lessons. Lessons were monitored over an eight week period comprising of 12 different PE lessons. The activities performed were categorized according to the characteristics of the activity, as previously defined by Fairclough and Stratton. Participants engaged in team games (e.g. kho-kho, traditional games) in two thirds of PE lessons and movement activities (e.g. dance) for one third of PE lessons.

For one week during the mid-point of data collection 12 participants' also had their PA assessed during school playtime. Only 12 participants had their playtime PA assessed due to a limited number of accelerometers with the ability to assess MVPA

using a 1-second epoch over extended periods. Playtime PA was assessed for the entire week including morning and lunch playtime, which lasted 15 minutes and 60 minutes respectively, including the time taken to eat lunch. All playtime was performed on the playground which was approximately 1400 m²; children were free to play on all areas of the playground, including the play structures and playground markings.

Physical Activity Measurement: Participants PA was assessed using accelerometer. Researchers were present on each day of testing to aid the children in fitting the accelerometers. All accelerometers were set to record at a 1 second time. The cut points of Evenson et al. were applied to the data in order to determine the time spent in MVPA.

Data analysis: A statistical analysis was conducted to determine sample size using data from Fairclough and Stratton comparing MVPA during different types of PE lessons. With an alpha of 0.05 and power of 0.95, power analysis revealed that the projected sample size needed was approximately N= 14. Since the selected sample size was N = 20 therefore that was found adequate to test the main hypothesis. Data analysis was conducted using SPSS statistical analysis software (v.19). Initially normality tests were used to ensure that data was normally distributed. Independent t-tests were used to compare anthropometric measures in boys and girls. Due to variation in the duration of PE lessons and between PE and playtime, the percentage of time spent in MVPA was calculated. A Paired samples t-test was used to compare the percent of time spent in MVPA during the two different types of PE lessons. A paired samples t-test also compared the average MVPA during PE and playtime. Statistical significance was set at P <0.05 throughout the analysis.

RESULT: There were no significant differences in anthropometric measures in govt. girls (Table 1). Girls had an above average BMI. There was a significant difference between the percent of time spent in MVPA during team games and movement activity PE lessons ($t(19) = -4.66$; $P < 0.001$). MVPA was significantly higher during team games compared to movement PE lessons. There was also a significant difference between the percent of time spent in MVPA during PE and playtime ($t(11) = -5.29$; $P < 0.001$); MVPA was significantly greater during PE than playtime.

Discussion

The primary aim of this study was to determine how active government primary school girls are during PE and which type of PE lesson is most facilitative of PA.

Table 1 Mean ± SD descriptive anthropometric and fitness data for sample

Measure	Boys (n = 13)	Girls (N=7)	All (n = 20)
Age (years)	9.3 ± 0.5	9.4 ± 0.5	9.4 ± 0.5
Height (m)	1.37 ± 0.07	1.36 ± 0.07	1.37 ± 0.07
Weight (kg)	35.0 ± 7.0	34.8 ± 7.3	34.9 ± 6.9
BMI (kg.m ⁻²)	18.5 ± 2.9	18.5 ± 2.6	18.5 ± 2.7
BMI (Z Score)	-0.01 ± 1.06	0.02 ± 0.97	0.00 ± 1.00
20mSRT shuttles (no.)	28.0 ± 10.9	26.0 ± 5.8	28.7 ± 9.4

20mSRT speed (km.h ⁻¹)	9.9 ± 0.7	9.2 ± 0.3	9.5 ± 0.6
20mSRT (Z score)	0.03 ± 1.16	-0.07 ± 0.62	0.00 ± 1.00

The findings of this single school experiment indicated that govt. primary school girls only spend an average of 9.5% of their PE lessons engaged in MVPA, a figure much lower than the 30-40% of PE spent in MVPA in adolescents and the recommended 50% threshold. However, the only known study examining govt. primary school girls PE found that 18% of lessons were spent in MVPA. Whilst this figure is slightly higher than in the current study, both findings indicate that govt. primary school girls PE is less effective at engaging children in MVPA than secondary school PE. In fact, evidence suggests that primary school PE achieves low standards in enabling young people to develop fitness. Furthermore, it has been seen that 46% of all PE lessons were spent developing motor skills and 18% watching and talking to teachers, despite almost one third of lessons consisting of team games. Whilst the percentage of time spent engaged in these types of activities were not measured in the current study, observation of the lessons highlighted that much time was spent listening to teachers and developing skills. Primary school PE lessons of this one class and one teacher seem to focus on skill development as the main aspect of PE. Whilst this skill development is important for lifelong PA participation, it may be restrictive of MVPA. However, opportunities for MVPA during PE are often underutilized. The findings of this study also revealed that girls were most active during team games PE lessons as opposed to movement PE lessons. Girls spent 11.4% of team game lessons engaged in MVPA as opposed to 7.5% of movement lessons. These results concur with the findings of Fairclough and Stratton and Waring et. al. who also found that more PA was performed during team games lessons than movement lessons. Team games require use of a significant proportion of muscle mass (e.g. running for the ball in football) perhaps therefore accounting for increased levels of MVPA. However, despite the higher levels of MVPA during team games, levels of PA during PE in primary school children are still worryingly low. Interventions to increase PA during primary school PE lessons need to be implemented and these should seek to target team games lessons as these make up the majority of the primary school girls PE curriculum and thus present the greatest potential for change. Teachers also need to be educated regarding best practice for teaching PE, or PE trained teachers employed, as it is possible that a lack of input within govt. primary school girls teacher training limits teacher's knowledge and understanding of what is required.

The secondary aim of this study was to compare PA levels during PE and school playtime. The comparison of PE lesson MVPA and playtime MVPA highlighted that children were significantly more active during PE, with only 6.1% of playtime being spent in MVPA. In recent year's school playtime has been highlighted as an important opportunity to allow children to engage in PA on a daily basis, yet the findings of this and other studies indicate that it is not effective at doing so and less effective than PE. Thus, steps need to be taken to provide children with opportunity to be more active. These steps could include strategies such as playground markings and equipment, set playtime activities and lunch time supervisors to provide children with active games to take part in. Encouraging team games might be an effective strategy for playtime as team games are more facilitative of MVPA than movement activities and require increased use of muscle mass. Moreover the quality, quantity and the timing of the mid day meal need to be

checked. Children studying in government schools generally belong to low socio economic background.

The limitations of using accelerometers are needed to be considered. Accelerometers more accurately detect locomotive movements and less accurately detects upper body movements. Thus if the movement lessons included more upper body activity than locomotion it is possible that MVPA was underestimated. The use of accelerometer cut points could also be considered as a limitation. There are a variety of cut points within the literature, all of which have been developed using a range of activities, criterion measures and age groups. Whilst the most suitable cut points for the children and activities in the current study were selected, the variety of cut points limits the comparison of the output of one study to another.

Conclusions

This study examined primary girl's PA levels during different types of PE lessons and compared PE, PA levels to those achieved during school playtime. The children in the current study only spent 9.5% of PE lessons engaged in MVPA and were significantly less active during movement lessons compared to team games. Furthermore, children were more active during PE than playtime. Both playtime and PE provide an important opportunity for PA however they are currently not being used effectively by government primary school girls. Interventions to target both areas of the school day are therefore required. Interventions during PE should target games lessons as they dominate the PE curriculum, encourage most PA and thus present the greatest potential for change. During playtime strategies to increase MVPA should encourage participation in team games through the provision of playground equipment, playground markings and set activities. It is essential that children's PA during PE and playtime are enhanced to allow children to engage in appropriate amounts of PA for health. However, it might be more important to target school playtime, as this provides children with a daily opportunity for PA.

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