



Level of physical activity during school recess within aspect of available dedicated playing space

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Abstract

In recent years decrease in physical activity (PA) amongst school children have been highlighted. The World Health Organization recommends daily moderate to vigorous PA for this age group for at least 60 minutes. Maintaining proper PA level contributes to numerous health benefits and proper children's development stimulation. School recess allows pupils to meet the recommended physical activity guidelines, it can as well be crucial for their social and emotional development, increased learning effectiveness, reduced tension and school stress. The following element is listed among factors determining the quality and level of school recess: space available for pupils meaning a place where they can move freely and safely (run, play). Therefore, this research attempts to define what is the relation between the type of school recess resulting from available free time space for children and pupils' physical activity level during this recess. 113 grade 2 and 3 pupils from the local elementary school participated in the research (66 girls and 47 boys). Their physical activity undertaken spontaneously during school recess was the main point of observation. Two types of 10-minute school recess were analyzed: 1) the one spent in a classroom 2) the one spent in a school hallway. Significant statistical differences have been found between types of physical activity depending on space available for pupils during school recess. Clearly school recess spent in a classroom impairs free movement and causes visible reduction in physical activity. Organization of school recess including arrangement of space available to pupils between the classes can be understood as following the WHO guidelines defining the daily level of children's physical activity.

Keywords: recess, physical activity, pupil, space.

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INTRODUCTION

Following the guidelines of the public health sector children and teenagers should spend at least 60 min every day on moderate to intensive physical activity [1]. Such daily level of activeness especially outdoors [2] maintained by a child on regular basis results in numerous benefits observed in many of his development areas. First of all, it supports the functioning of the bodily systems: cardiorespiratory and musculoskeletal [3]. Moreover, it positively influences body weight reduction and improvement of physical fitness, mainly strength and endurance [4]. Movement also contributes to reduction of stress, fear and states of depression. It helps in children's cognitive development: supports achieving school successes including high results in competence tests, increases self-esteem and self-confidence [5].

School is perceived as a place which offers the most opportunities for selecting physical activity by children during the day [6]. They can be active during PE classes, breaks during the class or school recess. While it is observed that children and teenagers suffer from pediatric inactivity, the role of active recreation during a school day is evaluated higher and higher in the area of meeting physical activity needs, health prevention and development support. School recess is defined as time between classes dedicated to free or organized activity within a school building or outside. It can be spent as well on a meal or moving between classrooms. Duration of school recess in Poland is not defined by any regulations and usually it varies from 5 to 30 minutes. It is approved by the School Headmaster based on consultations with parents' and students' councils. In most of the cases school recess lasts 5-10 minutes with one recess during the day being longer (20-30 min) and defined as a lunch break. For grades 1-3 it is recommended not to organize 45 min long classes, to resign from bells for lessons and thus adjust the time for break and its duration to the needs of children. In the light of Polish regulations, weather permitting the school should enable children to spend school recess outdoors [7].

Impact of recess on mental, physical and emotional and cognitive development has become a frequent subject of research and discussion. According to 'Strategies for recess in schools' among benefits resulting from a high quality school recess there are increased level of physical activity, memory and focus improvement, better attention to tasks during a class, reduction in destructive behaviour as well as development of social and emotional skills such as negotiations or sharing [5,8]. Time spent during a break can contribute greatly to the daily physical activity demand and help children to keep their activity at a recommended level. At the same time proper recreation can positively influence both children's behavior during the recess and in the class as well as increase teaching effectiveness [9]. Results of spending school recess actively is highly dependent on its quality. Massey et al. [8] indicate the elements influencing this quality such as space arrangement, equipment availability or adults' involvement in organizing the activities. Pawlowski et al [10] identifies 12 elements which can increase children's engagement in active participation in school recess: high self-evaluation of motor skills, sex, gendered school culture, influence of peers, conflicts and social exclusions, previous experience with using the space, lack of playing equipment, school policy on spending recess outdoors, possibility to use electronic devices, duration of recess, organized activities or weather. They might occur in a variety of configurations but their influence can also be independent.

It is a common situation that due to the crowded school hallways, children from grades 1-3 have to spend their school recess in a classroom or within a limited play area [10]. Teachers and their pupils can use the hallways in turns, they also frequently must keep children in a classroom for the break time. Both quantitative and qualitative research on dependence of space available for children at school recess and their physical activity were conducted by Delidou et al., Stanley et al., Ridgers et al. and the others [11-13]. Pupil's activity during the school day, especially during the breaks is a significant challenge in the perspective of increasing pediatric inactivity. Providing pupils with a high quality recess time does not need to be either expensive or difficult while it can contribute greatly to increased active recreation. Hence the aim of this work is an attempt to evaluate to what degree available space is linked with the physical activities of small school children during recess. The aim of the study was also to determine if during the recess a group of children demonstrating a certain level of activity is stable in number or there is fluctuation on that group.

MATERIAL AND METHODS

Subjects

Baseline data is taken from the 'Physical activity as a standard and stimulator of health in children and the youth' study, which included 'Space as a factor influencing recess physical activity', non-randomized observation carried out in 2018 and 2019 in one public school in Kielce, a city in central Poland. The school selected for this study was one of the biggest primary schools in Kielce. From all 2nd and 3rd grade classes 4 were selected for observation constituting 33.3% of all classes at this level of education. The sample group consisted of 113 pupils: boys (n=47) and girls (n=66). The age of the children ranged from 8 to 10 years (mean age 8.96 years, SD=0.42).

Protocol

The school operates between 8 a.m. and 3 p.m. Children have five or six 45-minute classes and 5-10-minute recesses and one 20 minute recess. After classes children can stay in the school lounge or come back home picked up by parents. The research was based on pure observation using the created Physical Activity During Recess Observation Questionnaire (PADROQ). Prior to that there were a series of training sessions for researchers aiming at teaching them how to identify activity patterns in line with the agreed benchmark. Research was always conducted by the same team of 3 people: the first observing girls, the second observing boys and the third operating equipment measuring time and noting down results. Participants were observed during 10-minute breaks. The observation was always carried out after 2nd or 3rd class, before noon, in the middle of the week. It was a group, discreet observation organized in a natural environment of children. It allowed checking authentic children behavior and the way they use recess time.

Children were observed during two school recesses. During the first they stayed in their classroom and they could leave it only to go to the toilet. They did not have access to any sports equipment and the space they could use was limited to the classroom furnished with tables and chairs. Moreover, 1/4th of the classroom was a free space with a carpet to serve as a play area. All participating classes were provided with the same classroom conditions. During the second recess children could either stay in the classroom or adjacent hallway. It was individual pupil's decision where to spend it. Also, in that scenario no sports equipment was provided. The school hallways were 7 m wide and around 30 m long.

Children activity during recess was assigned to one of three groups. The first was sedentary activity (Level 1, Stationary/Sedentary) where pupils were lying, sitting or standing. They could sway their bodies, swing, wave but they did not move. Sitting or lying children could play board games, do jigsaw puzzles, so some needlework, play with a ball or other objects or eat a morning snack. Level 2 was Light Physical Activity (LPA) demonstrated by walking or marching. Children could also make moves with their arms, legs and body. The third type (Level 3) was defined as Moderate to Vigorous Physical Activity (MVPA). Pupils assigned to that group were jogging, running at different pace, jumping, hopping, dancing etc. Children activity during recess was observed every minute. Altogether it was 10 measurements at every observed school break.

Statistics

Data was analyzed using Statistical Package (Version 13.3 TIBCO Software Inc.). Diversity of activity levels depending on type of recess was analyzed for the whole group as well as in division to sexes. Decisions about the most appropriate model were made using the Chi Square (χ^2) statistic. Generally, Chi Square should have a non-significant value ($p>0.05$, indicating model-to-data fit). The Chi Square test was used to test for differences in the distribution between categorized variables (the three levels of physical activity; the two space types and sex).

Ethics

The Institutional Review Board of the Bioethics Committee of Jan Kochanowski University in Kielce approved all the procedures used in the study. The study was conducted in accordance with the recognised ethical standards according to the Declaration of Helsinki regarding human

experimentation as it was adopted in 1964 and revised in 2013. The research included only those children whose parents provided their written consent.

RESULTS

Significant statistical differences have been found between types of physical activity depending on space available for pupils during school recess ($\chi^2 = 33.726$; $p \geq 0.05$ $df = 3$). Type of space during school recesses influences levels of children's physical activity. Clearly school recess spent in a classroom disables free movement and causes visible reduction in physical activity. Pupils select sitting position (level 1) almost twice as frequently when they stay in a classroom than when they spend their school recess in a hallway. Only singular children showed interest in higher type of activity remaining in a classroom for their school recess.

Classroom even if providing a free play area is not a place where pupils spend their recess actively. More children are characterised by selecting stationary activities in a classroom than in a hallway. Almost 3/4th of girls and boys were sitting during a break (Level 1) and only 4% showed physical activity at level 3 during a full recess spent in a classroom. However, in the case when space available to children was not limited, the number of pupils running, jogging, hopping or skipping during recesses increased fivefold. During a school break in the hallway the group of children with a stationary activity decreased. Higher number of kids undertake at least moderate physical activity outside a classroom (Table 1).

Analysis was done based on data percentages, therefore the results for a recess spent in a classroom and the one spent in the hallway could be compared. Observing behavior of children staying for the break time in a classroom it was visible that the activity level was stable. In consecutive minutes of the passing recess no dynamics of changed activity type was noticed. Children spending their breaks in a sedentary position, stood up only sometimes to move to a different place and again assume a static position. Only a few pupils spent this time in an active way, and these were the same ones during the whole time. Not many children joined this group, mainly from the walking ones.

The minute measurements of the classroom limited recess show that the way of spending this type of school break does not motivate children to be active. Only those of them having a natural need for movement try to satisfy it even within a limited space (Figure 1). Observation of activity level of children during a recess in a school hallway shows higher rotation in behavior change. No pupil spent the whole break time in a hallway in a static position. All children ran or walked at least for a short time. Most of them presented medium to high physical activity during the first 5 minutes of the break (Figure 2).

In the analysis, based on the three levels of activity and the two space types, we have shown differentiation of undertaken physical activity by both sexes. Visibly more girls (79.09%) as compared to boys (67.66%) during a school recess in a classroom but also in a hallway (respectively 43.06% and 33.13%) are characterized by low level of physical activity.

Table 1. Frequency distribution of pupils according to activity during recesses in a classroom or a hallway

parameter	%	girls	Chi Square statistic	boys	Chi Square statistic	all participants	Chi Square statistic
classroom	level 1	79.09	$\chi^2=19.619$; $p \geq 0.05$; $df=3$	67.66	$\chi^2=14.402$; $p \geq 0.05$; $df=3$	74.34	$\chi^2=33.726$ $p \geq 0.05$; $df=3$
	level 2	18.18		26.38		21.59	
	level 3	2.73		5.96		4.07	
hallway	level 1	43.06		33.12		38.73	
	level 2	36.29		35.62		36.00	
	level 3	20.64		31.25		25.27	

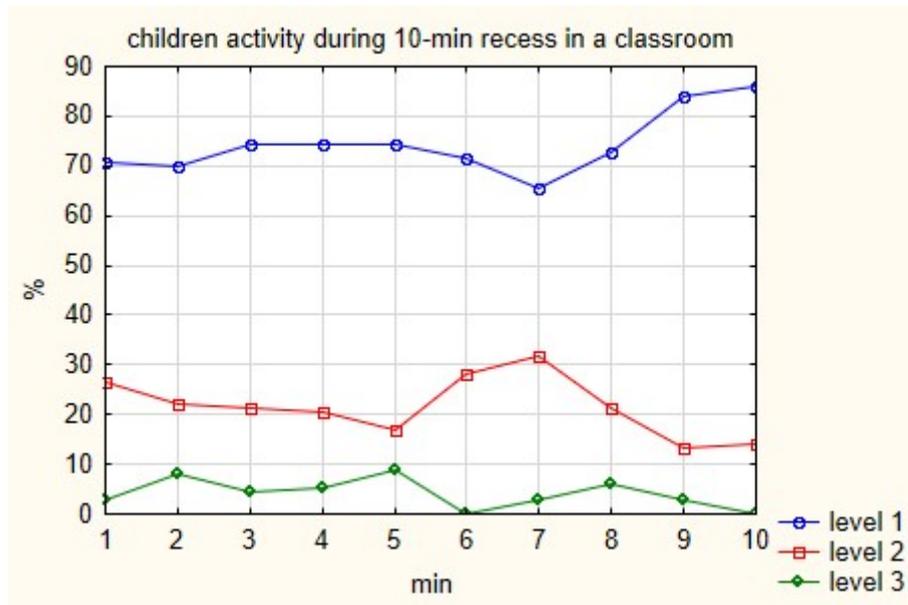


Figure 1. Measurement of three types of physical activity during school recess in a classroom

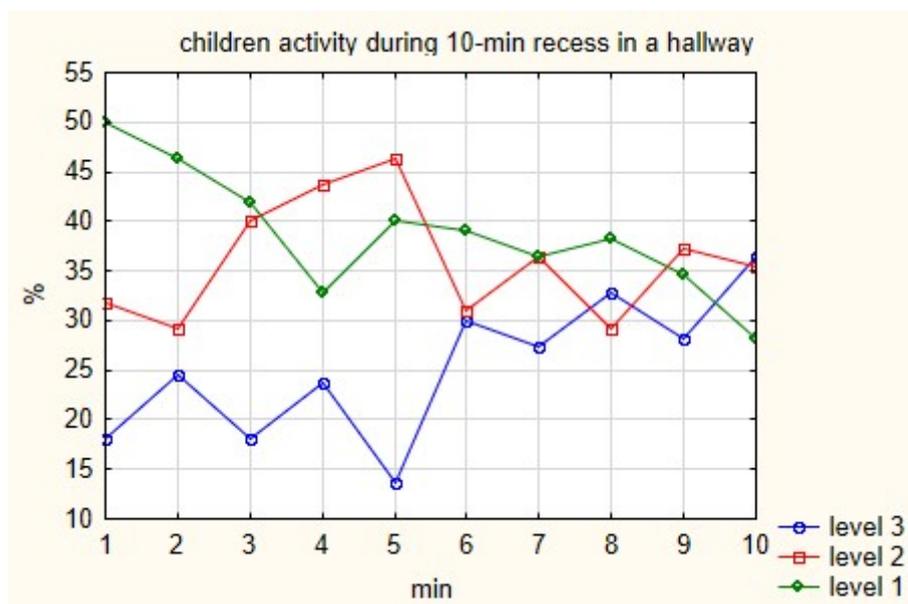


Figure 2. Measurement of three types of physical activity during school recess spent in a hallway

Analyzing behavior of girls in relation to the type of school recess it is worth noting that space limitation has a significant influence on their activity. Chi square test results present that behavior of girls changes visibly if they have bigger space available. Almost twice less girls showed a sedentary activity during a school recess in a hallway than the one spent in a classroom. In this case nearly 80% of them show tendency to more stationary activities. Open space clearly inspired girls to be active. Level 3 was observed in the group of over 20% of girls while in a classroom environment only 2.73% could be characterized by this level of activity (Table 1). In relation to boys the level of activity also changes visibly depending on the type of recess. The group selecting intensive activity in a hallway was fivefold higher than the one in a classroom. The group characterized by sedentary behavior decreased by half (Table 1).

DISCUSSION

The primary aim of this study was to examine the relation between space available for children during school recess and their levels of physical activity (PA). As proved in research availability of bigger free space for recreation between classes constitutes an important factor deciding whether pupils become active or not. In the times when the problem of decreased physical activity amongst children is becoming more and more visible, there is a need for programs and actions stimulating increased activity and lowering sedentary behavior. The research touching upon physical and social physical activity environmental interventions at schools found that their effectiveness differs greatly [14, 15].

Schools may be an ideal setting for providing each child to engage in physical activity regardless of their socioeconomic situation, health, family situation or patterning. Children spend between 30-40 h/week in school and this time is an attractive option for delivering health-promoting physical activity among pupils. Although in majority of schools there are PE classes in the curriculum, they are not part of everyday schedule [16]. In the Polish educational system physical education classes in curriculums at the level of elementary education should cover 3 hours weekly. It means that participation only in PE classes at school is not enough to reach the recommended daily level of physical activity. Hence recess provides opportunity for physical activity at school and helps them achieve this recommends level of MVPA at least 60 min each day. In this context the quality of school recess seems to be a fairly new subject of research. It has been accepted by researchers that during recess at least 40% of time pupils should spend in moderate-to-vigorous physical activity [17]. Study in Vancouver in elementary schools showed that only 16% of girls and approximately 34% of boys met the guidelines during recess [18]. Similarly, in research conducted amongst children aged 6-9 in southern Brazil 44% of recess time were spent in light-intensity physical activity [19]. Made by Reilly and colleagues [20] a systematic review 24 studies where MVPA had been measured objectively during school recess, found that the weighted mean recess MVPA was 12 minutes per school day. In our study moderate-to-vigorous physical activity during recess in a classroom characterized 4.07% of pupils while during the one spent in a hallway 25.27% while sedentary activity could be observed in the case of 74.34% and 38.73% respectively.

Space limitation during the school break drastically decreased the participation of pupils achieving MVPA. Moderate-to-vigorous physical activity is generally considered more beneficial than low-intensity activities to health and mental development, therefore it is alarming that the dominating behavior in many studies seems to be mostly sedentary or minimally physically active during the majority of recess time [for example 18, 21, 22].

The differences between studies can be explained by methods how physical activity was measured [23]. We used simple observation, other researchers work with accelerometers, the Fitbit or pedometers. Furthermore, schools can in a different way define the length, structure and type of recess. In our study, we observed a 10 min recess, but for example Nettlefold and colleagues [18] analyzed recess ranged in length from 15 to 25 min. To short breaks may not bring the expected result of increased PA despite preventing programmers being introduced [24].

The factor determining pupils' level of activity is the type of recess. In our study children spend their break time in a way they chose, there were no pre-organized activities. However, other research presented that increase in physical activity is achieved when a recess passes in a planned way rather than without any control [25]. Van Camp and Hayes [26] measuring physical activity using Fitbits showed that specific activities (running, walking, tag, soccer, free play) during recess for individual children is not always linked with a higher activity level.

The next determinant of recess quality is its location. A remarkable finding of one study of an intervention based on playground densities (measured inversely in terms of square meters per child), specific equipment seems to be important in triggering physical activity for schoolchildren [27]. However, results are not always spectacular. As shown by a quasi-experimental study aiming at testing the 12-month effects of a multi-component intervention on morning recess physical activity at playgrounds of six- and seven years children the level of MVPA did not increase. The intervention has only the positive effects on the time of recess spend in low physical activity rather than sedentary behavior [28].

The proportion of MVPA in physical activity during recess in classes and hallway in the present study was lower in the case of girls than boys. Visible differences to the disadvantage of girls were noted during the classroom recess. In most studies, the findings show that girls are less active than boys in overall PA, including during the school day [18, 29, 30]. In this study the frequency of MVPA in hallway observed in more than 20% girls and 31.25% boys but the frequency of sedentary activity applied to 43.06% girls and 33.13% boys. Sedentary behavior was demonstrated by 79.09% girls and 67.66% boys during a classroom recess. Our cohort of girls were more sedentary than boys independently of kind of recess.

Strengths and limitations of the current study and directions for future research

A strength of the current study is to provide useful information about school recess and its transfer to the next research and school practice. In general, there are also some weaknesses to our study. First, recess observation for the numbers defined in our study did not allow to generalize and refer to social and organizational differences, which may shape the recess in a significant way as well as impact physical activity of children. Moreover, observations were conducted without the use of accelerometers. Though we are aware of the limitations resulting from this approach, the clear benefit of this study is the fact that pure observation without any intervention does not disrupt a natural children's expression. The use of measuring tools draws attention especially of younger children which obviously can lead to modifications in their behavior to meet the expectations of researchers.

CONCLUSIONS

Organization of school recess including arrangement of space available to pupils follows rules imbedded in the WHO guidelines defining the daily level of children's physical activity. Well organized school recess (including arrangement of space) contributes to fulfilling of the minimum amount of physical activity as recommended in WHO guidelines defining the daily level of children's physical activity. Because girls are less active than boys and these findings are replicated in a large study, researchers, teachers and politicians should search for a way to allow girls to be more active.

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