

The Recess Period: A Key Moment of Prepubescent Children's Daily Physical Activity?

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Abstract

This study was designed to analyze the significance of the recess period and the effect of its duration on children's daily physical activity. Thirteen pupils attending school in a rural area were monitored with accelerometers during the study weeks. The intervention consisted of modifying regularly scheduled recess period for a month. Data from two school days during the third week were recorded for analyses. Analyses indicated that, according to the recommended 2 × 15 min recess schedule, children spent on average from 16.9 ± 5.7 min to 22.8 ± 3.7 min each day in moderate-to-vigorous physical activity (MVPA) at recess; that is, 16.3% to 20.0% of their daily MVPA (comprised between 103.4 ± 32.5 min and 113.9 ± 32.5 min). This level of activity increased with the increased recess duration. A 1.2% increase of the time spent at recess resulted in a 6.6% increase of their activity (average 23% to 26.5%). It appears that a more appropriate reorganization of school schedule, including recess period and proper physical education classes, may be beneficial for school children to experience adequate amount of physical activity.

L'objectif de cette étude était d'analyser l'importance de la période récréative et l'effet de son extension sur l'activité physique quotidienne d'enfants scolarisés. Treize enfants d'une école élémentaire rurale ont été évalués pendant 7 jours consécutifs par « accélérométrie ». Les données obtenues pour 2 jours ouvrables ont été utilisées pour les analyses, afin d'éviter les interférences. Les résultats montrent que, lorsqu'on se conforme aux recommandations officielles de 2 × 15 min, les enfants passent en moyenne entre 16.9 ± 5.7 et 22.8 ± 3.7 minutes de leur récréation, à réaliser des activités physiques d'intensité modérée à vigoureuse (APMV). Cette durée correspond à 16.3%-20.0% de leur activité quotidienne d'intensité modérée à vigoureuse. Cette proportion augmente avec la durée de la période récréative. En effet, une augmentation de la durée de la période récréative de 1.2% se traduit par un accroissement concomitant de 6.6% du temps actif passé à la récréation. Cette étude semble montrer que pour cette population d'enfants, il pourrait être utile de mieux organiser le temps scolaire en y incluant quotidiennement, une séance d'éducation physique appropriée. Cette organisation pourra permettre de compléter les périodes récréatives pour permettre aux enfants d'atteindre le niveau d'activité physique requis pour leur santé.

Key Words: Accelerometer, school, children, physical activity, physical education.

Introduction

The description and analysis of children's habitual physical activity (HPA) is increasing in accuracy thanks to technological improvements. More objective assessment tools (heart rate monitoring, accelerometer, double labelled water) have done a better job than subjective techniques (questionnaire, diary, interview, observation). These improvements may help to achieve a consensus about children's HPA characteristics. With these technological advances, it will be easier to develop and implement more relevant and consistent interventions that target to increase physical activity in the growing body of a child. For that to be effective, it also appears to be appropriate to make comprehensive analyses of specific periods of a child free time.

Analyses of children's free time activity could not be made without taking into account the cultural, socioeconomic, and climatic environments. Using the heart rate monitoring technique, French authors have reported that school children of 6 to 11 year-old were more active during school days than during free days in the South region of France (Gavarry, Giacomoni, Bernard, Seymat, & Falgairette, 2003; Falgairette, Gavarry, Bernard, & Hebbelinck, 1996). Nonetheless, in a given country, geographical and regional differences should be considered when characterizing children's HPA. In the European region, it should be noted that these French studies are congruent with studies completed in Great Britain (Armstrong, Balding, Gentle, & Kirby, 1990) or the Netherlands (Verschuur & Kemper, 1985). However, North American studies have revealed that children were more active out of school than in school or on the weekend than on weekdays (Trost, Pate, Freedson, Sallis, & Taylor, 2000; Simons-Morton, O'Hara, Parcel, Huang, Baranowski, & Wilson, 1990).

The discrepancies between these European and North American findings may be the result of contextual differences associated not only with space organization, playgrounds availability, but also with school day and school year schedule planning. However, the difference between school day and free day may be mainly due to the breaks such as the recess period and the lunch break. One of the differences of the French primary school schedule is that school days are the longest one in the continent (08:00AM to 04:30PM, 6h excluding the lunch

break versus =5h in Great Britain or the Netherlands). It is apparent that French school children spend the bulk of their waking hour inside the school institution. It may be convenient that a substantial amount of a child's physical activity take place at school, in order for the child to experience sufficient activity with respect to the daily and weekly recommendations. The most recent guidelines recommended children spend 30 to 90 min of physical activity per day (Canadian guideline, 2002; Corbin & Pangrazi, 1999).

In France, two recess periods of 15 min in duration for every half-day are officially prescribed for elementary school (Bulletin Officiel, 2002). In addition to physical education (PE) classes, these recess periods may be potential alternatives to increase physical activity for children. Unfortunately, to our knowledge, few studies have assessed the influence of the recess period with regard to children's daily and/or weekly physical activity. In an Australian study, results indicated there were few influences of equipment availability in the school playground on children's activity at recess (Zask, van Beurden, Barnett, Brooks & Dietrich, 2001). However, these authors have not described the potential influence of recess duration on children's playground free activities. Likewise, there is no answer to the question to know if French pupils are sufficiently active during recess relative to their daily physical activity. The aim of this study was to assess physical activity pattern of a sample of French rural pupils during a longer recess period.

Methods

Study population

Thirteen children (8 girls and 5 boys) ages from 8 to 10 (9.0 ± 0.6 yr-old) volunteered to participate in this study with the approval of the local advisory board (Comité Consultatif de Protection des Personnes dans la Recherche Biomédicale (CCPPRB) de Lille). Children and their parents provided written informed consent prior to any involvement in the study. Children's height was measured with a wall stadiometer (Vivioz medical); their body mass and body fat by a calibrated balance (Tanita TBF 543).

Procedures

Habitual physical activity (HPA) of children was assessed with uniaxial accelerometers during a whole week. The tool was tightly mounted on the right hip of each

child at the beginning of the week by an evaluator. The same evaluator had to verify, every morning before classes, if there were any problems with the activity monitor for a given child and to report information about any physical activity performed (or any moment) when the monitor could not be worn (e.g., swimming, bath). During a whole month the duration of the recess period was modified continually in an attempt to provide a change in children's habit and expectation.

Intervention

In agreement with the team of teachers, the decision was made to modify the duration of the recess periods. Thus, during an entire month, the recess duration consisted of an alternate of a 15-min period with a 20-min period. Accordingly, the first two weeks were designed to familiarize children with the new schedule. During these two weeks, the duration of the recess was either 2×15 min per day or 2×20 min per day, or 1×15 min plus 1×20 min for each half-day. Measurements were taken during the third week. Based on the result, the intervention was modified so that time spent in recess lasted 2×20 min on Monday and Thursday. The last week was comparable to the first 2 weeks and represented the end of the intervention period. Additionally, game playing was encouraged by offering an inviting playground with many equipment options (football, basketball, blocks...), so that children could play freely and voluntarily. However, during the recess periods, there was no other specific intervention by teachers or other physical educators.

Habitual physical activity assessment

A Computer Science and Applications (CSA) accelerometer (WAM 7164, Shalimar, Florida, USA) was attached to the right-hand side of the hip. This accelerometer (also called actigraph) measures $5.1 \times 3.8 \times 1.5$ cm, is lightweight (42 gm) and powered by a readily available 2430 coin cell lithium battery. The device is a uniaxial monitor which integrated accelerations/decelerations in the vertical plane via a piezoelectric plate. Acceleration detection ranges in magnitude from 0.05 to 2.00 g, and the frequency responses range from 0.25 to 2.5 Hz, so that motion outside normal human movement is rejected by a filtered bandpass. The acceleration-deceleration signal is digitized by an analog-to-digital converter and numerically integrated over a user-defined epoch interval.

The rate of change of acceleration is sampled 10 times per second and the data are summed up into epochs and stored in the internal memory; then the integrator is reset to zero. To begin data collection, the monitor is initialized using a compatible personal computer (PC). A real-time internal clock allows the researcher to begin collecting at desired time. The output from CSA monitor is in "counts" per each epoch. "Count" represents the amount and magnitude of acceleration summed up during each epoch. That is, higher numbers represent a combination of higher frequency and intensity of movement. For the purpose of this study, CSA accelerometers were initialized to capture movement counts within 1-min intervals.

Data reduction and physical activity indicators

Data collected over two school days (Monday and Thursday) were used for analyses. Raw data were processed with a macro Excel®. These two days were selected for their similarities within the school week, and because no physical education classes were scheduled on both days. Both school days were preceded by a free day (Sunday for Monday and Wednesday for Thursday). Data were collected between 7:00AM and 9:00PM for each day. To analyze the amount of time children spent engaged in physical activity each day, cut-off limits provided by Freedson, Melanson, & Sirard (1998), adjusted for age by Trost, Pate, Sallis, Freedson, Taylor, Dowda, & Sirard (2002) were used. For each school day analyzed, time spent engaged in moderate-to-vigorous physical activity (MVPA: average summed values of minutes spent at moderate, vigorous, and very vigorous minutes for each day) was calculated. This variable was calculated for each full day (calculated between 7:00AM and 9:00PM) as well as for the recess periods of 15 and of 20 minutes.

Statistical analysis

Descriptive data were presented as mean $\pm$ standard deviation. A Kolmogorov-Smirnov test was applied to verify the normal distribution of data. A Student « t » matched for pairs was used to compare data obtained over different periods. Coefficients of variation were computed to describe and compare the magnitude of physical activity variation among periods. Relationships were checked with the Pearson product moment coefficient of correlation (r). The level of significance was set at $p < 0.05$.

Results

Anthropometric parameters

Table 1 summarizes the anthropometric characteristics of children. Mean values for height and body mass were 136.9 ± 6.5 cm and 33.7 ± 6.6 kg respectively. The resulted body mass index (BMI) was 17.8 ± 3.2 kg.m⁻². No significant difference was found between genders.

Habitual physical activity and recess physical activity

Table 2 displays data of the time engaged in MVPA during the recess periods (20 min and 15 min) on Monday and Thursday and each full day activity. Analyses revealed that whatever the recess duration (15 or 20 min), time spent in MVPA on Monday recess periods were significantly higher than Thursday's time spent in MVPA ($p < 0.05$). This result is certainly due to a time spent in the morning recess period (R1) which was higher on Monday than on Thursday ($p < 0.05$), whereas no significant difference was obtained during the afternoon recess period (R2) regardless of its duration (See Figures 1 & 2). In all cases, the time spent in MVPA was higher when the recess period lasted 20 min than a 15 min duration ($p < 0.001$). On the other hand, there was no significant difference between the periods R1 and R2 of a given day, even if mean values of R1 appear to be quite higher than those of R2.

The variability of the time spent in MVPA varies from 13% to 34% from one day to the other, from a 20-min recess period to a 15-min recess period (Table 2). When comparing the recess periods, the coefficient of variation (CV) is consistently higher on Thursday than on Monday. This tendency was representative of the overall MVPA on Thursday (31%) and Monday (29%).

When examining the HPA of a given school day, a recess period of 15 min induces on average 16.3% to 20.0% of the daily physical activity. By increasing this period by 5 min, these values rose to 23.0% and 26.5%. The highest percentages were obtained on Monday. Correlation coefficients between MVPA of the recess periods and MVPA on full days were weak and non significant ($p > 0.05$).

Discussion

The aim of this study was to analyze the relative importance of the recess period in the daily physical activity (PA) of children in a rural school. Results indicate that physical activity during the recess period accounts for 16.3% to 26.5% of the daily PA of children. The time spent in moderate-to-vigorous physical activity (MVPA) during recess periods increases with its duration.

Being physically active at moderate-to-vigorous physical activity (MVPA) level on a daily basis is recognized as a public health objective although recommendations for the specific amount of PA have changed over time. The first guidelines for PA provided by the American College of Sports Medicine (1988) supported the adapted guidelines for youth (Sallis & Patrick, 1994), which prescribed at least 3 sessions per week of MVPA for 20 min or more. The Canadian guideline (Canada Health, 2002) recommended 90 min per day for children, whereas Corbin & Pangrazi (1999) prescribed 30 to 60 min per day of PA for elementary school children. Changes in PA levels recommendations over time indicate that researchers are actively searching for an appropriate level of PA and to reconcile opposing theories. However, children involved in the current study (recruited among a population of rural children) spent on average, 113.9 ± 32.5 min and 103.4 ± 32.5 min in MVPA during the 2 selected school days (for Monday and Thursday, respectively). These values are quite close to the consistent data obtained in four European countries (Denmark, Estonia, Norway, and Portugal) among children of similar age (Riddoch, Andersen, Wedderkopp, Harro, Klasson-Heggebo, Sardinha, Cooper, & Ekelund (2004). These authors have concluded that European children (recruited mostly in cities) of 9 yr-old, when measured objectively by accelerometer, are sufficiently active with reference to the existing guidelines. They reported on average, 192 ± 66 and 160 ± 54 minutes spent engaged in MVPA by European boys and girls, respectively. Nonetheless, this conclusion might be modulated by the residual questions about 1) the relevance of the threshold of 3 Met, which may promote health, 2) the appropriateness of current activity levels recommendations, 3) the limitations related to accelerometer accuracy. Whatever the limiting factors, the data obtained in this sample of French school children appeared to be lower than

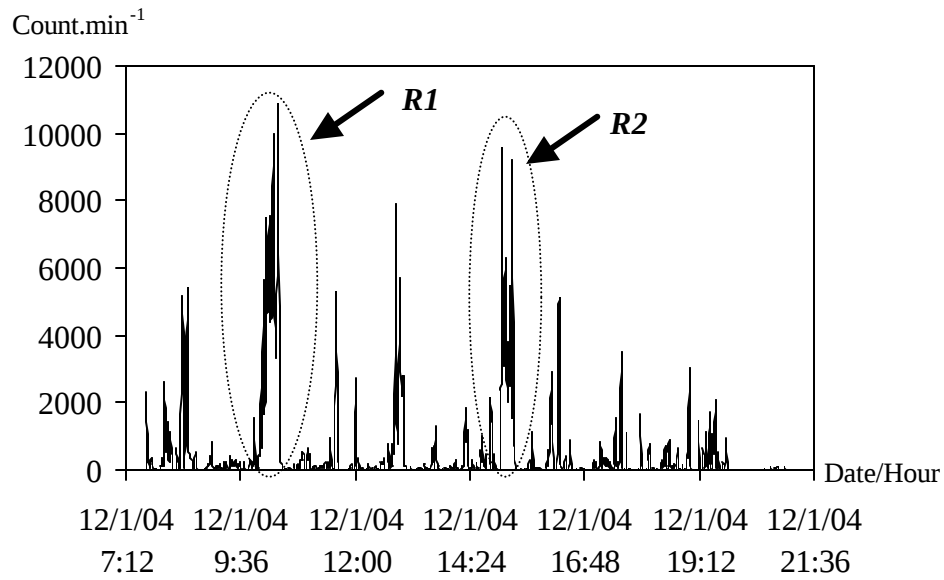


Figure 1: Typical graphic of data obtained with the actigraph (CSA, WAM 7164) on Monday of a boy of 9yr-old

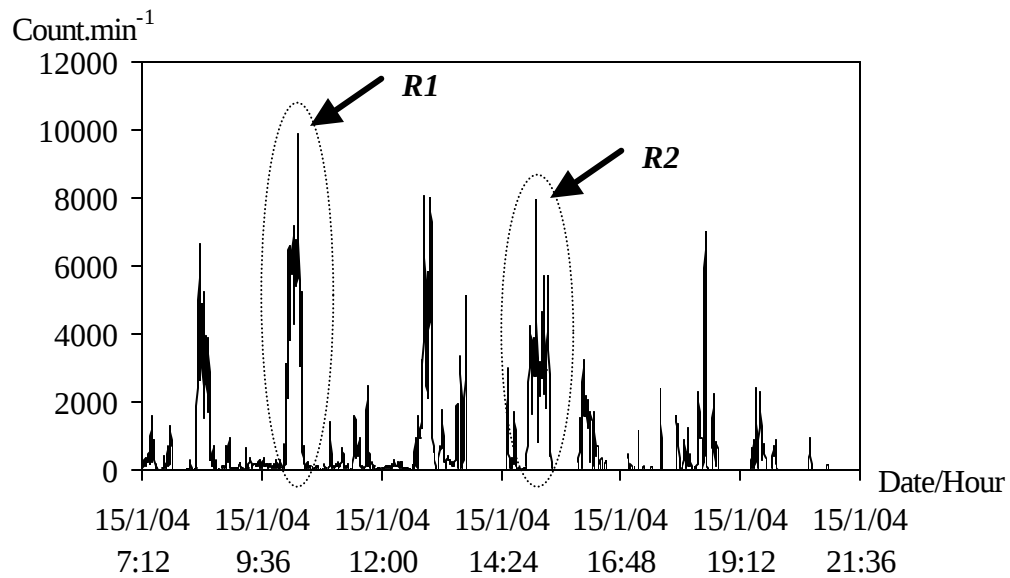


Figure 2: Typical graphic of data obtained with the actigraph (CSA, WAM 7164) on Thursday of the same boy of 9yr-old

Table1. Anthropometric parameters (mean $\pm$ SD)

	Age (year)	Height (cm)	Weight (kg)	BMI (kg/m ²)
Girls (n=8)	9.0 $\pm$ 0.5	134.9 $\pm$ 4.2	31.3 $\pm$ 4.5	17.1 $\pm$ 1.9
Boys (n=5)	9.0 $\pm$ 0.7	140.0 $\pm$ 8.7	37.6 $\pm$ 8.1	19.3 $\pm$ 4.5
All (n=13)	9.0 $\pm$ 0.6	136.9 $\pm$ 6.5	33.7 $\pm$ 6.6	17.8 $\pm$ 3.2

Note: BMI, Body Mass Index

Table 2. Moderate-to-vigorous physical activity by period and per day

	Monday		Thursday	
	MVPA (min)			
	Mean $\pm$ SD	CV	mean $\pm$ SD	CV
R1-20	15.6 $\pm$ 2.2	0.14	12.3 $\pm$ 3.5*	0.29
R2-20	14.5 $\pm$ 2.6	0.18	11.5 $\pm$ 6.6	0.58
Recess-20	30.2 $\pm$ 4.0	0.13	23.8 $\pm$ 7.3*	0.30
R1-15	11.6 $\pm$ 1.9	0.17	8.4 $\pm$ 2.8**	0.55
R2-15	11.2 $\pm$ 2.6	0.24	8.5 $\pm$ 5.1	0.61
Recess-15	22.8 $\pm$ 3.7	0.16	16.9 $\pm$ 5.7*	0.34
Full Days	113.9 $\pm$ 32.5	0.29	103.4 $\pm$ 32.5	0.31

Notes: * denotes a significance difference ($p < 0.05$); ** a significance difference ($p < 0.01$)

MVPA, moderate-to-vigorous physical activity; R1-20, time spent in MVPA during a morning recess period of 20 minutes; R2-20, time spent in MVPA during an afternoon recess period of 20 minutes; R1-15, time spent in MVPA during a morning recess period of 15 minutes; R2-15, time spent in MVPA during an afternoon recess period of 15 minutes; Recess-20, total time spent in MVPA during the 2 periods of 20 minutes (R1-20 + R2-20); Recess-15, total time spent in MVPA during the 2 periods of 15 minutes (R1-15 + R2-15); MVPA, time spent in moderate-to-vigorous physical activity of a given day; CV, coefficient of variation; SD, standard deviation.

those of Riddoch and coworkers (2004). The difference may be linked to the small size of our sample ($n=13$), or simply to a specific aspect of this population of prepubescent children, living in a rural environment. The coefficients of variation obtained in the current study (29% and 31% for Monday and Thursday, respectively) were nearly similar to those obtained by Riddoch et al. (2004) (34.4% and 33.8% for boys and girls, respectively). This comparison suggests that children involved in the present study are relatively less active than their European peers, and may require a longitudinal follow-up.

Few studies, to our knowledge, have analyzed the significance of PA during a specific period, such as the recess. Falgairette et al. (1996) hypothesized that the differences in HPA between school and non school days were in part related to an existing active recreation during school days. In fact, in France, in spite of relatively long school days, two recess periods of 15 min (each of them) are officially scheduled (Bulletin Officiel, 2002). These breaks may favor and encourage joyful games, and may be a wonderful reprieve for children whose attention was mobilized during class times. In an apologia for games, Byl (2002) posited that “the challenges of school can be stressful for children. That’s why games are an important part of each school day. They’re an excellent way to help students chill out. Creating a fun environment where kids can forget about the tensions of school” may be an appropriate way to improve their health, by increasing the opportunities to be physically active as well as soothing them. Therefore, the **alternation** of active recess periods and class activities could contribute to optimize children’s attention capabilities and enable them to get a substantial amount of daily PA. Each recess period of 15 min could be increased by 5 min, as reported by Falgairette et al. (1996). Results of the present study showed that when the recess period lasted 2×15 min (that is 3.6% of the waking hours of a child, with respect to the analyzed time frame of 07:00AM to 09:00PM), children spent, on average, 16.3% to 20.0% of their daily time in MVPA. On the other hand, an extension of this period to 2×20 min (that is 4.8% of the waking hours) induces a concomitant increase of physical activity to reach 23.0% and 26.5% of the daily MVPA. Thus, by increasing the recess period to 1.2%, there is a proportional increase of 6.5% to 6.7% in the time spent for physical activity during this period. The lowest values were obtained on Thursday, reflecting the gradual decreasing trend

in HPA that was observed toward the end of the week (unpublished results). Monday and Thursday are both preceded by free days (Sunday and Wednesday for Monday and Thursday, respectively). Given that HPA varies in a rhythmical way during a week (Rowland, 1997; Falgairette et al., 1996) – with high PA days alternating with low PA day – it was hypothesized that by coming out from a free day might favor high activity on the next day. Although, on average, MVPA on Monday was higher than Thursday, there was no significant difference between these 2 days - even if activity in recess periods was more important on Monday than on Thursday. Furthermore, regardless of the day, recess periods of morning (R1) were associated with higher PA than the afternoon recess periods (R2). An explanation to this shift may be that some children were still in their digestive phase (since children’s involved in this study were half-boarder), which could reduce their inclination to PA. This result suggests that, if it could be done, a combination of a recess period R1 of 20 min per day with a recess period R2 of 15 min per day might be a better compromise **with** the purpose of increasing children’s PA if its impact on the attention capacity of the second half of the day can be considered.

The levels of PA of children during the recess periods were not correlated to their daily PA, which imply that the children who were the most active during the recess period were not necessarily the same across the day. This result denotes the existence of a probable compensatory mechanism in PA, and adds a bit to the idea that PA is determined by both environmental and biological factors (Riddoch et al., 2004; Rowland, 1997). However, it appears that children could exhibit spontaneously high levels of PA when they are free in a secure environment, with suitable spatio-temporal conditions (adequate playground and sufficient time for recess).

Daily physical education (PE) classes could be viewed as **excellent incentives or instrument** to this spontaneous activity. They must provide a quantitative and a qualitative complement, with the purpose **of** promoting PA in children. Instead, as reported by Kohl & Hobbs (1999), from a large sample study in the United States of America (USA), the frequency with which schools conduct PE classes is related inversely to the amount of time children are given for recess. The authors have stated that schools may use recess to substitute for, rather

than supplement PE. French researchers have not yet pursued this area of inquiry. The numbers of hours per week allocated to PE lessons, in elementary school appear, at least theoretically, sufficient enough to place it within the normal range of the continent. The official instructions prescribe 160 min of PE classes per week; that is 36 to 40 min of activity per day (Bulletin Officiel, 2002). However, like the USA, it seems that the required minimum amount of PA was not provided by PE classes (Kemper, 2000). In addition, no study on the spot has attempted to solve this problem. For example, in the USA, McGinnis, Danner, & DeGraw (1991) showed that none of the elementary school included in their analyses, provided the recommended 50% of class time in MVPA. Similar results were obtained during a regional study, which involved 355 elementary schools and 117 secondary schools of the Harry County (Texas) (Simons-Morton, Taylor, Snider, Huang, & Fulton, 1994). If this is the case in France, at least in some regions with high proportion of pediatric obesity, then this is the time to determine the reasons and develop relevant strategies according to school schedule, specific socio-economic and cultural conditions, to increase children's participation in appropriate PE courses. This is important, especially according to one of the paramount goals of PE, in France, which is the "Search for hygiene and health". School plays a central role in promoting PA in children because school activities may determine approximately 50% of the activity for girls and 45% for boys (Verschuur & Kemper, 1985).

There are a few limitations of this study. It is recognized the small sample of children involved in analyses could preclude any transfer of the results to other setting. Nevertheless, the primary objective of the current study was to show the possible relevance of the recess period in children's activity habit. This might be a specific case study that could help health educators in the development of promoting physical activity intervention in school settings.

Finally, the combination of a morning recess period of 20 min with an afternoon recreation of 15 min could be proved an interesting alternative, since there is fitting space and appropriate pedagogical tools. However, further studies are needed to access the impact of an active recess period on children's attention capacities at a later part of the day. There is also a need to conduct study with a larger sample in a broader demographic area (urban and rural pupils) to be able to provide consistent

information for health and education policy makers, and for pedagogical teams, which have full scope to organize schools for the best results. Further schedule adjustments in the school planning could be considered to study the influence of a 4×10 min recess period in a school day. Likewise, the clarification of the compensatory nature of children's PA may also help to define more precise PE contents, on both recess periods.

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