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PHYSICAL ACTIVITY LEVELS DURING UNSTRUCTURED RECESS IN SPANISH PRIMARY AND SECONDARY SCHOOLS

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ABSTRACT

Introduction. The goals of this study were: a) to describe sedentary time and different physical activity (PA) intensities during school recess; b) to analyze sex and education level differences; c) to describe compliance with recommended guidelines for recess and; d) to determine the contribution of unstructured recess to PA guidelines. Material and Methods. Two subsamples from Spain participated: one of primary school students (114 girls, 8.77 ± 1.74 years and 59 boys, 8.47 ± 1.71 years), and one of secondary school students (100 girls, 12.16 ± 0.49 years and 116 boys, 12.15 ± 0.52 years). PA was quantified by accelerometers. Results and Discussion. Significant sex and education level effect was found over the combination of different percentages of PA intensities. All PA intensities except sedentary and light, showed higher values in primary education students. Boys reported higher values in MVPA both in primary and secondary. It was found a significant effect of sex and education level on the contribution of recess to PA guidelines. Conclusions. Interventions should be carried out to encourage PA during recess, especially for girls and secondary school students.

Key words: physical activity, accelerometry, adolescent, children, sedentary behavior

NIVELES DE ACTIVIDAD FÍSICA DURANTE LOS RECREOS, EN COLEGIOS ESPAÑOLES DE EDUCACIÓN PRIMARIA Y SECUNDARIA

RESUMEN

Introducción. Los objetivos de este estudio fueron: a) describir el tiempo sedentario y diferentes niveles de intensidad de actividad física (AF) durante los recreos escolares; b) analizar las diferencias según el sexo y el nivel educativo; c) determinar el cumplimiento con las recomendaciones internacionales de práctica de AF para los periodos de recreo; d) definir la contribución de los recreos a las recomendaciones diarias de actividad física. Materiales y Métodos. Participaron dos muestras de alumnos: una de educación primaria (114 chicas, 8.77 ± 1.74 años y 59 chicos, 8.47 ± 1.71 años), y una de educación secundaria (100 chicas, 12.16 ± 0.49 años y 116 chicos, 12.15 ± 0.52 años). Se utilizaron acelerómetros para analizar los niveles de AF. Resultados y discusión. Los resultados mostraron un efecto significativo del género y el nivel educativo en las diferentes intensidades de actividad física. Todas las intensidades, excepto tiempo sedentario y actividad ligera, mostraron valores mayores en alumnos de educación primaria. Los chicos mostraron valores mayores en la actividad física moderada-vigorosa (AFMV). Se encontró también un efecto significativo del sexo y el nivel educativo en la contribución del recreo al cumplimiento de las recomendaciones de AF. Conclusiones. Deberían desarrollarse intervenciones para fomentar la AF durante los recreos, especialmente para chicas y alumnos de educación secundaria.

Palabras clave: actividad física, acelerometría, adolescentes, niños, comportamiento sedentario

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INTRODUCTION

A recent study reported that levels of physical activity and prevalence of compliance to physical activity recommendations in youth are diverse across European countries (Van Hecke et al., 2016). However, different studies have found low physical activity levels in children and adolescents in Spain (Ramírez, Fernández & Blández, 2013; Laguna, Lara & Aznar, 2011), and a substantial number of children fail to engage in any physical activity (PA) outside school. These findings should come as no surprise given that the proportion of Spanish people with a poor attitude towards changing their PA levels was higher than that of people from other countries in Europe, as they are less perseverant in achieving positive changes in their PA status (Varo-Cenarruzabeitia et al., 2003).

School is a particularly outstanding environment for providing and encouraging MVPA, because it is the only setting that reaches nearly all children, most of whom spend six hours of their waking day at school. School recess was defined as the non-curricular time allocated by schools between classes for youth to engage in leisure activities (Ridgers, Stratton & Fairclough, 2005). The Robert Wood Johnson Foundation (2017) reported that recess is a period which may offer a great opportunity to promote PA among children during the school year (42% of time), followed by physical education (32%) and afterschool programming (26%). Previous research reported that children spend between 30 and 105 minutes in recess a day (Mota et al., 2005; Verstraete, Cardon, DeClercq & Bourdeaudhuij, 2006), and another study suggested that recess might contribute between 5% and 40% to daily PA recommendations (Ridgers, Stratton & Fairclough, 2006). Unstructured recess presents an opportunity for children to be physically active and provides a unique contribution to the creative, social, and emotional aspects of a child's development (Ramstetter, Murray & Garner, 2010). While other PA opportunities are provided by the school on an irregular or non-daily basis, recess represents a period of time when all children have the opportunity to be physically active every single day. In addition, it is said that it is more likely for younger children to participate in MVPA within unstructured play settings than within more structured contexts (Pate, Baranowski, Dowda & Trost, 1996). In an effort to determine how active children and adolescents should be during recess periods, Stratton and Mullan (2003) extrapolated the United States Department of Health and Human Services physical education criterion to recess, suggesting that children should be physically active for 50% of recess time. However, previous studies revealed that few children meet these PA guidelines during recess (Coleman, Geller, Rosenkranz & Dzewaltowski, 2008; Ridgers, Stratton, Fairclough & Twisk, 2007; Stratton & Mullan, 2005), and consequently an alternative suggestion was proposed. More specifically, a

threshold value of 40% was proposed as a more achievable target during school recess (Biddle, Sallis & Cavill, 1998).

Several studies that have identified individual correlates of PA during recess, have reported that the most important variable was sex (Ridgers et al., 2012), with boys being consistently more active than girls in preschool, childhood and adolescence (Hinkley, Crawford, Salmon, Okely & Hesketh, 2008). However, it should be pointed out that other studies did not find sex differences in PA levels during recess (Erwin et al., 2012) or found girls to be more physically active than boys (Mota et al., 2005). Nevertheless, it is generally accepted that girls are less active than boys during recess periods and other free play environments (Nettlefold et al., 2010; Van Sluijs, McMinn & Griffin, 2007). Boys may view recess as a chance to play competitive games that often lead the available space. Oppositely, girls may take recess as a chance to socialize with friends (Blatchford, Baines & Pellegrini, 2003). It should also be pointed out that no differences have been detected in terms of school year level (Haug, Torsheim, Sallis & Samdal, 2010). Recent studies have suggested that an in-depth exploration of children's PA behavior during recess is needed (Escalante, Garcia-Hermoso, Backx & Saavedra, 2014; Dobbins, Husson, DeCorby & LaRocca, 2013).

Although recess is mandatory in Spain (~30 min/day), limited objective data has been registered about PA levels in Spanish recess (Escalante, Backs, Saavedra, García-Hermoso & Domínguez, 2011), and to our knowledge, no study has compared recess PA between primary and secondary schools. Although it has been suggested that recess may contribute up to 40% of the daily recommended PA (Ridgers, Stratton & Fairclough, 2006), and between 6% and 13% of total daily MVPA (Ridgers, Tóth & Uvacsek, 2009), current empirical evidence in young people on this topic is inconclusive. Moreover, the overall contribution of recess to global PA recommendations has not been deeply studied.

Therefore, the objectives of this study were: a) to describe sedentary time and different spontaneous PA intensities of primary and secondary school children, during school recess periods; b) to analyze sex and education level differences in sedentary time and at different spontaneous PA intensities; c) to describe compliance with recommended guidelines for recess (40% and 50%) and; d) to find out the contribution of unstructured recess to PA guidelines for children (60 min/day).

METHOD

A cross-sectional study was developed, comparing the dependent variables (i.e., recess PA levels and compliance with recommended guidelines) according to sex and education level. Also, a descriptive analysis was developed to

examine the PA intensities in recess and the contribution of recess to compliance with PA guidelines.

Participants

There were two subsamples representing two educational levels: one with 173 primary school students (114 girls, 8.77 ± 1.7 years and 59 boys, 8.47 ± 1.71 years), and another one with 216 secondary school students (100 girls, 12.16 ± 0.49 and 116 boys 12.15 ± 0.52 years) from different schools in Spain. All students from those schools were invited to participate in the project. An information meeting with all the students was held on a class by class basis. A signed parental informed consent was required to participate in this study.

The schools were selected to participate under these criteria: a) their willingness to collaborate; b) their similarities in playground areas where there was no playground equipment or markings to stimulate PA; and c) same amount of time dedicated to recess in all schools.

The appropriate regional ethics committees accepted this study.

Measures and procedure

GT3X accelerometers (Actigraph, Pensacola, Florida, USA) were used to assess objective PA during the waking hours over a period of 5 consecutive school days (Barreira et al., 2015). Monitors were initialized as described by the manufacturer, and the epoch was set at 15 seconds. Participants were provided with detailed instructions on how to use the accelerometer in accordance with the guidelines suggested. Students were asked to wear the accelerometer for five consecutive days.

After measurement was carried out, valid participants were determined based on two inclusion criteria (Rowlands, 2007): 4 weekdays of monitoring, and 10 hours of continuous monitoring per day. The final sample was comprised of students who satisfied both criteria.

Actilife-v5 software (Actigraph, Pensacola, Florida, USA) was used to download data. The output obtained (counts/min) was translated into time (min/day) spent at different PA intensities using Evenson's cut-points, recommended to analyze PA in young people. The recess period of each day was removed from the general file (i.e., the whole measured day) and the following calculations were conducted over those specific periods of time. Time spent at different PA intensities was determined by adding minutes when the counts per minute number met the criterion for the corresponding intensity. It should be noted that MVPA was calculated by adding minutes of moderate and vigorous PA, and that sedentary time ($\text{min}\cdot\text{d}^{-1}$) was calculated as time (min) below the threshold of 100 counts per minute. Then, time spent in each PA intensity was calculated as a percentage: sedentary activity percentage (SA %),

light physical activity percentage (LPA %), moderate physical activity percentage (MPA %), vigorous physical activity percentage (VPA %) and MVPA percentage (MVPA %). Finally, the proportion of children that reached current health-related PA recommendations for recess (40% and 50%) and the contribution of recess to PA guidelines for children (60 min/day) were calculated.

Statistical analysis

A 2x2 MANOVA (Sex x Education level) was performed to test differences in SA %, LPA %, MPA % and VPA %. Post-hoc ANOVAS were reported for each variable. A 2x2 ANOVA (Sex x Education level) was performed to test differences separately in MVPA% and % of contribution of recess to PA guidelines (60 min/day). Effect sizes were reported through Partial Eta Square (η_p^2). Chi-square was calculated to test the relationship between education level and sex with percentage of participants that met the MVPA guidelines for recess (40% and 50% of MVPA recess). The theoretical requirements of these type of analysis were previously checked. Statistical analyses were conducted using SPSS 19.0.

RESULTS

The 2X2 MANOVA revealed that there was a significant sex (Wilks' Lamda = .781; $F(4,381) = 26.654$; $p < .001$; $\eta_p^2 = .219$) and education level (Wilks' Lambda=.507; $F(4,381) = 92.557$; $p < .001$; $\eta_p^2 = .493$) effect over the combination of percentages of PA intensities (SA%, LPA%, MA%, VA%). An interaction effect (Sex x Education level) was also significant in these variables (Wilks' Lamda=.909; $F(4,381) = 9.483$; $p < .001$; $\eta_p^2 = .091$). Details of the follow-up univariate tests of every variable are presented in Table 1.

TABLE 1

Mean scores, Standard Deviations (SD) and Significant differences of Physical Activity Levels and Percentages of Meeting Guidelines of the Study Samples.

	<i>Primary school</i>			<i>Secondary school</i>		
	All (n= 173)	Boys (n= 59)	Girls (n= 114)	All (n= 216)	Boys (n= 116)	Girls (n= 100)
Age (years)	8.67 (1.73)	8.47 (1.71)	8.77 (1.74)	12.15 (0.50)	12.15 (0.52)	12.16 (0.49)
<i>PA levels data</i>						
Sedentary %	42.54 (13.91)	31.96 (10.81)	48.07 (12.04) ^b	42.59 (10.37)	38.86(21-51) ^d	46.91 (15.57) ^c
LPA %	37.83 (7.75)	40.60 (7.17) ^b	36.38 (7.68)	49.04 (16.14) ^a	49.13 (17.50) ^d	48.94 (14.49) ^e
MPA %	10.26 (4.49) ^a	14.00 (4.22) ^{b-d}	8.33 (3.24) ^e	6.89 (8.65)	9.81 (10.10) ^c	3.51 (4.75)
VPA %	9.36 (6.80) ^a	13.43 (8.27) ^{b-d}	7.25 (4.71) ^e	1.48 (2.78)	2.20 (3.36) ^c	.63 (1.55)
MVPA %	19.6 (10-17) ^a	27.44 (11.22) ^{b-e}	15.58 (6.67) ^e	8.37 (10.42)	12.01 (12.12) ^c	4.15 (5.63)
<i>Meeting guidelines %</i>						
MVPA of recess (40%/50%)	6.40 ^a /1.20	16.9 ^{b-e} /3.4 ^{b-e}	0.9/0.00	1.85/0	3.45/0	0 /0
% of contribution of recess to PA guidelines	9.81 (5.08) ^a	13.72 (5.61) ^{b-d}	7.79 (3.33) ^e	4.48 (5.16)	6.25 (5.87) ^c	2.43 (3.14)

Significant differences: p<.05. Note: Symbols appear in the variable with the highest value. Detailed differences below: Letter) Type of difference.

a) Total educative level differences.

b) Gender differences in primary.

c) Gender differences in secondary.

d) Educative level differences in boys.

e) Educative level differences in girls.

It should be noted that all PA intensities, except sedentary and light PA, showed higher values in primary school students than in secondary school students. Boys reported higher values than girls in moderate and vigorous activity both in primary school and secondary school. Moreover, the inverse relationship was found in sedentary activity levels in both the education context and in light activity in secondary school.

A 2x2 ANOVA reported a significant gender ($F(1,384) = 104.871; p < .001; \eta_p^2 = .215$) and education level ($F(1,384) = 210.224; p < .001; \eta_p^2 = .354$) effect on the MVPA percentage. Moreover, analyses revealed a significant interaction effect of these factors ($F(1,384) = 5.658; p = .018; \eta_p^2 = .015$). We found a significant sex ($F(1,384) = 102.795; p < .001; \eta_p^2 = .211$) and education level ($F(1,384) = 176.791; p < .001; \eta_p^2 = .315$) effect on the percentage of recess' contribution to PA guidelines, and a significant interaction effect of these two factors ($F(1,384) = 4.818; p = .029; \eta_p^2 = .012$). It should be noted that the interaction factors showed low partial eta square values.

Chi-Square analysis showed that there were significant relationships between meeting the "40% recess" recommendation, and sex ($\chi^2(1) = 14.659; p < .001$) and education level ($\chi^2(1) = 5.319; p = .021$). No significant relationships were found either between meeting the "50% recess" recommendation and sex ($\chi^2(1) = 2.447; p = .118$), or between the recommendation and education level ($\chi^2(1) = 2.525; p = .112$).

DISCUSSION

The purpose of this study was to examine and to analyze sex and education level differences in ST and different spontaneous PA intensities of primary and secondary school children during school recess periods, to describe compliance with recommended guidelines for recess (40% and 50%) and to find out the contribution of unstructured recess on PA guidelines for children (60 min/day). Our results showed a significant sex and education level effect over the combination of percentages of PA intensities. All PA intensities, except sedentary and LPA, showed higher values in primary school students than in secondary school students. Boys reported higher values than girls in MVPA both, in primary and secondary school. Moreover, sedentary activity levels in both the education context and in LPA in secondary school showed inverse relationships. We found a significant effect of sex and education level on the percentage of MVPA, and the percentage of contribution of recess to PA global guidelines.

Although school recess has been traditionally considered as children's 'active play time' (Ridgers, Stratton & Fairclough, 2006), in our study many children, in particular girls, have been categorized as sedentary, or only participating in LPA during this time. This fact has already been suggested by

some studies (Blaes et al., 2013; Ridgers, Stratton & Fairclough, 2006; Verstraete, Cardon, DeClercq & Bourdeaudhuij, 2006).

Differences in PA have been linked to sex role patterns. Our results are consistent with other studies, which have suggested that differentiated sex roles exist at recess. Girls were significantly less active than boys during school recess (Blaes et al., 2013; Verstraete, Cardon, DeClercq & Bourdeaudhuij, 2006). The social context in Spain may explain these differences because, during recess, as it has been suggested in other countries (Verstraete, Cardon, DeClercq & Bourdeaudhuij, 2006), boys seem more interested in doing competitive games whereas girls usually spend more time talking to friends. This fact disagrees with the research conducted by Escalante, Backx, Saavedra, Gacía-Hermoso & Domínguez (2011), who found no sex differences in their study.

It could be hypothesized that girls may replace MVPA with sedentary activity and/or LPA during recess (Nettlefold et al., 2010). Our results seem to be congruent with this notion. This fact needs to be pointed out because, during the school day, recess represents the main context in which girls and boys have an equal opportunity to be physically active on a daily basis.

Recess guidelines suggest that 50% of the time should be spent on MVPA (Stratton & Mullan, 2003). Few studies have investigated children's PA levels during recess, but some of them have suggested that an in-depth exploration of children's PA behavior during recess is needed (Escalante, Gacía-Hermoso, Backx & Saavedra, 2014; Dobbins, Husson, DeCorby & LaRocca, 2013). Considering Stratton's and Mullan's (2003) recommendation, the results from our research highlight that children's compliance with PA guidelines during recess is very low, particularly in girls. This fact suggests that recess may need to be restructured in order for boys and girls to receive equal opportunities to be physically active. Our data showed lower values than findings of other studies, where children have been found to engage in moderate intensity activities for 35% (Stratton, 2000) and 37% (Stratton & Mullan, 2003) of their recess time. The differences between studies may be explained by individual, seasonal or methodological reasons. For example, Ridgers, Stratton and Fairclough (Ridgers, Stratton & Fairclough, 2005) used activity-count thresholds based on 5-s epochs to determine intensity levels, whereas the current study used 15-s epochs. Considering our results and given that percentages of children meeting the 50% threshold are usually low (Stratton, 2000; Stratton & Mullan, 2003), it could be suggested that unlike physical education, it may be an unrealistic goal for children to meet this recommendation during school recess (Ridgers, Stratton & Fairclough, 2005). That is why another alternative suggestion, 40% of recess (Biddle, Sallis & Cavill, 1998), was proposed in an effort to find a more achievable target.

However, in our study a low percentage of participants met this recommendation, indicating that interventions should be addressed to increase PA levels during recess period. Providing access to facilities and equipment, and identifying different ways to stimulate PA during recess, have previously been identified as good strategies to promote PA during this period (Ridgers et al., 2012). No significant relationships were found either between meeting the “50% of recess” recommendation and sex, or meeting the recommendation and education level, which may be due to the low percentage of participants that met those recommendations.

According to previous studies (Gidlow, Cochrane, Davey & Smith, 2008), significant differences in PA were found between primary and secondary children during recess. From those that have researched on age or education level differences during recess, no significant differences were found, for example, in a study conducted between years 3 and 7 (Ridgers, Stratton & Fairclough, 2005).

PA levels measured by direct accelerometry have been reported to be lower in adolescents than in school-aged children in all contexts. It is of concern that PA tends to fall between ages 11 and 15 for most European countries. For example, in Austria, Finland, Norway and Spain, the rates of exercise among boys halve between ages 11 and 15. In many countries, rates for 15-year-old girls are less than half of those at age 11, and in Austria, Ireland, Romania and Spain, rates of PA among girls fall by over 60% (OECD, 2012). Sallis, Buono, Roby, Micale & Nelson (1993) estimated that, depending on the type of PA assessment methodology used, there could be between 1.8% and 2.7% per year decline in reported PA among boys between 10 and 17 years old. These data for girls ranged from 2.6% to 7.4% per year, depending on the method used to assess activity. Differences in activity levels between 8- and 15-year-olds may reflect a move towards different types of activity, but also differences in PA intensity since free play is more common among younger children, and sedentary and light activities among adolescents.

In our study, light intensity activity was the most prevalent activity in the recess period. In order to explain these differences, it could be suggested that younger children are thought to have a stronger biological drive to be physically active. Moreover, lack of motivating school environments has been considered as an important reason why adolescents are not very active during school time (Hohepa, Schofield & Kolt, 2006). PA during the school day appears to be lower than out-of-school time, especially in secondary school, where adolescents accumulate a lower proportion of their total weekly MVPA than children (Gidlow, Cochrane, Davey & Smith, 2008). Finally, as a limitation of this study, it should be noted that other non-reported factors could be

confounding factors. Further research including other factors should be conducted.

CONCLUSIONS

In conclusion, recess provided an important non-curriculum context for children to engage in PA on a daily basis. Since sedentary activity accounted for the largest proportion of recess time, interventions should be targeted at promoting PA in this context, mainly for girls who engaged in less PA than boys. Recess should be reorganized so that boys and girls receive equivalent opportunities to be physically active. Considering our results, secondary school students also deserve special attention in the design of PA promotion programs.

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