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Original empirical article

ENERGY EXPENDITURE AND QUALITATIVE ASPECTS OF PHYSICAL EDUCATION LESSONS IN BUENOS AIRES CITY, ARGENTINA

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Abstract. *The aims of this paper were to describe physical activity levels in relation to content and teacher interventions, and the influence of selected variables, during physical education lessons in elementary schools within Buenos Aires, Argentina. This study uses SOFIT (System for Observing Fitness Instruction Time), which is a validated observation method. It is a comprehensive system based on the observation of student activity, lesson context, and teacher involvement. The authors examined each phase using percentages of observed intervals. A total of 359 boys and 353 girls, aged 6−12, were studied. The energy expenditure rate (EER) of the lessons (N = 55 classes) was estimated. The influence of the type of group (mixed, boys, girls) and of the grade attended by the participants was determined by the Kruskall-Wallis test ($p<0.05$). Among the sixth and seventh graders who attended single-sex classes, girls spent a higher fraction of time standing, and boys walking. Among all of the students, the percentage of time spent in moderate to vigorous physical activity (MVPA) was 46.57%. Mean EER was 0.0872 (±0.002) kcal/kg/min. Overall, for phase 2-, the general content (management activities, transition, and breaks) ranked highest at 38.9%, with game play coming in second (20.2%). For phase 3-, "instructs generally" ranked first (41.9% of the observed intervals). In all of the variables, significant differences were found among sixth and seventh graders. First graders had the highest mean EER. The percentage of MVPA is slightly lower than the U.S. recommendation of 50%. These findings should have broad general application for the planning of school-based physical education.*

Key words: *SOFIT, physical education, physical activity, health*

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INTRODUCTION

Physical activity not only leads to higher levels of fitness but can also help reduce risk factors for various chronic diseases, such as heart disease (Pate et al., 1995). Conversely, low physical activity levels have been associated with marked increases in death rates of all causes (Pate et al., 1995).

The authors have reviewed and collected recommendations and consensus statements on the physical activity of children and adolescents that have been issued by diverse international organizations; these advisory statements have covered the frequency, intensity, and duration of physical activity for the targeted age groups (Santa María & Laíño, 2006). In addition, the authors have assessed lessons in physical education within schools in the context of these recommendations and statements (Santa María & Laíño, 2006).

Lessons in physical education are one of the five most strongly recommended interventions for increasing the physical activity of children and adolescents (McKenzie et al., 2004). In Argentina, this position was supported by the National Survey on Risk Factors carried out by the National Ministry of Health (Ministerio de Salud de la Nación, 2007).

In the United States, the Centers for Disease Control and Prevention (CDC), the American College of Sports Medicine, and the Surgeon General have stated that the development of valid and reliable tools for the quantification of physical activity is a high priority for the public health sector (American College of Sports Medicine, 1998; Pate et al., 1995; United States Department of Health, 1996).

More than 30 different techniques have been used to estimate physical activity. Ideally, the method chosen should be precise, objective, reliable, ready to use, robust, efficient over time, noninvasive, and socially accepted; it should allow for a constant and detailed record of usual activity patterns, and finally it should be applicable to large populations (Valanou, Bamia & Trichopoulou, 2006). Techniques such as doubly labeled water and direct and indirect calorimetry, which have good reliability for measuring total energy expenditure, are impractical on a population basis. On the other hand, approaches that rely on self-reports, which are valid for epidemiological studies, lack the precision to quantify individual energy expenditure (Valanou, Bamia & Trichopoulou, 2006).

Direct observation has been used frequently to observe workers during their activities (to study efficiency and/or fatigue) and also to study children and adolescents. This technique has been included in diverse instruments or systems to measure physical activity or energy expenditure (Valanou, Bamia & Trichopoulou, 2006). The SOFIT observation system (System for Observing Fitness Instruction Time) is a diagnostic and longitudinal follow-up tool especially designed to collect information on physical activity levels; SOFIT has three phases: the student's activity, the lesson context/content, and the teacher's involvement (McKenzie, 2002; Rowe, Schuldheisz & Van der Mars, 1997).

In their paper on high schools in Buenos Aires (Santa María & Laíño, 2006), the authors observed that an average of 56.9% of the total observation intervals was devoted to moderate to vigorous physical activity. This percentage exceeded the guidelines of the *Healthy People 2010* program in the United States, which states that a moderate to vigorous intensity of physical activity should be achieved in 50% of every physical education lesson (McKenzie et al., 1995; Pope et al., 2002). Based on phases 2 and 3 of SOFIT, the authors concluded that the possible influence of seasonality on the observations made could be a hypothesis for future investigation, and the importance of carrying out surveys at different times was highlighted to determine how the variables associated with phases 2 and 3 might change.

With reference to employing SOFIT in elementary schools, the authors have not found any reports on its use in Argentina and in most countries in South America. However, there are some published papers related with SOFIT use in elementary schools in the USA (Heath, Coleman, Lensegrav & Fallon, 2006; McKenzie et al., 1995; McKenzie, Sallis, Kolody & Faucette, 1997; Nader, 1997; Pope et al., 2002; Rowe, Schuldheisz & Van der Mars, 1997; Scruggs, Beveridge, Watson & Clocksin, 2005). Some studies found that children, especially boys, would be more active outside physical education lessons than during them, and one study found the average child during thirty-minute classes to be vigorously active for only two minutes (Parcel et al, 1987; Sarkin, McKenzie & Sallis, 1997). In another paper, researchers found that physical education lessons conducted by classroom teachers consisted mainly of games in which a few children were active, while the remainder waited for a turn, and only 5% of these classes had fitness activities as their major focus (Faucette, McKenzie & Patterson, 1999).

An observational study of third-grade children during physical education lessons in 95 schools (in four states) in the U.S. showed that children accrued only 5−10 minutes of moderate to vigorous physical activity in classes that lasted 32 minutes (McKenzie et al., 1995). A wide variability in student physical activity was observed in relation to the geographical region, schools, teacher training, and class contexts (that is, the way in which the content was conducted). Boys were more active during class than girls, but only during free play time. A longitudinal intervention study showed that physical activity levels during physical education lessons could be improved through curriculum change, teacher training, and longitudinal follow-ups (Sallis et al., 1997).

In their study of children enrolled in grades 1 through 8, Rowe and colleagues (Rowe, P., Schuldheisz, J. & Van der Mars, H., 1997) found that moderate to vigorous physical activity represented 37% of the total time during physical education classes, substantially below the 50% suggested in Healthy People 2010 (Centers for Disease Control and Prevention, 2005).

Thus, the objectives of the present study are as follows:

- To describe student physical activity levels in relation to content and teacher interventions during physical education classes in selected elementary schools within Buenos Aires, Argentina.
- To determine the influence of selected variables such as the sex of teacher and students, the number of students per class, the school grade, and the infrastructure.
- To determine whether minimum levels of energy expenditure are reached, considering 50% as the minimum for the total percentage of the class with moderate to vigorous physical activity (3 to 6 and up to 9 METS [metabolic equivalents]).

METHODS

Subjects

We observed a total of 359 boys (74 first, 28 second, 94 third, and 163 sixth and seventh graders), and 353 girls (74 first, 28 second, 94 third, and 157 sixth and seventh graders), who participated in 55 physical education classes in private elementary schools located in Buenos Aires City, Argentina. Data were collected between September and November 2006. Students in sixth and seventh grade had their lessons together, and thus they were considered a single group. In the case of first through third grades only mixed

classes (boys and girls together) were observed, with totals of 15 for the first grade, seven for the second grade, and 13 for the third grade. In the case of sixth- and seventh-graders a total of 20 classes were observed, including three mixed, nine for boys, and eight for girls. The mean number of students observed per class was 29.9 (±5.5). The coefficient of variation was 18.47%, and the classes ranged from 20 to 54 in size.

The SOFIT (*System for Observing Fitness Instruction Time*) (McKenzie, 2002; McKenzie, et al., 1995) was the tool used to gather information. It is a simultaneous three-phase system for direct observation that allows gathering information on the physical activity levels of those students under observation in relation with the class content-context and teacher intervention. Detailed procedures for using SOFIT have been published previously (McKenzie, 2002). Briefly, four students are assigned to each observer who observes every twenty seconds and four minutes in total, and then rotates and moves to the second student, and so on, until the end of the class. Of the twenty seconds of observation included in each interval, ten seconds are devoted to the observation itself, and the other ten seconds to recording a single code for each of the three phases, in the form of an observation.

Through the physical activity levels and the application of a validated heart rate observation formula, the levels of energetic expenditure of each student in the class can be obtained (McKenzie, et al., 1995).

Once the observation is finished, all the information is entered in summary form, and using inverted time fractions for each activity level of phase one, the Energy Expenditure Rate (EER), in kcal/kg/min, is obtained according to the following equation (McKenzie, et al., 1995):

EER (kcal/kg/min) = proportion of time lying down x 0.029 kcal/kg/min +
proportion of time sitting x 0.047 kcal/kg/min +
proportion of time standing x 0.051 kcal/kg/min +
proportion of time walking x 0.096 kcal/kg/min +
proportion of time very active x 0.144 kcal/kg/min

Additionally, total class time fractions can be obtained for each variable in phases 2 and 3.

SOFIT has very high validity and reliability coefficients according to previous laboratory and field studies (McKenzie, 2002). Furthermore, it was applied in more than one thousand schools and a longitudinal follow-up was made to more than 1,000 children and adolescents, across the United States.

On the other hand, it is appropriate for use at both the initial level and elementary and high school education (McKenzie, 2002). Therefore, it is an objective tool used to determine the quality of Physical Education classes at school.

Procedure

Data was collected by 10 observers and each class was observed by three or four of them. All of the observers completed an extensive training program that was approximately 24 hours in length and included classroom sessions, videotaped assessment, and field practice. Inter-observer reliability coefficient for each observer, and for each phase taken independently exceeded 0.90. The coefficient was obtained through the following

general formula: the total number of agreements/total number of observed intervals (McKenzie, 2002; McKenzie, et al., 1995).

There were three independent variables: the number of students per class, grade attended, and sex (male or female). The five levels of student activity (dependent variables) were lying down, sitting, standing, walking, and very active. The study obtained the EER in kcal/kg/min and examined the following variables as part of phase 2: general content, general knowledge, physical fitness knowledge, fitness, skill practice, game play, and free play. For phase 3 it examined "promotes fitness," "demonstrates fitness," "instructs generally," "manages," "observes," and "other tasks". Rather than using absolute time, the investigators used observation intervals and expressed results as percentages of total intervals (McKenzie, 2002; Nader et al., 1997) because it was more clear and useful when making comparisons.

Statistics

The statistical analysis was performed using SPSS 13.0 (SPSS Inc., Chicago, Illinois, USA).

For all the dependent variables, the data were expressed as mean ±SD. The Student *t* test was used to compare girls' and boys' classes in the sixth-seventh grades (the only situation in which there were classes restricted to a single sex). Before application of the *t* test, the Levene test was performed to prove the homogeneity of the variances in the contrasted distributions. In addition, multiple correlations were performed between selected variables: number of students per class, duration of each lesson in minutes, the proportion of walking in class, proportion of "very active" in class, and EER.

The Kruskall-Wallis test was performed to determine whether there were significant differences in the sixth and seventh grades combined between classes made up of boys, of girls, and mixed classes and to assess all of the dependent variables relative to sex as the independent variable. The Kruskall-Wallis test was also used to determine whether there were significant differences between the mixed classes in the first, second, third, and sixth/seventh grades for all the dependent variables relative to the independent variable of grade attended (Alvarez Cáceres, 1995; Ferrán Aranaz, 1996). A p value <0.05 was considered statistically significant.

RESULTS

In terms of student activity, 1.73% of the total intervals observed were devoted to lying down (*SD*: 2.4%, range: 0−14.8%). Sitting accounted for 27.4% (*SD*: 14.28%, range: 0−53.3%). Standing represented 24.3% (*SD*: 10.15%, range: 1.1−53.3%). Walking accounted for 11.4% (*SD*: 8.1%, range: 0−31.3%). Finally, being very active accounted for 35.17% (*SD*: 13.27%, range: 8.2−64.5%). Thus, moderate to vigorous activity (the sum of walking and being very active) accounted for 46.57% of the total observation intervals. The mean EER was 0.0872 (±0.002) kcal/kg/min (range: 0.049−0.18).

In all, 38.9% of the observation intervals for phase 2 (lesson context) were invested in management activities, transition, and breaks (that is, general content). By category, the values were as follows: general content: 38.9% ± 20.2% (0−82.6%); general knowledge: 15.5% ± 11.5% (0−43.5%), physical fitness knowledge: 2.7% ± 6.3% (0−27.7%), fitness:

5.9% ± 10.8% (0−49.6%), skill practice: 16.5% ± 18.0% (0−54.1%), game play: 20.3% ± 27.0% (0−88.1%), and free play: 0.4% ± 1.5% (0−10.3%).

In terms of phase 3 (teacher behavior), the values were as follows: 41.9% of the total intervals (*SD*: 24.5%, range: 0.7−85.2%) were devoted to "instructs generally"; 29.7% were for "manages" (*SD*: 18.0%, range: 0−71.7%); 15.5% (*SD*: 11.5%, range: 0.45−39.1%) were represented by "observes"; 8.8% (*SD*: 15.7%, range: 0−53.4%) were made up of "promotes fitness"; 2.5% (*SD*: 3.7%, range: 0−21%) went to other tasks; and 1.7% (*SD*: 4.9%, range: 0−26.7%) went to "demonstrates fitness."

In the analyses of sixth- and seventh-grade students who attended lessons grouped by sex, several significant differences were noted. In level 3 (standing) of phase 1, the mean percentage (of intervals observed) for girls was 37%, with boys at 14% (t = 5.61, p = 0.0001), and in level 4 of phase 1 (walking) the mean percentages were 23% for boys and 11% for girls (t = 3.03, p = 0.008). The EER did not differ significantly by sex. For phase 2 (context), there were significant differences for fitness (girls, 14%; boys, 3%, t = .-3.05, p = 0.008) and in game play (boys, 60.7%; girls, 30.8%, t = 2.32, p = 0.035).

The examination of multiple correlations between the number of students per lesson, duration of the lessons, proportion of the lesson spent walking, proportion of the lesson spent being very active, and the EER revealed a significant association only between the proportion spent being very active and the EER (r = 0.963, p =0.0001); this was expected.

The results of applying the Kruskal-Wallis test to determine differences between classes of boys, girls, and mixed classes (sixth and seventh grades only) by dependent variables are shown in Table 1 (only the significant findings are shown).

Table 1. Significant Differences by Group (Boys, Girls, Mixed) among Sixth- and Seventh-Grade Students by Kruskal-Wallis Test.

Dependent Variable	Chi-Square	p
Phase 2 – general content	7.759	0.021
Phase 2 – fitness	12.158	0.002
Phase 2 – game play	8.387	0.015
Phase 3 – demonstrates fitness	9.721	0.008

The values for the means shown in Table 2 reveal that for general content, fitness, and game play (all of phase 2) and for "demonstrates fitness" (phase 3), there were significant differences between the groups. Specifically, for general content, fitness, and "demonstrates fitness" the mean was highest for mixed classes, while for game play it was the highest for the boys' classes.

Application of the Kruskal-Wallis test to determine whether there were significant differences according to grade in mixed classes revealed several differences, as demonstrated in Table 3. These differences were in standing and in being very active (phase 1), in general content, physical fitness knowledge, fitness, skill practice, and game play in phase 2, in promotes fitness, demonstrates fitness, and observes in phase 3, and in EER.

Table 2. Mean Percentages of Total Intervals for Variables with Significant Differences by Group (Sixth- and Seventh-Graders).

Variable	N (Classes)	Mean %
General content (phase 2)		
Boys	9	7.22
Girls	8	11.8
Mixed	3	18
Fitness (phase 2)		
Boys	9	6
Girls	8	12.5
Mixed	3	18.67
Game play (phase 2)		
Boys	9	14
Girls	8	9.38
Mixed	3	3
Demonstrates Fitness (phase 3)		
Boys	9	7.5
Girls	8	10.69
Mixed	3	19
Total	20	

Table 3. Significant Differences by Grade (Mixed Lessons Only) for Variables of Interest in Percentage of Total Intervals.

Dependent Variable	Chi-Square	p
Phase 1 – standing	9.044	0.029
Phase 1 − very active	11.131	0.011
EER (kcal/kg/min)	12.177	0.007
Phase 2 – general content	9.48	0.024
Phase 2 − physical fitness knowledge	17.188	0.001
Phase 2 − fitness	15.307	0.002
Phase 2 − skill practice	7.878	0.049
Phase 2 − game play	9.464	0.024
Phase 3 − promotes fitness	12.59	0.006
Phase 3 − demonstrates fitness	24.89	0.000
Phase 3 – observes	13.93	0.003

The results of applying the Kruskal-Wallis test to determine differences by grade attended in mixed classes are presented in detail in Table 4. Grade 1 had the highest values for being very active (phase 1), EER, skill practice (phase 2), and game play (phase 2).

Table 4. Significant Differences by Grade among Mixed Classes in Percentage of Total Intervals, by Kruskal-Wallis Test.

Dependent Variable	Grade	N (Classes)	Mean %
Phase 1 − standing	1	15	13.73
	2	7	18.43
	3	13	24.46
	6/7	3	29.33
Phase 1 − very active	1	15	26.6
	2	7	17.86
	3	13	12.85
	6/7	3	16.67
EER (kcal/kg/min)	1	15	27
	2	7	17.14
	3	13	12.69
	6/7	3	17
Phase 2 − general content	1	15	12.87
	2	7	24.57
	3	13	24.54
	6/7	3	19
Phase 2 − physical fitness knowledge	1	15	17.07
	2	7	16
	3	13	20.46
	6/7	3	35.67
Phase 2 − fitness	1	15	15.13
	2	7	22.71
	3	13	18.92
	6/7	3	36.33
Phase 2 − skill practice	15	24.33	
	2	7	17.57
	3	13	18.08
	6/7	3	6
Phase 2 − game play	1	15	25.4
	2	7	17.64
	3	13	15.54
	6/7	3	11.5
Phase 3 − promotes fitness	1	15	16.67
	2	7	15.14
	3	13	21.31
	6/7	3	36
Phase 3 − demonstrates fitness	1	15	16.5
	2	7	24.43
	3	13	16.5
	6/7	3	36
Phase 3 − observes	1	15	11.8
	2	7	26
	3	13	25.69
	6/7	3	16

Note: Only those variables with significant differences are shown.

DISCUSSION

Because the number of observed lessons was quite modest (only 55), this work is considered to be an exploratory approximation for examining the content of lessons in physical education among elementary school children in Argentina. The small scale of the study notwithstanding, we found much material of interest through the application of the SOFIT. First, we found that MPVA (moderate to vigorous physical activity) accounted for an average of 46.6% of the total observation intervals, or slightly lower than the 50% suggested as the threshold for energy expenditure during a physical education lesson (Rowe, Schuldheisz & Van der Mars, 1997).

We also found no significant difference between the sexes regarding the EER. The fact that first-graders had a significantly higher EER than the other analyzed grades is also of particular interest.

Regarding phase 3 of the SOFIT (teacher involvement), good pedagogical work could be observed, with teaching being the dominant activity followed by management and observation of the lesson. From our study of sixth and seventh graders we can conclude that while in mixed classes more activities related to the development of fitness were performed and there was less playing of games, in classes restricted to boys the opposite tendency could be observed. Again, the small scale of the study notwithstanding, these findings should be of interest. By grade (in mixed classes), we can conclude that while students in the sixth and seventh grades were more likely to perform activities for fitness development, in the first, second, and third grades there was more performance of activities connected with the development of motor skills and playing games, as would be expected.

In terms of the conduct of the study, the variability in the length of the lessons (mean: 27.082 ± 4.480 minutes) suggests that using the percentage of total intervals rather than absolute minutes was a desirable choice. No analyses were conducted based on the sex of the teacher, as 47 of the 55 lessons were conducted by men, and the eight lessons conducted by the one female teacher were restricted to girls in the sixth and seventh grades. No comparisons were made by location of the lesson, as all of the lessons took place in gymnasiums and open sites.

In earlier work, Pope and colleagues (Pope et al., 2002) found that MPVA accounted for 52.4% of the total lesson time for boys and girls in the third to fifth grades. In contrast, McKenzie et al. found an average of just 36.2% for MPVA in their study of third graders in four states in the U.S. (McKenzie et al., 1995). In a more recent study by McKenzie and colleagues, boys were more physically active than girls in activities outside of school, but few comparisons were made between the sexes during physical education using an objective measure (McKenzie; Prochaska; Sallis & Lamaster, 2007). In that study, in which accelerometers were used, girls and boys showed similar physical activity rates during mixed fifth-grade lessons, but boys were significantly more active during break times.

Nader and co-workers., in a study applying SOFIT in a study involving third-grade boys and girls, found that MPVA accounted for an average 37% of total observation intervals, with a significant difference between boys (38.3%) and girls (35.6%). The EER (in kcal/kg/min) was 0.0747 for boys and 0.0725 for girls (Nader et al., 1997).

In a study published in 1997, McKenzie et al. looked at physical education classes in the fourth and fifth grades in seven different schools, with teachers divided into three groups: no specific physical education training (CT), specific physical education training

(TCT), and physical education teachers (PET). The mean values (percentage of total observation intervals) for MVPA were 48.4% for CT, 50.5% for TCT, and 50% for PET; for EER (in kcal/kg/min), the averages were 0.0873 for CT, 0.0902 for TCT, and 0.091 for PET. None of these differences were significant (McKenzie; Sallis; Kolody & Faucette, 1997).

In a study by Scruggs, a total of 257 boys and girls in grades 1−4 were divided into two groups (n = 126 for grades 1 and 2 and 131 for grades 3 and 4). In terms of total observation intervals spent in MPVA the percentages were as follows: grades 1−2, 31.36% for boys and 29.29% for girls; grades 3−4: 36.37% for boys and 33.81% for girls (Scruggs; Beveridge; Watson & Clocksin, 2005).

It can be concluded that although the value for MPVA of 46.6% found in the present study is below the 50% set forth in Healthy People 2010, it is among the highest rates reported in the literature. In terms of phase 2 (lesson context) of SOFIT, the relative values for game play (20.3%), skill practice (16.5%), and general knowledge (15.5%) are congruent with the grades studies. The high amount of time invested in management, transition and breaks (38.9%) should be noted. Nader et al., in their work on third graders, reported the following values for the variables in phase 2: general |content, 21%; general knowledge, 13.6%; physical fitness knowledge, 0%; fitness, 14.4%; skill practice: 15.2%; game play, 33.8%; and free play, 2.1% (Nader et al., 1997). Thus, unlike in the present study, they found game play to prevail and general content to follow. Further, although the percentage for fitness was not high (14.4%), it was much higher than in the present study (5.9%). The only significant difference between the McKenzie (Mc Kenzie et al., 1995) and Nader (Nader et al., 1997) studies of third-graders was in the fitness values: 21.8% in McKenzie and 14.4% in Nader.

Finally, in their study published in 1997, McKenzie and co-workers reported values of 36.1% for fitness, only 13.6% for general content, 25.4% for skill practice, and 13.2% for game play (McKenzie; Sallis; Kolody & Faucette, 1997). The present study mostly agrees with this report except for the high value of general content (38.9%).

CONCLUSION

In conclusion, SOFIT has been found to be a powerful tool for understanding Physical Education in the elementary school setting, one that can contribute significantly to the quality control of lessons in physical education. In the near future, SOFIT needs to be applied to different samples at diverse educational levels and at different times during the school term because of the influence of the time of year in which this tool is applied. It is worth highlighting that an adequate diagnosis is the starting point to making interventions of schools and their teachers as effective as possible. The physical education lesson should be considered not only as a pedagogical intervention but also as a health intervention leading to the promotion of regular physical activity among children and adolescents.

Then, we conclude that the school can appropriately be seen as a social institution whose primary responsibility is to a guarantee a better quality of life for the population, both in the present and, by teaching habits for adulthood, in the future.

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POTROŠNJA ENERGIJE I KVALITATIVNI ASPEKTI ČASOVA FIZIČKOG VASPITANJA U BUENOS AIRESU, ARGENTINA

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Ciljevi ovog rada bili su da se opišu nivoi fizičke aktivnosti u odnosu na njihovu sadržinu i uticaj nastavnika, i uticaj određenih varijabli, tokom časova fizičke kulture u osnovnim školama u Buenos Airesu, Argentina. U istraživanju korišćen je SOFIT (system za posmatranje vremena posvećenog instrukcijama za fitness), kao validan metod obzervacije. To je složeni system koji se zasniva na posmatranju učeničke aktivnosti, sadržine nastave i uticaja nastavnika. Autori su analizirali svaku fazu koristeći procenat intervala posmatranja. Ukupno je učestvovalo 359 dečaka i 353 devojčica, starosti 6−12. Proučavan je stepen potrošnje energije (EER) tokom časova (N = 55 časova). Uticaj tipa grupe (mešovita, dečaci, devojčice) i razreda koji učesnici pohađaju utvrđen je Kruskall-Wallis testom ($p<0.05$). Među decom iz šestog i sedmog razreda koji su bili u jednorodnim odelenjima, devojčice su provodile više vremena stojeći, a dečaci hodajući. Među svim đacima, procenat vremena koji su provodili u umerenim ili žustrim fizičkim aktivnostima (MVPA) bio je 46.57%. Srednja vrednost EER je 0.0872 (± 0.002) kcal/kg/min. Uopšteno gledajući, tokom faze 2-, sadržaj opšteg tipa (upravljanje, prelazi, i pauze) činio je 38.9%, dok je igra bila na drugom mestu (20.2%). U fazi 3-, "uopšteno daje instrukcije" bilo je na prvom mestu (41.9% posmatranih intervala). U svim varijablama, značajne razlike pronađene su samo među učenicima šestog i sedmog razreda. Učenici prvog razreda imali su najveću srednju vrednost EER. Procenat MVPA nešto je niži od onog koji se preporučuje u Sjedinjenim Američkim Državama, 50%. Ovi rezultati bi trebalo da imaju široku primenu u planiranju časova fizičke kulture u školama.

Ključne reči: *SOFIT, fizička kultura, fizička aktivnost, zdravlje*