Original Article

Does a Physical Education-based fitness program benefit everyone regardless of the students' physical fitness profile? A cluster-randomized controlled trial

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Published online: May 30, 2020

(Accepted for publication: May 18, 2020)

DOI:10.7752/jpes.2020.03213

Abstract:

The objective of the present study was to compare the effect of a Physical Education-based physical fitness program on physical fitness and physical activity levels among secondary school students with healthy and unhealthy physical fitness profile. One hundred and seven students (final sample 95, 48% females; $M_{age} = 12.39 \pm 0.75$) from five pre-established classes of 7th-8th grade of Secondary Education were cluster-randomly assigned into control group ($n = 19$) or experimental group ($n = 76$). Then, according to students' cardiorespiratory fitness baseline, the experimental group was divided into healthy and unhealthy physical fitness profiles. The experimental group students performed a physical fitness program twice a week for nine weeks. The control group worked a different content during the same time and with the same frequency, but without emphasizing on the physical fitness improvement. Before and after the physical fitness program, students' physical fitness was objectively measured by the 20-meter shuttle run test. Participants' physical activity levels were objectively measured through a heart rate monitor (Polar RS300X, Finland) during Physical Education sessions. Results of the one-way analysis of variance showed that both students with healthy and unhealthy physical fitness profiles statistically significantly improved their physical fitness levels after the program ($p < 0.01$) and had higher statistically significantly physical activity levels during the Physical Education sessions ($p < 0.01$). Although a Physical Education-based physical fitness program seems to have a similar effect on students with different physical fitness profiles, students with an unhealthy profile obtain more benefits on physical activity levels during the Physical Education sessions.

Key Words: Educative intervention, Physical activity, cardiorespiratory endurance, adolescents, baseline level.

Introduction

Physical activity (PA) is considered an important life-style factor for health promotion during adolescence (World Health Organization, 2014). Among adolescents, moderate-to-vigorous PA (MVPA) is strongly and positively associated with numerous health markers such as adiposity, cardiometabolic biomarkers (e.g., insulin resistance or cholesterol), or bone health; with physical fitness (Poitras et al., 2016), as well as with better mental health (Biddle, Ciacconi, Thomas, & Vergeer, 2019). Adolescents should achieve at least 60 min of MVPA daily (World Health Organization, 2014). However, on average, this recommendation is only met by approximately 19% of adolescents worldwide (22% of males and 16% of females) (Guthold, Stevens, Riley, & Bull, 2020; World Health Organization, 2014).

Schools, and specifically Physical Education (PE) subject, are considered a key setting for increasing students' PA levels, and its consequent benefit on their physical fitness levels (Association for PE, 2015), due to its compulsory character and the guidance by capable professionals (Viciana, Martínez-Baena, & Mayorga-Vega, 2015). Previous studies have shown that students had higher MVPA levels on school days with PE than on non-PE days (Calahorra-Cañada, Torres-Luque, López-Fernández, & Carnero, 2016; Mayorga-Vega, Martínez-Baena, & Viciana, 2018; Viciana, Mayorga-Vega, & Parra-Saldías, 2017). The Association for PE recommends that students should be implicated in at least 50% of the PE session time in MVPA (Association for PE, 2015). Unfortunately, in secondary education this recommendation is hardly ever met (on average, students are involved in MVPA 40.5% of the session time, Hollis et al., 2017), except when the PE sessions are concretely designed to improve students' MVPA levels (Lonsdale et al., 2013).

MVPA is positively associated with adolescents' physical fitness (Marques, Santos, Ekelund, & Sardinha, 2015). During adolescence, higher physical fitness levels are associated with better quality of life (Evaristo et al., 2019) and academic performance (Ruiz-Ariza, Grao-Cruces, de Loureiro, & Martínez-López, 2017). Unfortunately, nowadays unhealthy physical fitness is a worldwide issue which affects a high proportion

of adolescents (on average, 33% of males and 46% of females), increasing this proportion considerably every year (8% and 10% for males and females, respectively) (Piccino & Colella, 2014; Tomkinson et al., 2016). Thus, healthy physical fitness levels during adolescence should be promoted through different settings such as sports programs or in school (Tomkinson et al., 2016). In this sense, PE plays an important role in the increasing of students' physical fitness levels (Guijarro-Romero, Casado-Robles, & Mayorga-Vega, 2019). However, several problems make it difficult to achieve an increase in physical fitness levels in the PE setting (e.g., large volume of curricular contents to deliver during the school year, limited curriculum time allocation to PE subject, or heterogeneous level of the students) (Guijarro-Romero et al., 2019; Hardman, Murphy, Routen, & Tones, 2014). Despite these limitations, previous studies have shown that it is possible to improve average students' physical fitness levels during PE (Costa et al., 2016; Mayorga-Vega, Montoro-Escañó, Merino-Marban, & Vicianá, 2016; Minatto, Barbosa Filho, Berria, & Petroski, 2016).

Nevertheless, due to the heterogeneity of the classes related to educational context (Mayorga-Vega & Vicianá, 2015), PE-based fitness programs applied in the aforementioned studies (Mayorga-Vega et al., 2016; Minatto et al., 2016) could not benefit all students in terms of PA and physical fitness levels. For instance, the magnitude effect of a PA program is negatively associated to the physical fitness baseline (Resaland, Andersen, Mamen, & Anderssen, 2001). Likewise, Mayorga-Vega and Vicianá (2015) found that after a physical fitness program, only students with lower physical fitness levels improved. However, these authors divided the experimental group by a statistical criterion (i.e., percentile 50) instead of divide them based on students' healthy or unhealthy physical fitness profile. Additionally, they did not examine the effect on students' PA levels. To our knowledge there are no previous studies that examine the effect of a PE-based physical fitness program on both physical fitness and PA levels among students with healthy and unhealthy physical fitness levels. Consequently, the aims of this study were to compare the effect of a PE-based physical fitness program on physical fitness levels achieved and PA levels during the PE sessions among secondary school students with healthy and unhealthy physical fitness profiles.

Material & methods

Study design

The present study is reported according to the current CONSORT guidelines for cluster randomized trials (Campbell, Piaggio, Elbourne, & Altman, 2012). The protocol conforms to the Declaration of Helsinki statements (64th WMA, Brazil, October 2013). The Ethical Committee for human studies of the University of Granada approved the present study protocol. Recruitment was carried out in June of 2017, and the intervention was done from September to December of 2017. For practical reasons and because of the nature of the present study (i.e., established classes from an educational setting) a cluster-randomized controlled trial was used (i.e., randomization was per classes not per individuals) (Guijarro-Romero, Mayorga-Vega, & Vicianá, 2018; Mayorga-Vega et al., 2016). This study was non-blinded (treatments were not masked from the students or teachers), and parallel-group (study with two different treatments; Spieth et al., 2016), with two evaluation phases.

Participants

The principal and the PE teacher of a state secondary school chosen by convenience of the city of Membrilla (Castilla-La Mancha, Spain) were consulted for the implementation of the study. They were informed about the study, and permission to conduct it was requested. After school approvals were obtained, all the 107 students (55 males and 52 females) from the seventh to eighth grade of secondary education (i.e., 12-14 years old) of the selected school center were invited to participate in the present study. Adolescents and their legal guardians were fully informed about the characteristics of the project. Before taking part in the study, participants' signed written informed assent and their legal guardians' signed written informed consent were obtained. According to the center's reports, all the students' families had a middle socioeconomic level.

The inclusion criteria were: (1) being enrolled in the first to second grades of the secondary education level; (2) participating in normal PE sessions; (3) being free of any health disorder or other reasons why students should not undergo PA; (4) presenting the corresponding signed consent by their parents or legal tutors, and (5) presenting the corresponding signed assent by the students. The exclusion criteria were: (1) not having performed all the dependent variables correctly following their rules of administration, and (2) not having an attendance rate equal to or over 85% during the fitness program.

Sample size

Based on the main dependent variable (i.e., cardiorespiratory fitness), and assuming independency of observations as previous personal related (unpublished) studies have shown, a priori sample size calculation was estimated with the G*Power Version 3.1.9.4 for Windows. Parameters were set in a conservative manner as follows: effect size $f = 0.15$, significance level $\alpha = 0.05$, statistical power $(1 - \beta) = 0.80$, and correlation among repeated measures $r = 0.7$. A minimum final sample size of 69 was estimated.

Randomization

Randomization was conducted at the class-level, using a computerized random number generator. Before the pre-intervention evaluation was administered, five established classes of the selected school center (three 7th and two 8th grade classes) were randomly assigned by an independent researcher, blinded to the study objectives to form the study groups: control group (CG, one seventh-grade class) or experimental group (EG, four classes, two seventh- and two eighth-grade). However, according to the education rules, prior to the start of the scholar year the students who composed each of these five classes had been assigned randomly by the school center following the criterion that the classes should be balanced between males and females (i.e., each class should have the same proportion of males and females).

Later, the experimental group students were divided by their maximal oxygen uptake baseline (e.g., healthy or unhealthy fitness zone according to the gender and age-adjusted cut-point values; e.g., 40.3 ml/kg/min for males at the age of 12 years) into two sub-groups: Healthy group (HG) (i.e., $\geq$ healthy fitness zone score), and unhealthy group (UG) (i.e., $<$ healthy fitness zone) (Welk, Laurson, Eisenmann, & Cureton, 2011).

Intervention

The EG carried out a physical fitness program twice a week for nine weeks during the PE sessions. Because of educational contingencies (e.g., meteorological problems), in the end the EG students completed a total of 16 sessions. The sessions were designed and delivered by the PE teacher (15 years of experience) with the supervision of the main researcher according to the established curriculum approved by the school center.

Each intervention session lasted 50 minutes and consisted of a 5-to-10-minute warm-up, 35-to-40-minute main part, and five-minute cool-down. During the warm-up the students carried out low-to-moderate aerobic activities followed by some joint mobility and stretching exercises. In the main part, the EG carried out commonly used PE-based physical fitness sessions (e.g., running games, interval training, fartlek or circuit training) followed by some team games. For example, in the fartlek session students performed different kinds of fartleks (i.e., four times of: five minutes running soft plus one minute running fast) during 25 minutes, followed by team relay races for 10 minutes. In the cool-down students carried out low intensity exercises (e.g., walking slowly around the sports court). The PE teacher placed special emphasis on reaching a moderate-to-vigorous intensity during the main part of the sessions.

With regard to the CG students, they also carried out PE sessions twice a week during the intervention period, with a similar structure as EG (i.e., 5-to-10-minute warm-up, 35-to-40-minute main part, and five-minute cool-down). However, the content (basketball and hockey instead of physical fitness) and methodology followed during the main part of the sessions were different (mostly based on technique-learning practice and/or recreation, and without any special focus on PA intensity). For example, during both basketball and hockey sessions, students had to learn how to perform correctly technical aspects such as passing or throwing the ball.

Measures

Data collection was carried out during the PE session time by the same tester, instruments, and protocols. Prior to carried out the intervention, students' gender and age information were obtained from the school reports. Additionally, students' anthropometric measures were taken. Regarding physical fitness evaluation, it was carried out during a PE session immediately before (pre-intervention) and after (post-intervention) the physical fitness program. The physical fitness measurements were taken on the same day of the week, at the same time for each student, in an indoor sports facility with a non-slippery floor. Prior to the evaluation, the participants completed a standardized warm-up consisting of five minutes of running from low-to-moderate intensity followed by some joint mobility exercises.

Anthropometric. Participants' body mass and height were measured in shorts, T-shirts, and barefoot following the *International Standards for Anthropometric Assessment* protocol (Stewart, Marfell-Jones, Olds, & De Ridder, 2011). For measuring body mass, the participant stood in the center of the scale (Seca, Ltd., Hamburg, Germany; accuracy = 0.1 kg) without support and with the weight distributed evenly on both feet. For the body height assessment, participants stood with their feet together with the heels, buttocks and upper part of the back touching the stadiometer (Holtain Ltd., Crymmych, Pembrokeshire, United Kingdom; accuracy = 0.1 cm), and with the head placed in the Frankfort plane. Two measurements of both body mass and height were performed and the average of each was calculated. Then, the body mass index was calculated as body mass divided by body height squared (kg/m^2).

Physical fitness. Cardiorespiratory fitness was assessed through the 20-meter shuttle run test (Léger, Mercier, Gadoury, & Lambert, 1988). Participants ran between two parallel lines placed 20 meters apart, in a progressive rhythm marked by a recorded beep until they were not able to reach the line two consecutive times. During the test each participant wore a heart rate monitor (Polar® RS300X, Finland). In order to ensure the test maximality, only the scores of participants who reach a heart rate value equal to or higher than 90% of estimated maximum heart rate (Mahar, Welk, & Rowe, 2018) were used. The maximum heart rate was estimated by the following equation: $209 - 0.7 \times \text{age}$ (in years) (Shargarl et al., 2015). The total number of completed laps (n)

and time (in seconds) were retained. Then, the maximal oxygen uptake (in ml/ kg/ min) was estimated using the following equation: $31.025 + 3.238 \times \text{speed} - 3.248 \times \text{age} + 0.1536 \times \text{speed} \times \text{age}$ (speed expressed in km/h and age in the lower rounded integer) (Léger et al., 1988).

Finally, the absolute (post-intervention – pre-intervention) and relative $[(\text{post-intervention} - \text{pre-intervention}) \times 100] / \text{pre-intervention}$ change scores of the maximal oxygen uptake, and total time-based performance were calculated. The 20-meter shuttle run test has demonstrated adequate reliability and criterion-related validity among secondary students (e.g., ICC = 0.89; $r_p = 0.78$) (Léger et al., 1988; Mayorga-Vega, Aguilar-Soto, & Viciana, 2015).

Physical activity. The students' heart rates were monitored during the PE sessions (Hellin, Garcia-Jimenez, & Garcia-Pellicer, 2019; Martínez-López, Moreno-Cerceda, Suárez-Manzano, & Ruiz-Ariza, 2018; Szakály et al., 2016) according to the protocol followed in previous studies (Mayorga-Vega et al., 2016). In each research group, five students per class were randomly selected to wear a heart rate monitor (Polar RS300X, Finland). These five students were different in each lesson, for example, in the second lesson five students different from the first lesson wore the heart rate monitor, and so on until all students' work intensity of the same class were measured.

Therefore, all students' PA was monitored about two or three times during the intervention period. Average heart rate (beats per minute and percentage of estimated maximum heart rate), total PA (percentage of total time involved in an intensity equal to or over 50% of estimated maximum heart rate) and MVPA (percentage of total time involved in an intensity equal to or over 70% of estimated maximum heart rate) were calculated. Then, students were also categorized as meeting or not the recommendation of achieving at least 50% of the PE session time in MVPA (Association for PE, 2015).

Statistical analysis

Data were reported as mean (standard deviation), and displayed as mean (standard error) in the Figures. All the statistical tests' assumptions were first checked and met for each dependent variable by common procedures (e.g., histograms and normal Q-Q plots for normality). After exploring if recorded descriptive variables would contaminate in the analysis of variance (ANOVA) models (i.e., grade, age, gender, body height, body mass, body mass index, and attendance), none of them showed a contamination effect. Then, one-way ANOVA were used to examine the effect of the PE-based fitness program on physical fitness and PA levels between the students from the three groups (CG, HG, UG).

Subsequently, the *post-hoc* with the Bonferroni adjustment was used for pairwise comparisons. The chi-square test was calculated to analyze the effect of the program on the percentage of students that met the MVPA recommendation during the PE sessions between the three groups. Effect sizes were estimated using the partial eta squared (η_p^2)/Cohen's *d* and Cramer's *V* for continuous and dichotomous variables, respectively (Field, 2017). All statistical analyses were carried out using the SPSS Version 21.0 for Windows (IBM® SPSS® Statistics) setting the statistical significance level at $p < 0.05$.

Results

Final sample and general characteristics

Figure 1 shows a flow chart corresponding to the participants included in the present study. Although all the invited 107 students (48.6% females) agreed to participate and met the inclusion criteria, finally 95 students (48% females) satisfactorily passed the exclusion criteria and were analysed. No participant was lost because of the rejection to continue in the study or change of the school.

Table 1 shows the general characteristics of the included participants. The HG, UG, and CG participants obtained an average attendance of 95%, 94%, and 89% in the fitness program, respectively.

Table 1. General characteristics of the included participants.

	Control group (<i>n</i> = 19)	Unhealthy group (<i>n</i> = 20)	Healthy group (<i>n</i> = 56)	Total (<i>N</i> = 95)
Age (years)	11.84 (0.69)	12.55 (0.69)	12.52 (0.71)	12.39 (0.75)
Gender (males/females)	53/47	25/75	61/39	52/48
Body height (m)	1.45 (0.06)	1.51 (0.09)	1.49 (0.07)	1.49 (0.08)
Body mass (kg)	49.49 (9.93)	56.76 (14.04)	46.02 (7.73)	48.98 (10.58)
Body mass index (kg/m ²)	23.49 (4.13)	24.82 (4.32)	20.52 (2.48)	22.02 (3.75)

Note. Data are reported as mean (standard deviation) for age, body height, body mass and body mass index variables, or percentage for gender variable.

Figure 1. Flow chart of the school classes and participants of this study. All numbers are school classes [students].

Physical fitness

Figure 2 shows the comparison of the effect of a PE-based fitness program on physical fitness levels between the three groups. Results of the one-way ANOVA showed overall statistically significant differences between the three groups [maximal oxygen uptake (ml/kg/min): $F_{2,92} = 10.104$; $p < 0.001$; $\eta^2_p = 0.180$; maximal oxygen uptake (%): $F_{2,92} = 10.881$; $p < 0.001$; $\eta^2_p = 0.191$; total time-based performance (s): $F_{2,92} = 11.881$; $p < 0.001$; $\eta^2_p = 0.205$; total time-based performance (%): $F_{2,92} = 15.034$; $p < 0.001$; $\eta^2_p = 0.246$].

Subsequently, *post-hoc* analyses showed that both the students with healthy and unhealthy physical fitness profiles statistically significantly improved their physical fitness levels [maximal oxygen uptake (ml/ kg/ min), maximal oxygen uptake (%), total time-based performance (s), and total time-based performance (%)] compared with the control group students (HG vs. CG, $p < 0.001$, $d = 0.62$, 0.62 , 0.58 and 0.63 ; UG vs. CG, $p < 0.01$, $d = 0.57$, 0.64 , 0.49 and 0.84).

However, statistically significant differences between the students with healthy and unhealthy physical fitness profiles were not found (HG vs. UG, $p > 0.05$, $d = 0.05$, -0.02 , 0.09 and -0.22).

Figure 2. Comparison of the effect of the Physical Education-based fitness program on maximal oxygen uptake (ml/ kg/ min, A; %, B) and total time-based performance levels (s, C; %, D) between the three groups. CG = Control group; UG = Unhealthy physical fitness profile group; HG = Healthy physical fitness profile group. Results of the one-way analysis of variance (all $p < 0.001$) followed by the pairwise comparisons with the Bonferroni adjustment: UG/ HG vs. CG (***) $p < 0.001$, ** $p < 0.01$).

Physical activity

Figure 3 shows the comparison of the effect of the PE-based fitness program on PA levels in PE sessions between the three groups. Results of the one-way ANOVA showed overall statistically significant differences between the three groups [heart rate (bpm): $F_{2,92} = 42.416$; $p < 0.001$; $\eta^2_p = 0.480$; heart rate (%): $F_{2,92} = 42.795$; $p < 0.001$; $\eta^2_p = 0.482$; total PA: $F_{2,92} = 10.156$; $p < 0.001$; $\eta^2_p = 0.181$; MVPA: $F_{2,92} = 47.268$; $p < 0.001$; $\eta^2_p = 0.507$]. Subsequently, *post-hoc* analyses showed that both the students with healthy and unhealthy physical fitness profiles had statistically significant higher PA levels [heart rate (bpm), heart rate (%), total PA (%), and MVPA (%)] than the control group students (HG vs. CG, $p < 0.01$, $d = 2.01, 2.04, 0.55$, and 2.46 ; UG vs. CG, $p < 0.001$, $d = 2.56, 2.60, 0.76$, and 3.34) during the PE sessions. Additionally, the students with an unhealthy physical fitness profile had a statistically significant higher MVPA levels than those with healthy levels ($p < 0.05$, $d = 0.88$). However, for heart rate (bpm and %), and total PA (%), statistically significant differences between the students with healthy and unhealthy physical fitness profiles were not found ($p > 0.05$, $d = 0.55, 0.56$, and 0.21).

Figure 3. Comparison of the effect of the Physical Education-based fitness program on heart rate (bpm, A; %, B), total physical activity (%), and moderate-to-vigorous physical activity levels (%), during the Physical

Education sessions between the three groups. CG = Control group; UG = Unhealthy physical fitness profile group; HG = Healthy physical fitness profile group. Results of the one-way analysis of variance (all $p < 0.001$) followed by the pairwise comparisons with the Bonferroni adjustment: UG/ HG vs. CG (** $p < 0.001$, ** $p < 0.01$) and UG vs. HG (# $p < 0.05$).

Figure 4 shows the comparison of the effect of the PE-based fitness program on the percentage of students that met the MVPA recommendation during the PE sessions between the three groups. Results of the chi-square test on the percentage of students meeting the MVPA recommendation during the PE sessions showed overall statistically significant differences between the three groups ($\chi^2_{2,1} = 22.688$; $p < 0.001$; Cramer's $V = 0.489$). Subsequently, the results of the two x two chi-square test showed that there was a higher percentage of students with the healthy and unhealthy physical fitness levels that met the MVPA recommendation during the PE sessions than in the CG (HG vs. CG, $\chi^2_{1,1} = 13.653$; $p < 0.001$; Cramer's $V = 0.427$; UG vs. CG, $\chi^2_{2,1} = 22.133$; $p < 0.001$; Cramer's $V = 0.753$). In addition, a higher percentage of students with unhealthy physical fitness levels met the MVPA recommendation during the PE sessions than those with healthy levels ($\chi^2_{1,1} = 4.308$; $p < 0.05$; Cramer's $V = 0.238$).

Figure 4. Comparison of the effect of the Physical Education-based fitness program on the percentage of students that met the moderate-to-vigorous physical activity (MVPA) recommendation during the Physical Education sessions between the three groups. CG = Control group; UG = Unhealthy physical fitness profile group; HG = Healthy physical fitness profile group. Results of the chi-squared test (overall $p < 0.001$) followed by the two x two chi-square test comparisons: UG/ HG vs. CG (** $p < 0.001$) and UG vs. HG (# $p < 0.05$).

Dicussion

The first aim of this study was to compare the effect of a PE-based physical fitness program on physical fitness levels among secondary school students with healthy and unhealthy physical fitness profiles. Results of the present study show that both students with healthy and unhealthy physical fitness profiles improved their physical fitness levels after the program. Previous studies have shown that, a short-term fitness program increases average physical fitness levels among adolescents (Mayorga-Vega et al., 2016; Mayorga-Vega, Viciana, & Cocca, 2013). However, the magnitude effect of these programs has been negatively associated to the physical fitness baseline (Resaland et al., 2011). Similarly to this study, Mayorga-Vega and Viciana (2015) examined the effect of a physical fitness program during PE sessions performed twice a week, taking into account the initial physical fitness level. These authors found that only students with low baseline physical fitness improved it after the fitness program. Nevertheless, Mayorga-Vega and Viciana (2015) divided the EG students according to their physical fitness baseline statistically by percentiles (i.e., under P_{50} and equal or over P_{50}). Additionally, they did not consider if these levels were healthy or not. Therefore, the improvements obtained in students' physical fitness could be insufficient to get a healthy fitness profile because they were initially classified by percentiles instead of by criterion-referenced standards (Tomkinson et al., 2016; Welk et al., 2011). Also, they did not examine the time that students spent in MVPA, meaning, the intensity of the sessions could have not been enough for students with a higher baseline level to improve their physical fitness after the fitness program. Thus, it was possible that the aforementioned authors obtained similar results in students with lower baseline levels, but not in those with a higher baseline level.

Resaland et al. (2011) carried out a PA program performed daily during two years with the purpose of showing if students improved their physical fitness levels taking into account their baseline level. They observed that their program produced a higher impact in students with a lower baseline level. However, the frequency of this program was totally different from the time appointed to PE in most countries (i.e., two hours per week) (Hardman et al., 2014). Regarding the magnitude of the effects, the intervention effect size was moderate both

for students with healthy and unhealthy profiles ($d = 0.62$ and 0.57 , respectively). Mayorga-Vega and Viciano (2015) found similar values, but only in students with low baseline levels ($d = 0.45$).

The second purpose was to compare the effect of the PE-based fitness program on PA levels during PE sessions among secondary students with healthy and unhealthy physical fitness profiles. Results of this study showed that after the fitness program, students with healthy and unhealthy physical fitness profiles improved their PA levels (average heart rate, total PA, and MVPA) during PE sessions. However, students with unhealthy physical fitness profile had higher MVPA levels during the PE sessions than those with a healthy physical fitness profile, as well as there being a tendency to significance in the average heart rate and total PA ($p = 0.082$ and 0.077 , respectively). Calahorra-Cañada et al. (2016) analyzed the differences in PA levels during PE sessions regarding students' physical fitness status. Unlike the present study, these authors found that students with healthy physical fitness were more active during PE sessions than those with unhealthy physical fitness. However, these authors carried out a descriptive measure of the students' PA levels, and they did not apply any fitness program.

On the other hand, international recommendations suggest 60 min a day of MVPA (World Health Organization, 2014), and 50% of the PE sessions time involved in MVPA (Association for PE, 2015) for adolescents. Regarding this, previous studies have shown that school days with PE had higher MVPA levels than non-PE days, so that, PE could be considered an important promoter of a healthy lifestyle (Calahorra-Cañada et al., 2016; Mayorga-Vega et al., 2018; Viciano et al., 2017). Results of the present study showed that students spent between 55-70% of PE sessions' time in MVPA. Additionally, results of the present study are in accordance with previous studies that have shown that carrying out a fitness program during PE sessions can improve, on average, 24% of the time that students are involved in MVPA (Lonsdale et al., 2013). However, in most of these studies, the frequency of the intervention was three or more sessions per week, moving away from the most common worldwide educational setting. Moreover, these studies did not differentiate among students with healthy or unhealthy physical fitness profiles and, consequently, the improvements in MVPA levels could be produced in students with both profiles or only in one. Unfortunately, the percentage of PE session time involved in MVPA is lower than the recommended (40.5%) when PE sessions are not specifically designed to improve students' MVPA levels (Hollis et al., 2017).

Regarding the proportion of students who met the recommended of being involved at least 50% of the PE sessions time in MVPA, the present results showed that a higher percentage of students with an unhealthy physical fitness profile met the MVPA recommendations than those with a healthy profile (80% and 50%, respectively). However, the proportion of students who met this recommendation is practically zero when a specific intervention is not designed for this purpose (Viciano et al., 2015). This is a good contribution of the present study (showing the achievement of 50% of the PE session time involved in MVPA through the fitness program). Nevertheless, results regarding the MVPA levels achieved by the healthy and unhealthy students point to the conclusion that individualized teaching is a crucial aspect in PE tasks designs oriented to the increase of students' physical fitness and PA. Moreover, different intensities applied to healthy (higher intensity) and unhealthy (lower intensity) students during the program could cause a similar time involved in MVPA during the sessions and also presumably similar increments of their physical fitness. An example of this individualization could be observed in the circuit organized by Mayorga-Vega et al. (2013), composed by eight tasks with two levels of intensities each. Finally, regarding the intervention effect sizes, the present study showed a similar range of results as previous studies focused on the increase of MVPA levels during PE sessions ($d = 2.46$ to 3.34 , 0.13 to 2.81 , respectively) (Lonsdale et al., 2013).

The strengths of this study were that: a) It is the first study in which students' were divided into healthy or unhealthy physical fitness profiles based on their maximal oxygen uptake baseline (Welk et al., 2011), instead of by statistic criteria such as in Mayorga-Vega and Viciano (2015); and b) this study showed the improvements in PA by physical fitness profiles, differentiating among the healthy or unhealthy physical fitness profiles. Additionally, the present study showed the percentage of students who met the MVPA recommendations during PE sessions. Regarding the limitations, the main limitation was that the maximal oxygen uptake was estimated through a validated equation because it was not feasible to measure it directly. Secondly, the present study was carried out only in a secondary school of a particular place. This particularity limits the possibility of generalization of the obtained results to similar contexts. The third limitation was related with the research design. Due to the fact that for the first independent variable (i.e., fitness program) a cluster-randomized control trial was applied instead of a true randomized control trial (i.e., participants are randomly assigned to groups) and the design used with the second independent variable (i.e., *ex-post-facto*) does not allow for causal relationships, the outcomes of this study should be interpreted with caution (Thomas, Nelson, & Silverman, 2015). Nevertheless, because of the nature of the context (i.e., school) and second independent variable (i.e., cardiorespiratory fitness could not be manipulated), as well as with the objective of keeping the ecological validity, this design was more appropriate for the present research purpose. Future studies could measure maximal oxygen uptake with a portable gas analyzer with the purpose of having a direct measurement of this parameter, and could add information regarding different samples characteristics in order to generalize results.

Conclusions

To our knowledge this is the first study that compares the effect of a PE-based fitness program on physical fitness and PA levels among secondary school students with healthy and unhealthy physical fitness profiles. Although a PE-based fitness program seems to have a similar effect on all the students' physical fitness profiles, students with unhealthy physical fitness profiles benefit considerably more in PA levels during the PE sessions. Furthermore, the students with unhealthy physical fitness profile had higher average MVPA levels during the PE sessions than those with a healthy profile. Additionally, a higher percentage of students with an unhealthy physical fitness profile met the MVPA recommendation during the PE sessions than those with a healthy profile.

Acknowledgments

The authors want to thank you to all the students and the Physical Education teacher who made this research possible. We also thank Aliisa Hatten for the English revision of the manuscript. This work was supported by the Spanish Ministry of Universities [FPU15/02387 (Santiago Guijarro-Romero) and FPU16/03314 (Carolina Casado-Robles)].

Conflicts of interest - The authors declare that there is no conflict of interest.

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