

Original article. Is Physical Education more enjoyable outside than inside the school center?
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Is Physical Education more enjoyable outside than inside the school center? ¿Se disfruta más de la Educación Física fuera que dentro del centro escolar?

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Ethical aspects: 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 (452/CEIH/2017) approved the present study protocol.

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Abstract

Pupils' enjoyment during Physical Education lessons positively affect their physical activity levels in out-of-school contexts. Unfortunately, to our knowledge, no previous studies are examining the effect of a Physical Education-based alternated teaching unit on the possibilities of practicing physical activity inside-outside on the pupils' enjoyment. The aim of the present study was to examine the effect of a Physical Education-based inside-outside alternated teaching unit in pupils' enjoyment levels in Physical Education. One hundred seventy-nine pupils (94 females) aged 13-15 years old were cluster-randomly assigned to the Alternated or Inside groups. The alternated group carried out a four-week alternated teaching unit, twice a week, with one Physical Education lesson inside and one outside the school. Regarding the inside group, it carried out a four-week inside teaching unit, twice a week with Physical Education lessons only inside the school. Pupils' enjoyment towards Physical Education subject was assessed before and after the intervention, as well as at the end of each Physical Education lesson of the teaching unit through the short version of the Spanish version of the Sport Satisfaction Instrument. Results showed that the alternated teaching unit improved pupils' enjoyment in Physical Education subject ($p < 0.01$; $d = 0.65$). Moreover, pupils in the Alternated group reported higher enjoyment values during the outside Physical Education sessions compared to their inside sessions ($p < 0.05$; $d = 0.46$). These findings may guide the design of Physical Education-based programs enjoyable for pupils to promote their physical activity levels.

Keywords: enjoyment; alternated teaching units; secondary education; secondary school students; satisfaction.

Resumen

El disfrute de los estudiantes durante las clases de Educación Física influye positivamente en sus niveles de actividad física en contextos extraescolares. Desafortunadamente, hasta donde sabemos, no existen estudios previos que examinen el efecto de una unidad didáctica alternada en Educación Física de práctica de actividad física dentro y fuera del centro sobre el disfrute de los estudiantes. El objetivo fue examinar el efecto de una unidad de enseñanza alternada dentro-fuera basada en la Educación Física en los niveles de disfrute de los alumnos en Educación Física. Ciento setenta y nueve estudiantes (94 mujeres) de 13 a 15 años fueron asignados aleatoriamente al grupo Alternado o Dentro. El grupo Alternado realizó una unidad didáctica alternada de cuatro semanas, dos veces por semana, con una clase de Educación Física dentro y otra fuera del centro. En cuanto al grupo Dentro, realizó una unidad didáctica de cuatro semanas, dos veces por semana, exclusivamente con clases de Educación Física dentro de la escuela. Se evaluó el interés de los estudiantes por la asignatura de Educación Física antes y después de la intervención, así como al final de cada sesión de Educación Física a través de la versión corta de la versión en español del *Sport Satisfaction Instrument*. Los resultados mostraron que la unidad didáctica alternada mejoró el disfrute de los estudiantes hacia la asignatura de Educación Física ($p < 0,01$; $d = 0,65$). Además, los estudiantes del grupo Alternado reportaron mayores valores de disfrute durante las sesiones de Educación Física fuera del centro escolar en comparación con las sesiones de dentro ($p < 0,05$; $d = 0,46$). Estos hallazgos podrían orientar el diseño de programas de Educación Física que resulten agradables a los estudiantes para promover sus niveles de actividad física.

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Palabras clave: disfrute; unidades didácticas alternadas; educación secundaria; estudiantes de secundaria; satisfacción.

Introduction

Despite the regular practice of physical activity (PA) is considered a powerful health indicator in school-aged children, and its well-recognized benefits (e.g., reduce the likelihood of obesity and diabetes, or improvements in academic achievement) (World Health Organization, WHO, 2020), worldwide, about 80% of school-aged children do not meet the daily recommendation of 60 minutes of moderate-to-vigorous PA (Guthold, Stevens, Riley, & Bull, 2020). Moreover, previous studies have demonstrated a decline in PA levels as age progresses (Corder et al., 2019). Therefore, nowadays the promotion of PA practice among school-aged children is a health priority (OECD/WHO, 2023). For this reason, Physical Education (PE) subject has been recognized as an ideal setting to encourage pupils to be physically active in both in-school and out-of-school contexts, promoting the acquisition of lifelong healthy PA habits (OECD/WHO, 2023). Furthermore, this acquisition is also included as a primary aim to achieve throughout the Secondary Education stage in the PE subject in most countries, such as in Spain (Ministerio de Educación y Formación Profesional, 2022).

Besides, it should be considered that Ryan and Deci (2020) highlighted pupils' enjoyment as a relevant factor influencing their intrinsic motivation, which is of great importance since without motivation learning is not possible in the educational context (Rehman & Haider, 2013). Therefore, pupils' enjoyment in carrying out educational tasks is key in leading them to learning achievement. The term enjoyment is widely understood as a positive physiological state, which involves feelings of pleasure and fun related to PE practice (Scanlan & Simons, 1992). Moreover, to achieve an effective healthy habits promotion from the PE setting, the enjoyment towards PE is a primary determinant that influences the school-aged children's willingness to participate in PA (Burns, Bai, Podlog, Brusseau, & Welk, 2023). Specifically, the pupils' enjoyment during PE lessons would affect their PA levels in out-of-school contexts, tending to look for more opportunities to be physically active in out-of-school contexts those with higher levels of enjoyment during PE lessons (Cox, Smith, & Williams, 2008). Unfortunately, as well as the decline observed in PA levels, previous longitudinal studies observed a progressive

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decrease in pupils' enjoyment levels during PE lessons as they grow up (e.g., Hashim, 2007). Therefore, the design and implementation of enriching and motivating experiences in PE that address the improvement of pupils' enjoyment levels are needed to achieve satisfactory learning and, ultimately, to increase their PA practice during leisure time effectively (Baena-Extremera, Granero-Gallegos, & Ortiz-Camacho, 2012; Cox et al., 2008; Dishman et al., 2005).

In this line, some previous intervention studies have been carried out to improve school-aged children's enjoyment in different PE-based teaching units (TU). On the one hand, some studies were focused on assessing the pupils' enjoyment according to the teaching content. For example, Carriedo (2019) found schoolchildren's high levels of enjoyment during PE lessons when implementing a TU based on innovative content (i.e., combat sports). However, these findings do not agree with those found by Hortigüela, Gutierrez-Garcia, and Hernando-Garijo (2017), who did not find differences in pupils' enjoyment comparing a combat sport TU and two TUs of popular sports such as football and basketball. Therefore, the relationship between the content and pupils' enjoyment is not completely clear. On the other hand, previous findings suggest that beyond the content developed, it seems necessary to include specific strategies in those TU, such as the design of activities and objectives adapted to pupils' level or creating opportunities for decision-making, to affect positively the pupils' enjoyment during PE (e.g., Sevil, Abós, Aibar, Julián, & García-González, 2016). Besides that, previous studies included another interesting option to favorably improve school-aged children's enjoyment during PE lessons based on developing all the lessons of the TU in the close environment (i.e., outside of the school center) (Baena-Extremera & Granero-Gallegos, 2015; Baena-Extremera, Granero-Gallegos, & Ortiz-Camacho, 2012; Greco, Poli, Cataldi, & Fischetti, 2024). The use of the immediate surroundings in PE includes both outside school facilities (e.g., municipal sports center, streets or squares) and natural resources (e.g., parks, fields or blue spaces) (Bonavolontà, Cataldi, & Fischetti, 2021; Greco, Poli, Cataldi, & Fischetti, 2024; Guijarro-Romero, Viciano, Casado-Robles, & Mayorga-Vega, 2024; Hortigüela, Hernando, & Sánchez-Miguel, 2017; Rocher et al., 2020). For instance, there is evidence that the use of natural resources as part of PE programs has favourable effects among students (Bonavolontà, Cataldi, & Fischetti, 2021; Hortigüela, Hernando, &

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Sánchez-Miguel, 2017; Rocher et al., 2020). Hortigüela et al. (2017) observed that after performing a TU of 10 sessions of knotting in a nearby park, students experienced higher levels of motivation and positive perceptions regarding the TU performed. Rocher et al. (2020) found that the inclusion of nautical activities in blue spaces as part of the PE curriculum improved students' general health and well-being. Bonavolontà et al. (2021) found that a 12-week program consisting of walking and running activities conducted in fields near the school participating in the study improved students' body image.

The inclusion of the outside PE lessons could also provide pupils with authentic performances that they can apply to their leisure time, achieving the principle of transferability of learning from PE classes to pupils' daily life competencies (Viciano & Mayorga-Vega, 2018), and leading ultimately to lifelong outside PA participation (Institute for Outdoor Learning, 2020). Therefore, in order to design effective and authentic interventions in PE context, Viciano and Mayorga-Vega (2016) proposed four "Innovative TU" to better organize learning/teaching periods. In particular, the alternated TU were designed to link the learning developed by two complementary elements (e.g., contexts), thus allowing students to understand the fundamentals that connect them, and reaching authentic and meaningful outcomes. Previous evidence has shown that the application of inside-outside school TU were effective for improving students' environmental knowledge for physical conditioning outside of school (Guijarro-Romero et al., 2024). In this sense, the implementation of a PE-based alternated TU (Viciano & Mayorga-Vega, 2016) which combines possibilities of PA practice in the school center (inside) and out of the school center (outside), could allow PE teachers to connect the learning developed in the classroom to the pupils' life, while also seeking to increase the pupils' levels of enjoyment.

Following the evidence showing that school-aged children's enjoyment towards PE and PA levels decline during the Secondary Education stage (Corder et al., 2019), the secondary education stage seems to be an ideal target context for PE TU to prevent these declines. Unfortunately, to our knowledge, no previous studies are examining the effect of a PE-based alternated TU on the possibilities of practicing PA inside-outside on the pupils' enjoyment. Consequently, the present study pursues two main aims: (a) to examine the effect of an alternated TU doing lessons inside-outside the school center on

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pupils' enjoyment levels during PE lessons; and (b) to compare the effect on today's PE lesson pupils' enjoyment between inside and outside lessons.

Method

Study design

The present study is reported according to the CONSORT for cluster randomized trials guidelines (Campbell, Piaggio, Elbourne, & Altman, 2012). The Ethical Committee for Human Studies of the University of Granada (452/CEIH/2017) approved the present study protocol. The protocol conforms to the Declaration of Helsinki statements (64th WMA, Brazil, October 2013). A cluster-randomized controlled trial design was used for practical reasons and due to the nature of the present study (i.e., natural groups from an educational setting) (Campbell et al., 2012). Recruitment was carried out in December of 2018, and data collection was done from January to May 2019.

Participants

The principal and the two PE teachers of a public high school center (chosen by convenience) of the province of Granada (Andalucía Region, Spain) were consulted for the implementation of the study. They were informed about the project, and permission to conduct the study was requested. After school approvals were obtained, all the 179 pupils aged 13-15 years old (94 females and 85 males), from the second to the third grade of Secondary Education in the Spanish education system, were invited to participate in the present study. Pupils and their legal tutors were completely informed about the features of the study. Pupils' signed written informed assent and their legal guardians' signed written informed consent were obtained before taking part in the study. According to the center's reports, all the pupils' families had a middle socioeconomic level.

The inclusion criteria were: a) being enrolled in the second to third grade at the Secondary Education level (grades in which approval of the school was obtained); b) participating in the normal PE classes; c) being free of any health disorder that would make them unable to engage in PA normally; d) presenting the corresponding signed consent by their legal guardians, and e) presenting the corresponding signed assent by the pupils. The exclusion criterion was not having performed the dependent variables correctly following their rules of administration.

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Sample size

A priori sample size calculation was estimated with the Optimal Design Plus Empirical Evidence Software Version 3.01 for Windows. Parameters were set as follows: significance level $\alpha = 0.05$, number of participants per cluster $n = 25$, effect size $\delta = 0.50$ (Guijarro-Romero et al., 2024), intra-cluster correlation coefficient $(1 - \beta) = 0.01$, and statistical power $(1 - \beta) = 0.80$. A total number of six clusters (150 participants) was estimated.

Randomization

Randomization was conducted at the class level, using a computerized random number generator. Before the pre-intervention evaluation was administered, six natural classes of the selected school center (four second and two third-grade classes), balanced by grade (i.e., two second-grade and one third-grade classes per group), were randomly assigned by an independent researcher, blinded to the study objectives to form one of the following study groups: Inside group (IG, $n = 88$) or Alternated group (AG, $n = 91$). Moreover, according to the education rules, the pupils had been previously assigned randomly into classes by the school center, following the criterion that the classes should be balanced between males and females, at the beginning of the school year.

Intervention

Before the intervention, the PE teachers responsible for teaching all the AG and IG lessons received two teacher-training sessions regarding the specific features of the TU. The research group carefully designed both TU and provided guidelines to the PE teachers for correctly delivering the lessons. The main researcher supervised all the lessons and made sure all guidelines were considered during the program (Table 1). The intervention was adjusted to 100% of what was planned according to the recorded results of the application of the fidelity control sheet (Table 2).

Pupils in the AG carried out a TU of eight PE lessons (i.e., a four-week TU, two lessons per week) based on the alternated TU proposed by Viciano and Mayorga-Vega (2016) for the practice of PA inside and outside the school center. This innovative proposal is based on the concept of transfer learning (Yañez & Castejón), which consists of alternating two TUs with related elements (e.g., contents, contexts, etc.) making students aware that both elements are related. For instance, two contexts allow for

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developing similar learnings, and could be better taught in an alternated manner than consecutively, in order to make students reflect on their similarities (Viciana & Mayorga-Vega, 2016). Specifically, in this study the two related elements belong to the context of where the PA is developed (i.e., inside- and outside-the-school), and it consists of four PE lessons for PA practice inside and four PE lessons for PA practice outside, delivering one inside lesson (i.e., inside the school center) followed by one outside lesson (i.e., in the immediate environment near the school center), which allow establishing a transference of learning from the conventional PE classroom inside the school center to outside contexts. Table 1 shows the Alternated TU scheme.

Table 1
Scheme of the main part of the lessons of the alternated teaching unit

Lesson	Inside/Outside	Physical fitness contents ^a	Sport and games contents ^b
1	Inside	Total body circuit-training workout in pairs (three	Baseball or kickball games
2	Outside	levels of difficulty)	(each pupil chose one of them)
3	Inside	CrossFit teens competitions in	Indoor football or handball games
4	Outside	teams of 3-4 players (three levels of difficulty)	(each pupil chose one of them)
5	Inside	High interval intensity training through relay games in	Ultimate or American handball games (each
6	Outside	teams of 3-4 players (three levels of difficulty)	pupil chose one of them)
7	Inside	8-stations gymkhana about physical fitness tasks and sports developed in the teaching unit, in teams of	
8	Outside	3-4 players, using an augmented reality app (HP-Reveal mobile app)	

Note. ^a Contents developed during the first half of the main part of the lessons (i.e., 20 minutes); ^b Contents developed during the second half of the main part of the lessons (i.e., 20 minutes)

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Table 2
Alternated group fidelity checklist

Sessions 1 and 2

A circuit of seven stations with three levels of difficulty is performed in pairs in the first half of the main part of the session.
 Opportunities for choice between sport/game contents in the second half of the main part of the session are provided.
 Similarities between activities developed and how these can be done in different contexts (i.e., inside or outside) are highlighted.
 Interrogative feedback to make students reflect on the relationship between the two contexts is delivered.

Sessions 3 and 4

A CrossFit competition with three levels of difficulty is performed per teams of 3-4 players in the first half of the main part of the session.
 Opportunities for choice between sport/game contents in the second half of the main part of the session are provided.
 Opportunity to choose activity partners is provided.
 Similarities between activities developed and how these can be done in different contexts (i.e., inside or outside) are highlighted.
 Interrogative feedback to make students reflect on the relationship between the two contexts is delivered.

Sessions 5 and 6

A high interval intensity training through relay games with three levels of difficulty is performed per teams of 3-4 players in the first half of the main part of the session.
 Opportunities for choice between sport/game contents in the second half of the main part of the session are provided.
 Opportunity to choose activity partners is provided.
 Similarities between activities developed and how these can be done in different contexts (i.e., inside or outside) are highlighted.
 Interrogative feedback to make students reflect on the relationship between the two contexts is delivered.

Sessions 7 and 8

A 8-station gymkhana about physical fitness tasks and sports is developed.
 Opportunity to choose activity partners is provided.
 Similarities between activities developed and how these can be done in different contexts (i.e., inside or outside) are highlighted.
 Interrogative feedback to make students reflect on the relationship between the two contexts is delivered.
 Innovative resources and contents (i.e., HP-Reveal mobile app) are included.

The useful time for each lesson was 55 minutes divided into a 10-minute warm-up, 40-minute main part, and 5-minute cool-down. Throughout all the lessons, physical fitness tasks (e.g., high-intensity interval training methods) and sports (e.g., volleyball) were developed in the main part of the lessons (20 minutes approximately each type of content). Those contents were selected since they are the most broad-spread globally in PE (Hardman, Murphy, Routen, & Tones, 2014), and could be the most applicable to students' free time (individually or in small groups with friends). Moreover, these contents are part of the "Basic Knowledge A and C", specifically related to an active style of life and the development of physical fitness oriented to health; and the "Specific Competences numbers 1 and 2", related to the integration of an active style of life into the students habits, and to quantitative aspects of the movement, all of which belong to the Spanish PE curriculum in the Secondary stage. Moreover, the four lessons developed outside the school were related to the "Specific Competence number 5", related to PA developed in urban and natural contexts belonging to the Spanish PE curriculum in the Secondary stage (Ministerio de Educación y Formación Profesional, 2022). The study

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was carried out with the Organic Law for the Improvement of Educational Quality (LOMCE). However, as the development of the study was not influenced by the change of laws, all above-mentioned curriculum elements belong to the current PE curriculum (i.e., Organic Law of Modification of the Organic Law of Education, LOMLOE). The main difference between inside and outside lessons was the material and the space used in each environment. In this way, the inside lessons were developed using the traditional PE materials (e.g., gymnastic benches, medicine balls, vaulting boxes, wall bars, or mats) and conventional spaces within the educational center (e.g., indoor gym and sports court). In contrast, the outside lessons were developed taking advantage of the spaces and material resources offered by the immediate environment. Specifically, one natural park and another urban park with their resources (e.g., trees, swings, benches, and other urban furniture), and the municipal sports center which had several sports courts (e.g., a football field or paddle courts) were used.

The teaching methodology included strategies to increase pupils' enjoyment during PE classes trying to maximize their involvement, stimulation, and excitement based on Hashim's (2007) recommendations. Specifically, these strategies were to: (a) offer a wide range of involvement choices with the same goal in order to individualize according to pupils' preferences. This strategy was developed giving each pupil the opportunity to choose one of the two possible sports and game contents for each session: for example, in sessions one and two they could choose between indoor football or handball; (b) match school-aged children's needs and skills, individualizing the tasks according to their level and guiding the task as challenging. This strategy was developed establishing three different levels of difficulty in physical fitness tasks; (c) propose small-group activities in which the opportunity to choose activity partners during lessons were given to pupils. This strategy was developed giving each pupil the opportunity of election of three or four peers for performing the activities: for instance, in sessions three and four during CrossFit competitions; and (d) include variety and innovative contents and resources which lead to perceive the task as exciting. This strategy was developed by using the HP-Reveal mobile app.

As regards the pupils in the IG, they also carried out a TU of eight PE lessons (i.e., a four-week TU, two lessons per week). The useful class time, the structure of the lesson

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divide into three parts, and tasks were the same as the AG. Moreover, the IG pupils also could choose the sport and game contents. However, in contrast to the AG, pupils only received the lessons inside the school center. Therefore, the eight PE lessons were developed using conventional PE materials and school facilities within the educational center. Unlike the AG, no transference of learning from the PE context to out-of-school contexts nor PA practice in the immediate environment was promoted in the IG.

Measures

All evaluations were carried out during the PE class time by the same researchers, instruments, and protocols. The pupils completed in print the questionnaires in an ordinary classroom in quiet and comfortable conditions. Pupils were asked for their maximum sincerity, and they were guaranteed the confidentiality of the obtained data. Although instructions on how to correctly respond to the questionnaires were explained before starting, the main researcher was present during the whole evaluation session in order to solve any question that might emerge. The measurement protocol followed with each variable is detailed below.

Demographic characteristics

Participants' age, grade, and gender data were registered at the beginning of the study.

Anthropometric measurement

Pupils' body mass and body height were assessed at the beginning of the study (twice each one and the mean was retained) following the International Standards for Anthropometric Assessment (Stewart, Marfell-Jones, Olds, & De Ridder, 2011). Then, body mass index was calculated as body mass divided by the square of body height (kg/m^2). Finally, participants' body weight status was categorized by the body mass index thresholds as overweight/obesity (i.e., gender- and age-adjusted cut-point values equal to or higher than the equivalent value of 25 kg/m^2 at the age of 18 years) or non-overweight/obesity (i.e., lower than the equivalent cut-point values of 25 kg/m^2 at the age of 18 years) (Cole, Bellizzi, Flegal, & Dietz, 2000).

Extracurricular physical activity

The weekly hours that pupils spend practicing PA after-school were assessed with the enKid questionnaire at the beginning of the study (Martínez-Gómez et al., 2009). It

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consists of a single question (i.e., How many hours do you spend weekly in extracurricular sports activities?). A 6-point Likert-type scale, ranging from “0 hours/week” to “More than 5 hours/week” was used. This questionnaire showed an adequate convergent validity comparing with accelerometer-measured total PA and moderate-to-vigorous PA in Spanish students ($r = 0.43$ and 0.46 , respectively) (Martínez-Gómez et al., 2009).

Enjoyment in Physical Education subject

The pupils’ intrinsic enjoyment towards PE subject was measured during a PE class time at the beginning and another one at the end of the intervention (i.e., pre-intervention and post-intervention, respectively), using a short version of the Sport Satisfaction Instrument (SSI-PE, Baena-Extremera, Granero-Gallegos, Bracho-Amador, & Pérez-Quero, 2012) proposed by Casado Robles (2022). The questionnaire proposed by Casado Robles (2022) consists of four items that assessed the pupils’ enjoyment towards PE subject (i.e., one dimension averaging the four items; e.g., “I usually have fun in Physical Education lessons”). The questionnaire was preceded by the sentence “Indicate your degree of disagreement or agreement with the following statements, referring to your Physical Education lessons...”. According to previous studies (e.g., Casado Robles, 2020), in order to facilitate the evaluation of the items by the students, a 10-point Likert-type scale, ranging from 1 (“Strongly disagree”) to 10 (“Strongly agree”) was used since is the scale that Spanish school-aged children receive in their scholar marks. Afterward, the dependent variable “enjoyment in PE subject” was calculated as the mean value of the four items in each moment (i.e., pre- and post-intervention). The Spanish version of the adapted SSI-PE has shown adequate psychometric properties among school-aged children (GFI = 1.00; CFI = 1.00; RMSEA = 0.00; $\Omega = 0.92$; Cronbach’s alpha = 0.80) (Casado Robles, 2022).

Enjoyment during today’s Physical Education lesson

The pupils’ intrinsic enjoyment towards today’s PE lessons was measured at the end of each PE lesson of the intervention (i.e., during the five-minute cool-down) using an adapted short version of the Spanish version of the SSI-PE (Baena-Extremera, Granero-Gallegos, Bracho-Amador, & Pérez-Quero, 2012) proposed by Casado Robles (2022). The questionnaire proposed by Casado Robles (2022) consists of four items that assessed the pupils’ enjoyment towards today’s PE lessons, referring to the lesson that

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had just finished (i.e., one dimension averaging the four items; e.g., “In today’s Physical Education lesson I had fun”). The questionnaire was preceded by the sentence “Indicate your degree of disagreement or agreement with the following statements, referring to today’s Physical Education lesson...”. A 10-point Likert-type scale, ranging from 1 (“Strongly disagree”) to 10 (“Strongly agree”) was used. Afterward, the dependent variable “enjoyment during today’s PE lesson” was calculated as the mean value of at least two valid lessons in each condition (i.e., inside and outside lessons). The Spanish version of SSI for today’s PE lesson has shown adequate psychometric properties among school-aged children (GFI = 1.00; CFI = 1.00; RMSEA = 0.00; Ω = 0.92; Cronbach’s alpha = 0.88) (Casado Robles, 2022).

Statistical analysis

Means and standard deviation/standard error or percentage for general characteristics of the participants and dependent variables were calculated. Statistical tests assumptions were checked by common procedures (e.g., histograms and Q-Q plots for normality). The internal consistency of the dependent variables measured by the questionnaires was examined with Cronbach’s alpha. Alpha values < 0.40 were considered poor, 0.40–0.59 fair, 0.60–0.74 good, and 0.75–1.00 excellent. First, as exploratory analyses, the chi-squared analyses for categorical variables (i.e., gender and grade), and the one-way analyses of variance (ANOVA) for continuous variables (i.e., age, body mass, body height, body mass index, extra-curricular PA, and attendance rate) were conducted to examine potential differences between the two groups. Afterward, the effect of a PE-based alternated TU on pupils’ enjoyment in PE subject was examined. An intention-to-treat approach was followed, that’s means, all the participants were included in the statistical analyses regardless of adherence to the protocol. Because the unit of randomization and intervention was the class, a Multilevel Linear Model with participants nested within classes and measures within participants was selected (i.e., two-way mixed nested ANOVA) (Field, 2024). The maximum likelihood estimation method was used. The -2 log-likelihood ($-2LL$, i.e., comparing the change in the chi-square test) was used to compare the model’s fit. From all the potential confounding variables explored (i.e., gender, age, grade, body mass, body height, body mass index, extra-curricular PA, and intervention attendance), no covariables were used. Finally, for the *post-hoc* analyses, the

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within-group pairwise comparisons with the Bonferroni adjustment were used. Similarly, regarding the effect of a PE-based alternated TU on pupils' enjoyment during today's PE lesson, a Multilevel Linear Model with participants nested within classes was selected (i.e., one-way nested ANOVA). From all the potential confounding variables explored, no covariables were used (except age for the inside-outside comparison). Effect sizes were estimated using Cohen's *d* for pairwise comparisons. Finally, although in the present study an intention-to-treat approach was followed, as sensitivity analyses, all the above-mentioned analyses were also carried out with a per-protocol approach (i.e., including only the participants with an adherence to the protocol $\geq 87.5\%$, that is, seven lessons). All statistical analyses were performed using the SPSS version 25.0 for Windows (IBM® SPSS® Statistics). The statistical significance level was set at $p < 0.05$.

Results

Final sample and general characteristics

Figure 1 shows the flow chart corresponding to the participants included in the present study. Although all the invited 179 pupils (94 females and 85 males) agreed to participate and met the inclusion criteria, the number of students that satisfactorily passed the exclusion criterion to become the final sample group was different between pupils' intrinsic enjoyment in PE subject ($n = 169$) and today's PE lesson ($n = 174$). All the participants that did not follow the protocol were because they did not have an attendance rate equal to the 100%. No participants were lost because of the rejection to continue in the study or change of the school.

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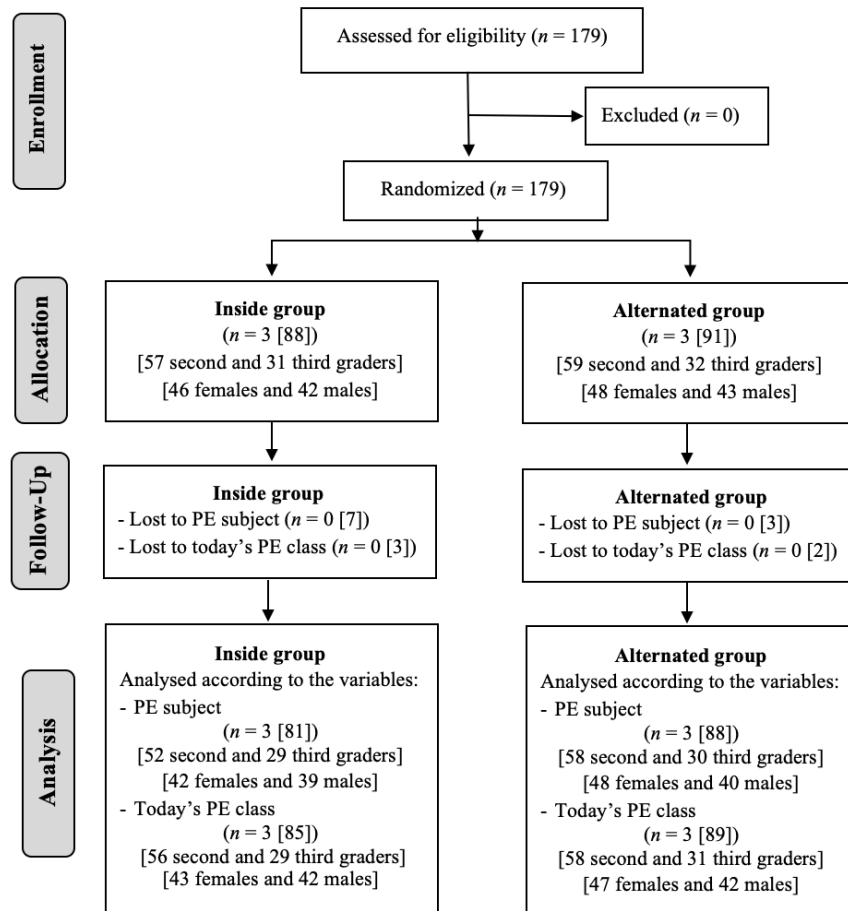


Figure 1. Flow chart of the school classes and students of the present study. All numbers are reported as school classes [students]. PE = Physical Education.

Table 3 shows the general characteristics of the participants. The results of the one-way ANOVA and the chi-square test did not show statistically significant differences in terms of general characteristics and attendance rate between the two groups ($p > 0.05$). In the sample of the present study, the Cronbach's alpha values for enjoyment during PE subject was 0.86, and enjoyment during today's PE lesson was 0.89.

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Table 3

General characteristics of the participants and differences between the two groups

	Total	Alternated	Inside	ANOVA/Chi-squared test	
	(N = 179)	(n = 91)	(n = 88)	F/χ^2	p
Age (years)	14.08 (0.95)	14.03 (0.81)	14.13 (1.07)	0.532	0.467
Gender (females/males)	52.50/47.50	52.70/47.30	52.30/47.70	0.004	0.949
Grade (2 nd /3 rd)	64.80/35.20	64.80/35.20	64.80/35.20	0.000	0.993
Body mass (kg)	59.76 (13.37)	58.39 (11.73)	61.19 (14.82)	1.966	0.163
Body height (cm)	164.26 (8.18)	164.08 (7.98)	164.45 (8.43)	0.091	0.736
Body mass index (kg/m ²)	22.05 (4.13)	21.60 (3.60)	22.53 (4.60)	2.241	0.136
Overweight-obese (no/yes)	67.40/32.60	69.20/30.80	65.50/34.50	0.279	0.597
Extra-curricular PA (hours/week)	2.30 (2.15)	2.41 (1.97)	2.18 (2.33)	0.495	0.483
Attendance rate	90.43 (14.99)	91.48 (13.93)	89.35 (16.03)	0.908	0.342

Note. Continuous variables (i.e., age, body mass, body height, body mass index, and extracurricular PA) are reported as mean (standard deviation) and categorical variables (i.e., gender, grade, overweight-obese and intervention rate) as percentage. PA = Physical activity.

^a One-way analysis of variance for continuous variables and the chi squared test for categorical variables.

Enjoyment in Physical Education subject

Table 4 shows the effect of the inside-outside alternated TU on enjoyment in PE subject. The MLM results on enjoyment showed a statistically significant interaction effect ($p < 0.001$). Subsequently, the within-group pairwise comparisons showed that the AG participants improved statistically significant their enjoyment from the pre- to the post-intervention measure ($p < 0.01$; $d = 0.65$). However, for the IG statistically significant differences were not found ($p > 0.05$).

Table 4

Effect of the inside-outside alternated teaching unit on enjoyment in Physical Education subject

Group	Pre-intervention	Post-intervention	Multilevel Lineal Model			ES
	M (SE)	M (SE)	- 2LL	F	p	d
Alternated	8.1 (0.2)	8.8 (0.2)*	1317.08	11.510	0.001	0.65
Inside	8.8 (0.2)	8.4 (0.2)				

ES = Effect size; M = Mean; SE = Standard error; - 2LL = -2 log-likelihood; d = Cohen's d effect size; Alternated, $n = 88$, Inside, $n = 81$.

* $p < 0.01$, *post-hoc* pairwise comparisons with Bonferroni adjustment for within-groups analyses.

Enjoyment during today's Physical Education lesson

Table 5 shows the effect of the inside-outside alternated TU on enjoyment during today's PE lesson. The MLM results showed that the AG participants reported statistically significant higher enjoyment values during the outside sessions than during their inside sessions ($d = 0.46$), as well as compared to the IG participants ($d = 0.52$) ($p < 0.05$). However, for the comparison between AG inside sessions and the IG, statistically significant effects were not found ($p > 0.05$).

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Table 5
Effect of the inside-outside alternated teaching unit on enjoyment during today's Physical Education lesson

Group	Inside	Outside	Multilevel Lineal Model				ES
	M (SE)	M (SE)	Comparison	- 2LL	F	p	d
Alternated	8.5 (0.1)	9.0 (0.1)	AG-IG Inside	599.19	0.231	0.632	0.07
Inside	8.4 (0.1)	-	AG-IG Outside	564.89	6.985	0.039	0.52
			AG In-outside	515.85	31.272	< 0.001	0.46

ES = Effect size; M = Mean; SE = Standard error; - 2LL = -2 log-likelihood; *d* = Cohen's *d* effect size; Alternated, *n* = 89, Inside, *n* = 85. AG = Alternated group; IG = Inside group.

Sensitivity analyses

The sensitivity analysis (i.e., per-protocol approach) found the same outcomes as the main analysis (i.e., intention-to-treat approach), except that, for the enjoyment during today's PE lesson, no statistically significant differences between the AG participants during their outside sessions and the IG participants were found, although it was close to 0.05 ($p = 0.062$ in the sensitivity analysis vs. $p = 0.039$ in the main analysis).

Discussion

The purposes of the present study were: (a) to examine the effect of alternated TU doing lessons inside-outside the school center on pupils' enjoyment levels during Physical Education lessons; and (b) to compare the effect on today's PE lesson pupils' enjoyment between inside and outside lessons. The findings of the present study showed that the alternated TU improved pupils' enjoyment during PE lessons compared with the inside TU. Moreover, regarding the comparison of the pupils' enjoyment during each PE lesson, pupils in the AG reported higher enjoyment values during their outside sessions than during their inside sessions across the TU, as well as higher enjoyment values than the IG participants during the inside sessions.

The success of the present TU to increase school-aged children's enjoyment may be possibly due to the teaching methodology and evidence-based strategies known to maximize students' involvement, stimulation, and excitement (Hashim, 2007). Among others strategies: (1) the opportunity for pupils to engage in a wide variety of activities (Michael, Coffield, Lee, & Fulton, 2016); (2) the provision of choice between different activities with the same objective considering the current pupils' interests (Granero-Gallegos, Baena-Extremera, Sánchez-Fuentes, & Martínez-Molina, 2014); (3) the inclusion of interactions and cooperation with peers (i.e., small-group activities) (Dishman et al., 2005); or (4) the individualization of tasks to maximize feelings of

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pupils' ability or competence according to the degree of challenge (Lubans et al., 2017) may foster their enjoyment in PE lessons and facilitate lifelong PA habits. These results agree with those found by Sevil et al. (2016) and Abós, Sevil, Julián, Abarca-Sos, and García-González (2017), which also increase pupils' enjoyment levels after the implementation of a PE-based intervention based on specific motivational strategies in comparison with the control group, although with all their lessons inside the school center. Furthermore, boredom in the PE classroom tends to appear when the lessons are monotonous and repetitive (White et al., 2018), so the novelty of the TU may be another influential factor in improving enjoyment since pupils are tired of always doing the same activities (Baena-Extremera & Granero-Gallegos, 2013). This novelty is reflected in the innovative contents and resources included (e.g., CrossFit-teens or mobile apps) and the use of outside spaces for some PE lessons, which are very different from the traditional PE to which all students are accustomed.

Moreover, the outside public spaces are also classified as the most favorite places for PA practice by school-aged children (Rehrer et al., 2011), so conducting PE lessons in these spaces could be conducive to the enjoyment of its practice more than inside the school center. In this line, these improvements in students' enjoyment during outside lessons support previous findings studies (e.g., Baena-Extremera & Granero-Gallegos, 2013, 2015) which indicate that the realization of experiences outside the conventional PE classroom supposes an increase in the student's interest and enjoyment. However, the present study represents an advance over previous knowledge because it obtains improvements in pupils' enjoyment during outside PE lessons, but also an effect of the whole alternated TU on pupils' enjoyment using only half of the outside sessions than the previous ones which developed all their lessons outside. In other words, a combination of inside-outside sessions such as the one proposed also improves pupils' enjoyment and could reduce some disadvantages of outside TU such as, the teachers fear and concerns about students' safety outside the school grounds, the limited and strict institution timetables or adverse weather conditions that disadvantage to undertake all the lessons outside (Ernst, 2014). Furthermore, previous studies differ from the present one in the contents developed during the TU. The previous outdoor studies were based on adventure activities (e.g., climb, rappel, zip line, or skiing), which are one of the less common

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activities included in PE (Hardman et al., 2014), while the present study proposes the development of those contents most broad-spread globally in PE (i.e., physical fitness tasks and individual/team sports) (Hardman et al., 2014). With regard to the lack of differences in the IG enjoyment after the intervention, and between the AG inside lessons and IG, the main reason could be that all lessons were performed inside the school center and students may have perceived them as boring because of the monotony and lack of novelty due to the use of the same spaces and materials for developing PE lessons as previous literature has evidenced (González-Cutre, Brugarolas-Navarro, Beltrán-Carrillo, & Jiménez-Loaisa, 2023; White et al., 2018). That is, students could feel bored of developing lessons always in the same spaces with the same materials (Baena-Extremera & Granero-Gallegos, 2013). Therefore, according to previous literature (González-Cutre, Jiménez-Loaisa, Abós, & Ferriz, 2021), PE teachers should apply different strategies to satisfy students' need of novelty such as the introduction of varied and novel materials or the development of the lessons in different spaces (e.g., urban parks or municipal facilities).

Regarding this transference from PE lessons to their daily life, following the Granero-Gallegos, Baena-Extremera, Pérez-Quero, Ortiz-Camacho, and Bracho-Amador (2012) suggestion, the environmental context of the school (e.g., extracurricular activities, green zones, or municipal sports centers) should be analyzed previous the study. In this way, the content covered during PE lessons could be continued by school-aged children in their free time, as many hours as possible. Moreover, the contents used in the present study could be the most applicable to students' free time (individually or in small groups with friends), without the need for special equipment or a specialist's supervision like previous studies (e.g., adventure activities). Therefore, the present alternated TU provides students authentic and situational PA practices using the environment that surrounds the school center and their particular community, making pupils capable to practice PA autonomously in the out-of-school context (European Commission/EACEA/Eurydice, 2013; SHAPE America, 2013). Another advantage of connecting both contexts (i.e., inside the school center and the immediate environment) could be a better understanding of the relationship between what is developed in PE lessons and how it can be applied to pupils' daily life (Viciano & Mayorga-Vega, 2018).

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It could make them realize that the way of working in both contexts is very similar and, therefore, in the future pupils could pay more attention to inside PE lessons acquiring the necessary knowledge and feeling competent to apply it autonomously to their free time (Bandura, 2023).

Besides this transference of learning, it could also be facilitated that if pupils have higher feelings of enjoyment during PE lessons outside the school center, this enjoyment could also be transferred to PA practice in their free time using the same environment and ultimately promoting the acquisition of healthy PA habits. In this line, several studies have suggested that if school-based programs are enjoyable for students, they may contribute to becoming physically more active during their daily life (e.g., Burns et al., 2023), so this TU may be suitable for promoting pupils' participation in PA. Besides that, significant international agencies, such as the General Conference of UNESCO (2015), also highlights the need to provide quality and motivating PE lessons which promote enjoyment for lifelong participation in PA. Therefore, the present alternated TU is very interesting considering that the promotion of PA practice among pupils is a global health priority (OECD/WHO, 2023).

Strengths and limitations

The main strength of the present study was that, to the best of our knowledge, this is the first study that analyzes the effect of an alternated inside-outside TU of physical fitness and sports on pupils' enjoyment during PE lessons. Moreover, there are no previous studies that have evaluated enjoyment day by day during all the lessons of the TU, which allows us to evaluate short-term fluctuations in mood using a minimal amount of time, and to check if there is any difference between inside and outside lessons. Furthermore, the use of a cluster-randomized controlled trial design was the most appropriate considering the nature of the context (i.e., natural school classes) (Campbell et al., 2012). Finally, due to this cluster design, the evaluation of the effect of the TU with a Mixed Multilevel Linear Model with participants nested within classes, represents an advance with respect to the commonly applied analyses. However, the present study also has some limitations that should be considered. Firstly, a limitation was that the study was carried out in a specific region of one country and using a convenience sample, so the findings could not be generalized. That is, if the study was applied in a different

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socioeconomic context, the results could be affected. Moreover, the influence of sex in the outcomes was not examined. However, due to human and material resource restrictions, a probabilistic and larger sample could not be examined. Furthermore, the comparison with a third group (i.e., Control group) which worked another completely different content than IG and AG, inside the school center, could allow us to check if the teaching contents may affect the outcomes and it could add quality to this study. Nonetheless, the comparison with the IG that also worked physical fitness and sports, but only inside the school, allows us to check that the improvements are due to the outside lessons.

Conclusions

The findings of the present study showed that the alternated inside-outside TU is effective for improving pupils' enjoyment during PE lessons compared with the inside TU. Moreover, pupils enjoy PE more during outside lessons compared to inside lessons. Overall, the study's findings have several important theoretical and practical implications for policymakers as well as for PE teachers when designing and implementing programs, considering it as a meaningful TU to enhance pupils' enjoyment towards PE. However, future research studies should examine if these improvements obtained in enjoyment are actually translated into improvements in school-aged children out-of-school PA habits as highlight in previous theories.

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