

Enhancing high school students' engagement in physical activity through a fitness education model in physical education

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Abstract

As children mature, their participation in physical activity often declines, resulting in lower overall activity levels. Although physical education is a mandatory component of the curriculum, students' active involvement is frequently limited in actual school environments. To foster health resilience, physical education must emphasize the promotion of an active lifestyle both within and beyond school settings. This study aims to analyze students' engagement in a physical activity programme based on a fitness education model, with a particular focus on encouraging positive involvement in physical activity. Sixty-one twelfth-grade students from three classes at a secondary school participated in the programme during the entire school year. The fitness education model from McConnell (2010), with six arising steps, was rearranged into four distinct cycles, based on five health-related fitness dimensions (cardiorespiratory endurance, muscular strength, endurance, flexibility and body composition). Data collection methods included students' worksheets, focus groups, individual interviews, researcher field notes, participant observation, and fitness testing. Data analysis employed deductive-inductive thematic analysis for qualitative data and descriptive and inferential analysis for quantitative data. The results were organised into three main themes: 1) students' engagement and commitment, 2) students' challenges and dilemmas, and 3) benefits and students' voices about the experience, with a sub-theme regarding physical fitness. They indicated improvement in students' engagement, involvement, and commitment with the activities, along with their autonomy, teamwork and health-behaviour knowledge for future life. Although initial gains in physical fitness levels were observed, the cycle focused on planning their own fitness plans emerged as the one that most engaged the students. In conclusion, the findings suggest that a well-structured physical activity programme in physical education can boost student engagement, involvement, and fitness levels with as little as two physical education classes per week. This underscores the potential of equipping students with the skills, knowledge, and confidence to maintain an active lifestyle in future life.

Key Words: Health-related Fitness Education; Wellbeing; Physical Fitness; Students' Adherence; Motivation.

Introduction

Health is a construct shaped and developed in a relationship between each individual and their social, cultural and natural environments (Quennerstedt, 2019). Drawing on Antonovsky's (1996) salutogenic approach, which views health along a continuum ranging from health to disease, initiating health promotion efforts from younger ages becomes imperative. Schools should serve as strategic driving forces to promote health among children and adolescents and to increase their participation in Physical Activity (PA) (Peralta et al., 2020), particularly given the suggestion from UNESCO (2015) regarding quality Physical Education (PE). According to this organization, a quality PE approach ensures equal opportunities for all students through a well-balanced and inclusive curriculum. It should cultivate psychomotor, social, and emotional skills essential for developing self-confidence and resilience, while promoting physical competence and lifelong enjoyment of PA.

Building on this understanding, PE should prioritize cultivating an environment conducive to foster an active lifestyle within and beyond the school setting (Pate et al., 2011). Collaboration among education, public health professionals and policymakers is needed to enhance PE's contribution to holistic health (Sallis et al., 2012), expanding PE's goals beyond merely reducing illness risks (pathogenic perspective) to actively promote health resilience (Quennerstedt, 2019). By adopting a salutogenic approach in PE, students would be directed towards active health development for their lives (Antonovsky, 1996; McCuaig & Quennerstedt, 2018), recognizing that health is influenced by sociocultural contexts, experiences, and histories (Quennerstedt, 2019).

The entrenched challenge arises when PE adopts a pathogenic view of health care, often falling short on motivating students to engage in PA, hindering the fulfilment of the desired health outcomes. To achieve this,

teachers should be involved in the process of changing this pathogenic narrative. They need to recognize the need for effective strategies, where a 'healthy' PE programme plays a key role in encouraging students to embrace an active lifestyle and making it easier for them to adopt healthy habits (Quennerstedt, 2019). For Neil-Sztramko et al. (2021), adolescents with better healthy habits might sustain them into adulthood. Additionally, Newell's (2011) research suggests that individuals with greater PA skills tend to maintain active lifestyles. Within this perspective, PE programmes should carefully consider the fitness education curriculum to address embracing students' needs. This includes building their confidence, knowledge, engagement, physical competence, awareness and understanding to foster their own choices in the future that align with an active lifestyle (Cairney et al., 2019; Mercier et al., 2016; Stevens-Smith, 2016). However, this effort must also address a key obstacle: as children grow, they tend to become less motivated to engage in PA, leading to a subsequent decrease in their PA levels (Mayorga Vega & Vicianá, 2015). Even though PE is mandatory, and a natural involvement should exist from students, this is not what happens in real school context. Teachers need to adopt student-centred approaches (Goodyear & Dudley, 2015) to enable students with the knowledge and competencies needed to engage in PA for life. This requires facilitating reflective discussions about the learning process and the benefits of embracing a physically active lifestyle, highlighting the consequences of inactivity to encourage a healthy lifestyle (Eastham, 2018). In line with this perspective, the purpose of this study is to examine students' engagement to a PA programme in PE, based on a fitness education model and focused on students' positive involvement in PA. To address this goal, three research questions were formulated: 1) How did the students' level of engagement and involvement in PE and PA change throughout the implementation of the fitness programme in PE classes?, 2) What difficulties, dilemmas and problems did students encounter throughout the programme? and 3) What benefits and values did students ascribe to the implemented fitness programme?. The objective of addressing these questions is to provide valuable insights into the ongoing dialogue surrounding the enhancement of PE programmes, fostering sustained student engagement and well-being.

Heath education (HE) in PE

Several models have been used in school PE programmes. Mong and Standal (2019), in their literature review, identified two streams of thought regarding teaching practices in HE. The first approach emphasizes the reduction of health problems through behaviour change, where teachers adhere to a structured program using traditional methods to increase PA. This approach combines cognitive and behavioural self-management strategies with information about the relationship between PA and health, adopting a more biomedical and pathogenic perspective. The second approach focuses on developing the whole person, positioning students as active participants and teachers as facilitators of learning. This method challenges students physically, cognitively and emotionally, aiming to foster comprehensive development.

Moreover, McCuaig and Quennerstedt (2018) and Quennerstedt (2019) emphasize that a salutogenic perspective must be followed in PE to strengthen students' health resources and to direct students towards active health development rather than just preventing a disease. As Antonovsky (1996) illustrated through the river metaphor, everyone lives within a system (river) - a path that sees each individual for their current state along a health-disease continuum, instead of being determined by a dichotomous classification between health and illness.

Fitness Education Model

Following a salutogenic perspective, as outlined by McCuaig and Quennerstedt (2018), health promotion intends to enhance life quality and it's important to adopt models that follow this approach, such as the fitness education model from McConnell (2010). Leading the author to state that the most comprehensive approach to health-related fitness education is a model framed in three primary roots: (1) engaging in appropriate PA; (2) learning why PA is important; and (3) knowing and being able to plan and execute personal PA programmes. The emphasis on the cognitive domain extends beyond acquiring knowledge or understanding concepts. It also challenges students to show their ability to execute, assess and design their programmes.

The model is structured in six steps to be followed progressively: 1) do activity; 2) start getting fit; 3) begin self-assessing strengths and weaknesses; 4) initiate self-planning; 5) introduce lifetime activity, and 6) transfer it to life with the knowledge and skills needed to be active throughout their lives (McConnell, 2010). Throughout these raising steps, the model intends to encourage students to move from a state of dependence to an increase in their levels of autonomy in decision-making and engagement, a skill needed for their future lives.

Material & methods

Context and Participants

This study involved three twelfth-grade classes from a secondary school, totalling 61 students. It was conducted in an urban area of Portugal, from September to June. The classes were assigned to three preservice teachers (PST) in their last graduation year, with a cooperating teacher (CT) with more than 40 years of work as PE teacher, facilitating the process due to his fitness expertise, availability and commitment. Additionally, a university supervisor provided support to ensure the effective application of the fitness model.

Each class had, on average, 20 students, distributed as follows: Class A - 15 girls and five boys (n=20), Class B - 15 girls and five boys (n=19) and Class C - 13 girls and nine boys (n=22). Ages were between 16 and 18 years old, girls with a mean of 16.98 ($\pm$ 0.64) and boys 17.05 ($\pm$ 0.62) years. The mean height for girls was 163.05 cm ($\pm$ 6.62) and for boys 179.84 cm ($\pm$ 5.59). Body mass followed the same distribution, with girls, on average, with 63.69kg ($\pm$ 12.62) and boys 71.46kg ($\pm$ 8.23). Twenty-three students were active outside school, with at least three hours of weekly PA, while the other 38 did not achieve this amount of time.

Besides the inherent differences in students' characteristics, the researcher observed differences in behaviours, skills and knowledge among the classes. Class A revealed outstanding behaviour in PE classes from the first day. The students enjoyed working together to accomplish the defined goals and, as they had been working with the CT for two years, their fitness skills and knowledge were good. They understood the process, showed interest in the activities, and demonstrated a good level of proficiency in the several exercises proposed. Class B also exhibited good behaviour. They arrived on time, remained quiet, and carried out the proposed tasks by the PSTs. However, their lack of interest in PE was critical, as reflected in their level of abilities and knowledge. Class C was distinct from the other two. Despite the students' great skills, their behaviour wasn't good, leading to low levels of knowledge attainment. This class had seven football players who only wanted to play football and did not want to help the girls, making it a challenging situation.

All the students involved were selected through convenience sampling (Patton, 2002), regarding the classes assigned to each PST from the CT. At the beginning of the school year, the study design and objectives were explained to the participants, emphasizing that they had the option to withdraw from the study at any time without consequences. The participants and their parents/guardians signed an informed consent form to participate, and the university and school authorities where the research was conducted granted ethical approval for the study.

Study Design

The fitness education model (McConnell, 2010) with six raising steps was rearranged into four distinct cycles for this experience purpose. All cycles objectives and description, as well as knowledge development, can be seen in *Table 1*. The planning of the four cycles was carried out jointly with the researcher, the preservice teachers, the university supervisor and the cooperating teacher, although it followed different timelines in the three classes.

Table 1. Study design

School Year	Cycle	Objective	Description
September	1st – Improve PF and work on becoming fit	Foster student participation in appropriate PA with an emphasis on becoming fit	First three weeks: All class working out together to facilitate PST's control. The plan is focused on the standard movement patterns such as pull, push, squat, lunge, hinge, rotation and gait-
October (fitness test on the 11th of October)			Next three weeks: With the data from M0 and the characteristics of each student and class, distinct workout groups were created. Their plan had five strength exercises divided between upper body, lower body and torso and the CRE was also included.
November			December: as students started evolving and getting better, the PSTs created different plans for each group with two levels of difficulty. Students could choose which level they were capable to do.
December (fitness test on the 13th of December)			Students' knowledge development focused on: heart rate variations during exercise, importance of using heart rate monitors, distinct muscular groups and exercises for each of them, critical criteria for each exercise and demonstration ...
January	2nd – Self and peer assessment	Develop students' skills in self and peer assessment, enabling them to identify individual and collective strengths and weaknesses while working towards the assigned goals	Students continued following their plans in small groups, at the end of each class (15 to 20 minutes). This moment was recorded, and a meeting was conducted so that the students could see how they performed, assessing their main strengths and difficulties and what they could do to improve through a worksheet. The PSTs managed to do this activity twice with each class.
February			Students' knowledge development focused on: ethics, how to breathe during exercise, critical criteria for each exercise and knowledge about where to look and how to assess them ...
March			
April	3rd – Self and group planning	Enable students to formulate and implement their own fitness plan, by applying relevant concepts, principles,	Students, with the knowledge acquired throughout the programme, supplemented with the information given in the plan worksheet and in the mobile app, built their own fitness plan. The PSTs had a crucial role here, being

May		and strategies	always present and doing a first revision to help students creating the best plan possible. All plans had, at least, 5 exercises, focused on the different body parts, chosen according to the student's levels of PA, needs and characteristics. A representative image of each exercise was used, as well as the number of sets and reps and the criteria of success. Students' knowledge development focused on: training principles, FIIT formula, knowledge of strength training ...
June	4th Introduce Fitness for Life	Encourage students to consistently increase their daily and weekly PA levels throughout the school year, introducing PA for life	Two group challenges were realized: (1) during the Christmas break, students' had to run, walk or ride a bike as many km's as possible – wins the team with highest total km's and (2) during the last week of school, students had to complete as many tasks as possible from a predefined list, with each task giving points to the team – wins the team highest accumulated points (i.e. "100 points – a video with the team members working out"). Students' knowledge development focused on: benefits of being active, CRE and strength training.

Throughout the school year, students' work centred around the five health-related fitness dimensions (cardiorespiratory endurance (CRE), muscular strength (MS), endurance, flexibility and body composition), aiming to enhance their knowledge and PA levels. The health-related-fitness tests selected followed the recommendation of Britton et al. (2019). Therefore, the two-dimension split suggested by the author - MS and CRE - was used to plan all the physical fitness (PF) activities, combined with the principles of training: overload, reversibility, progression, individualization, periodization and specificity. The aforementioned dimensions were analysed at the end of the first cycle through five physical fitness tests conducted at both the beginning and the end of the cycle in question. Each class had two sessions of 100 minutes per week on non-consecutive days, with 80 minutes of class time available, following an organization format: warm-up (15/20'), content as basketball or gymnastics (45/50') and PF (15/20'). PF incorporated exercises targeting both MS and CRE, with greater emphasis on MS as CRE was already stimulated throughout the lessons. The teaching of invasion team sports (Fairclough & Stratton, 2006) combined with appropriate intensity (e.g. exercise selection) and class organization (e.g. avoiding waiting in lines) can lead to higher levels of PA during class (Abad & Cañada, 2014).

Students' knowledge was developed throughout the year using 'tips of the week', focused on specific themes and content that needed to be explored in class to achieve the ascribed aims (e.g. heart rate variations during exercise, strength training principles...).

Data Collection

Distinct instruments were used to collect data on students' perceptions, value and meaning of the process, to analyse and improve their engagement to the PE and PA programme, and to identify the main challenges and dilemmas students faced in each cycle.

- **Students' Worksheets** – Produced by the researcher and the three PST's for all participants: first cycle – 1) PF ladder with space in each step for each student to define their individual objectives, 2) self-assessment on each fitness testing moment, using short and long answers to analyse the results obtained and define new goals, and 3) reading and analysing heart rate monitors; second cycle – self and peer assessment from the video recordings, conducted in the meetings outside the PE class; third cycle – reflection on their personal plans to capture dilemmas, difficulties, benefits and value students attributed to each task.
- **Focus Group Interviews** – Six focus group interviews (two per class) were conducted by the researcher during PE class with, at least, six students to collect information on the process development and scheduled at specific moments: at the end of the first cycle and by the end of the school year. The PSTs were also interviewed in group at the end of the first and third cycles, with questions connected to students' engagement, development, challenges and assigned value. Examples of questions included: "After the school year is over, what is your assessment of the programme of PF?" (students) and "How was the students' involvement in the first two phases of the project? Which were their main difficulties?" (PSTs)
- **Individual Interviews** – Four individual semi-structured interviews were conducted by the researcher with the PC (beginning and end of the year and end of cycles one and three) and two with the PSTs (at the beginning and end of the school year). They were realized in school, at the end of the school day, gathering a total of 72 minutes to capture students' understandings, perceptions and information ("What contributions do you consider this project brought to the students?").
- **Participant Observation** – The researcher conducted 18 participant observations (six per class) in PE classes, using strategic moments (beginning and end of the first, second and third cycle). Several observation sheets were created previously with the key points need to capture about students': (a) their involvement and proficiency in the PF exercises; (b) main difficulties encountered; (c) strategies used to enhance engagement to PE and PA; (d) PSTs' role in fostering positive student engagement.

- **Researcher Field Notes** – Non-guided or structured reflections conducted by the researcher throughout PE classes (six classes per week), observing (a) students' involvement and engagement, (b) the main difficulties students faced; and (c) the apparent attributed value and benefits students got. Almost 9000 words were written.

Fitness Testing - Conducted in two distinct moments: (1) beginning of the school year - M0, October; and (2) before Christmas Holidays, December – M1. These dates were defined by the duration of the first cycle, focused on improving PF and working on becoming fit. The PF test battery used was based on the Britton et al. (2019) study, consisting of five tests divided into two dimensions. The first dimension was MS with four tests: two of lower body (horizontal jump – distance in a horizontal jump with both feet together; high jump - distance in a vertical jump with both feet), one to abdominal (curl-ups - greatest number of curl-ups at a predefined cadence) and one to the upper body (push-ups - greatest number of push-ups at a predefined cadence). The second dimension was CRE, using one test (pacer - greatest number of routes over 20 meters at a predetermined cadence). Each test protocol was analysed and explained by the three PSTs to ensure strict engagement to the established standards. All fitness tests were conducted during the PE classes, with the PSTs collaborating and the students involved. In some instances, two lessons were required to complete the programme due to the need for protocol explanation, test objectives, and demonstrations.

Data Analysis

Qualitative Data

A deductive-inductive thematic analysis was followed to analyse data from students' worksheets, focus group and individual interviews, participant observations and researcher field notes (Miles et al., 2014), focused on exploring students' engagement to a PA programme that desired to improve students' levels of positive involvement and PA. Data analysis began after the first individual interviews and was continuously triangulated with other instruments used in data collection. For example, at the end of each cycle, the collected worksheets were analysed alongside individual and focus group interviews to inform subsequent steps in the research process. Triangulating data across various data sources enhanced the trustworthiness of the findings (Patton, 2002). The individual and focus group interviews were audio recorded and transcribed before being returned to PSTs and PC to read and approve the final transcripts, with everything conducted in Portuguese. In this case, every data was first read and examined incident by incident, focusing on the major information collected from the instruments and highlighting the relevant extracts (Charmaz, 2006). The data underwent further analysis to address the goals of the study, and the codes used to explore the material. NVivo facilitated the analysis and to ensure the trustworthiness of the coding process, two authors independently reviewed all data. Translation to English was only undertaken for dissemination.

Quantitative Data

An exploratory data analysis was performed using descriptive and inferential statistics on the quantitative variables examined in beginning of the school year (M0) and at the end of the first cycle (M1), as described and outlined below. To facilitate the comparison of the results in the strength variables, a linear normalization process $z_i = (x_i - \min(x)) / (\max(x) - \min(x))$ was implemented: "vertical jump distance", "horizontal jump distance", "number of curl-ups", "number of push-ups". This normalization process allowed to combine the strength tests into a single strength composite variable, ranging from 0 to 1, as the average of all four strength-related variables. The Kolmogorov-Smirnov test was used to verify the normality of the simple and composed quantitative variables using IBM SPSS Statistics version 29. Since not all variables fulfilled the normal distribution assumptions, the Wilcoxon Signed Rank Test was chosen to compare paired data between the two moments (M0 and M1). The test was applied to the entire sample and further divided by gender and levels of PA to understand differences within these subgroups. A significance level of $p \leq 0.05$ was established to determine whether the null hypothesis (indicating no difference between the pairs) could be rejected. The effect size was also calculated with the rank-biserial correlation. The r value is interpreted similarly to other effect sizes: a small effect is indicated by $r = 0.1$, a medium effect by $r = 0.3$ and a large effect by $r = 0.5$ (Field, 2017).

Results

The findings are structured around three key themes: 1) students' engagement and commitment, 2) students' challenges and dilemmas, and 3) benefits and students' voices about the experience, with a sub-theme regarding physical fitness.

1. Students' engagement and commitment

Engagement levels raised throughout the study, supported by moments and activities designed to foster students' development. These were aligned with the different cycles of the model used, guiding students towards increased autonomy in decision-making. Both PSTs and CT acknowledge recognised the importance of involving students in their learning journey. They gradually placed students at the forefront of the process, emphasizing their central role.

"It's not enough to just tell them that we have something very good, that they will participate. (...). There is an emotional plan there that needs to be conquered on the part of the students." / CT

"The student knows where they are, where they are going and the best way to get there. The student must always know everything about what is being done, as a way of motivating them and giving meaning to the things we do. (...) is essential for them to feel involved, motivated and to improve effectively. If they don't know why they are doing what they are doing, the likelihood of failure is much greater." / **PST**

At the beginning of the year and of the first cycle (improve PF and work on becoming fit), students used fitness plans created by their PSTs. Despite differences among the three classes, a noticeable increase in students' engagement was observed:

"All classes show notable improvements in the various components of the session, particularly in terms of PF, both in terms of involvement and also quality of execution." / **Researcher**

"I was, in fact, extremely happy with the class involvement; it demonstrated that they wanted to improve the job done and that they were really involved in the proposed activities." / **PST**

A high level of commitment was also observed by the researcher in most of the classes conducted in the second cycle focused on self and peer assessment, particularly in classes where the PST's had changed the fitness plan or brought new group assignments.

"This class also seemed very motivated (...) There are several reasons that could be influencing: grades, new plan, group changes, greater presence of the teacher... (...) they said it was because of the plan, that they liked it because it was different and because it challenged them, especially because it had three different difficulty levels. They felt that they can always improve and do a little more (...)" (**Researcher**)

However, the highest point of students' involvement and engagement was reached during the third cycle (focused on planning), when students began crafting their own plan, as expressed by the researcher *"This high level of intrinsic motivation is largely due to the use of their own plan, for the first time. These levels weren't the same during the remaining session when carrying out handball exercises..."*

By the end of the school year and of the four cycles with the three classes, students' that demonstrated less engagement throughout the school year through the researcher and PST's lens expressed regret, recognising that their lack of involvement hindered potential benefits. They acknowledged that greater involvement from the beginning could have led to more significant gains, underscoring the value they placed on the experience and their appreciation of the journey: *"I would have worked harder and harder in everything. Probably, if I had a bigger commitment, the goal I reached now would be higher."* / *"I think I would have involved even more."* / *"I would have tried and committed more."* (**Student**)

Nevertheless, with the diversity of students present in each class, it is important to address this diversity by finding ways to get students to engage and participate not only in each class, but also according to each student. The researcher even stated that *"(...) we can achieve significant participation with some students who will participate immediately, while others will only get involved later."* and the CT added *"(...) the process is not unidirectional, the student must also want to get involved, evolve and progress in this field."* and *"(...) classes have different responses to the same problem, as well as preservice teachers (...) the best or worst outcome of the process may have been triggered by these differences. They vary in commitment, adherence, way of being... Even depending on the weather outside (...). When it's sunny, they become more energetic and are in a good mood, while when it's raining, they tend to come with less focus to work."*

Strategies to improve student's level of engagement and commitment

Some strategies were found to be effective in increase students' engagement and commitment levels. Working in small groups was identified as a good strategy. One student mentioned *"(...) if it wasn't my group, I wouldn't be able to do it. They help me out and motivate me. I prefer it this way!"*. Additionally, the use of external objects was also shown to be beneficial. A class expressed they felt more motivated when the lesson involved weights, saying *"We want to do more workouts with the weights!"*. In response, the PST adjusted the lesson to align with the students' motivations. Another strategy was dividing the class into two so that half could be playing and learning about a specific sport planned and the other doing and following their PF plan (*"Half playing football and the other half carrying out the fitness plan provided by the PST."* / **Researcher**).

The relationship between students and PSTs was crucial for the successful development of the programme, particularly during the third cycle, which involved planning. Students worked diligently to meet the challenges, and feedback from the PSTs was equally important. One student noted, *"The teacher pushed me. I had easier exercises, and he said they weren't enough for me. It was nice to hear that."*

Even though all the strategies created, some students only got involved and motivated when there were challenged, with prizes involved or the idea of "winning" to somebody else and competition turned out to be another strategy used to encourage students (*"It motivated me! I wanted to win!"* / *"(...) a prize helped!"* / *"(...) to improve and see better results and win this challenge."* / **Student**).

2. Students' challenges and dilemmas

All students identified the difficulties they faced during the four cycles of this programme application, which were consistent across the three classes, despite their unique characteristics.

In the first cycle dedicated to improving PF and working on becoming fit, students were able to identify their problems regarding their level of ability, such as in flexibility (*"We don't have flexibility."* / **Student**), velocity (*"The final sprint is horrible. It's really the worst of all."* / **Student**), upper body muscular strength (*"They push-*

ups are still my major difficulty.” / **Student**) and CRE (*“Pacer. The best and the worst are the same. The best thing was getting to 101 and the worst was afterwards because I was dying.”* / **Student**). The researcher, the PSTs and the CT acknowledged additional problems such as, the lack of body awareness and unfamiliarity with exercises, similar in all classes.

“The issue of breathing is something that still needs to be worked on, as well as body awareness, but not everything is possible, (...) This work has been done in extra meetings, but, as not all students are present, the improvement is not clear with all elements. / **Researcher**

“Although highly involved in the tasks to be completed, the students performed some exercises with technical errors that need to be corrected. (...) it’s the first time they do this fitness plan.” / **Researcher**

While certain students faced more challenges than others, as exemplified by B*, who demonstrates remarkable dedication and engagement, she encounters considerable difficulties in both CRE and MS. This struggle is exacerbated by a minor joint injury in one of her legs. (*“She applies, dedicates herself and will always continue with this posture, but she has a lack of coordination and strength. (...) she had placed 30 running routes at the end of each series. She quickly managed to admit that it was a lot and that she didn’t feel capable. She challenged herself to do 20 and, when he finished them, he even said “now I’m going to run well in the pacer, I’m going to improve my mark”. I was really happy with this challenge to herself and for recognizing the importance of the race to also improve her personal records, not comparing herself to the rest of the group.”* / **Researcher**)

Regarding the second cycle and the assessment practices, the greatest difficulty was convincing the students to attend additional meetings outside PE class hours, given they weren’t mandatory. However, those who participated in these extra meetings found the experience enjoyable (*“The recordings were very helpful.”* / *“(…) in the next session, we could see what we were doing bad and improve it”* / **Student**).

The third cycle, that considered self and group planning, brought mixed feelings among students. While they noticeably enjoyed the autonomy of planning their personal plans, the process was challenging and unfamiliar to them, as they were not accustomed to selecting their own exercises. (*“(…) to the difficulty in planning and choosing the exercises best suited to you, as well as their correct sequence. (...) that changes can be made to improve the plan initially constructed, so that everyone feels motivated to carry out the proposed tasks but that they complete them with rigour and proficiency.”* / **Researcher**)

Another challenge was during the school breaks, exams, and COVID time... which students and PSTs struggled with, affecting the study.

“I feel really tired. It might be because of COVID. I’ll continue working, but I’ve been doing everything at the easiest level because I’m not feeling one hundred per cent.” / **Student**

“I felt the students tired, disconnected and with their minds elsewhere. Perhaps (...) is normal given the moment of the year: the final weeks of the school year, with a lot of stress and work.” / **Researcher**

3. Benefits and students’ voices about the experience

Students assigned different values to this experience, including enhanced PA, knowledge applicable to future life, increased autonomy, improved teamwork, involvement of their family... When considering improvements in the PF tests, all participants observed and experienced them, underscoring the advantages of engaging in a fitness education model in PE.

“(…) I didn’t do any push up and today I did four. I’m much better!”) and *“(…) I was very surprised when we went back to perform the tests, and I had a much better evolution than I was expecting.”* / **Student**

“I was expecting them to improve their PF level, but I wasn’t expecting the one that happened.” / **PST**

Furthermore, students began to directly perceive this development, displaying positive indicators that go beyond formal tests results, as they expressed: *“I feel better in the jumps, in everything... It doesn’t cost as much.”* / *“Now, at the gym, I feel like I do some exercises better. I already knew how to perform them, but now I’m doing them better.”* / *“I’m learning how to train! I’m not an expert yet, but I feel like I’m evolving, and I like that...”* / **Student**

There were also evident signs of enhanced understanding and knowledge among students regarding how to design and implement their fitness plans: *“At least now I know what I’m working ...”* / *“I enjoyed it. I had to think about the exercises and how each of them works. It was cool.”* / *“And also, the process of making our own plan gave us knowledge, not only about ourselves but also things, about the exercises.”* / *“(…) by the end of the year, I was able to do the plan as the teacher suggested the exercises all in conditions.”* / **Student**

This improvement was also felt and shared by the PSTs ... *“In PF, I feel that the students are happy to be performing a plan created by them. This class has a strong personality, and they are motivated by tasks that make them feel important. The commitment is significantly greater.”* / **PST**. Although there were some students with divergent opinions such as: *“I prefer when it’s the teacher planning, because that way I don’t have to get worried.”* / **Student**

Autonomy emerged as another significant value recognised by students throughout the process. As previously mentioned, students moved from a state of dependence to one characterized by greater independence in decision-making.

“I enjoyed working alone because I felt like I did it for myself.” / *“I liked being autonomous.”* / **Student**

*"They are autonomous and enjoy what they do, they are committed to the tasks and seek to improve." / "(...) those who see the class from outside, won't even realize that the teacher is nearby, since the students are already quite autonomous, and PST ends up being just a facilitator." / **Researcher***

The opportunity to learn how to plan their own fitness plan was one of these moments of autonomy students enjoyed (*"Proud! It was done by me"* / **Student**). This step is essential for empowering students to become physically active for life.

The collaborative group work undertaken by students was also highlighted as a crucial advantage, serving as an indicator of improved peer relationships and a sense of belonging: *"(...) the group I belonged supported each other, allowing the exercises to be done more easily. We take notice of each other difficulties so that it is possible to improve the necessary aspects." / "(...) my group helps me improve, motivating me to achieve my goals." / "If it wasn't in the group, I wouldn't make it. They motivate me." / **Student***

Another valuable outcome for students was their increased enjoyment of participating in PA and their willingness to continue working outside of school and throughout their life.

*"I go to the gym three times a week, and I really like it. I go on days when I don't have PE." / **Student***

*"After this year, I feel much better and more motivated to continue training next year." / **Student***

*"This isn't motivation, but now I like to do PE. At the beginning of the year, it was torture." / **Student***

*"They only work when they have to, so we need to oblige them and then make them see the importance of what they did, valuing their effort, encouraging to continue. (...) it is important that they begin to value the tasks they carry out so that they can, later, doing everything of their own free will. Talk to them before and during the PF exercises, and ask how it went at the end... And, of course, try to make them continue this practice outside school, whether in clubs or at home." / **Researcher***

Doing PA was something that they began doing not only by themselves but also with their friends and family, even on holidays.

*"I started running with my family, so I would like to have a fitness plan to do outside school. Continuing to be active is important not only for my physical but also for my mental Health. (...) by bringing my parents and sister, we spend quality time as a family, and we contribute to our health." / **Student***

*"(...) during this school break, I started to follow a fitness plan, especially with my family." / **Student***

The most important part was that *"students were tired, but happy (...)" / **Researcher***, because *"PE helped us understand what we need, what our needs are and what we need to keep doing (...)" / **Student***

The overall feedback from both PSTs and CT is highly positive, indicating the successful creation of an effective programme and a significant stride to enhance student engagement.

*"I believe that the process is tending to be positive. (...) it's built almost from scratch, and this is perhaps a very important conclusion." / "There is a clear evolution from all students, without exception, making it easier for them to do the exercises the correct way, with continuity and with fewer rest stops." / **CT***

*"(...) we moved to the periphery and the student became more, and more in the centre. The proof of this is that they have the tools to make their own plan and the plans are, in fact, good and appropriate for their level." / "I think the balance is very positive, (...) I would say it is very close to perfection. In addition to us being able to make students deeply interested in developing their PF, I think, thanks to this teaching experience, it is possible to create the issue of 'lifelong PA'." / **PST***

Physical fitness improvements

The fitness testing aimed to enhance awareness of physical well-being and measure students' fitness progression, a relevance underscored by analysis at the beginning of the school year and after the 1st cycle (approximately 9 weeks), which focused on improving PF levels and working on becoming fit. There is no certainty that the results are solely driven by the work conducted in this first cycle, but the objective of the study is also for students to increase their level of PA outside the school context.

A simple visual inspection (*Figure 1*) of the obtained values in M0 and M1 revealed a relationship between the normalized muscle strength combined variable and the total number of routes completed. This suggests that students who completed more routes in the pacer test tend to have better levels of combined muscle strength, and the data collected also points out statistic differences between the two moments of fitness testing: MS ($Z = -4.340, p < 0.001$) and CRE ($Z = -4.491, p < 0.001$).

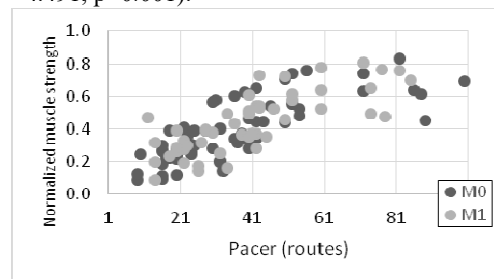


Figure 1. Scatterplot between the composite muscle strength variable and number of completed routes in the pacer test by each student

Regarding the tests conducted, it is important to note that boys ($Mdn_{MS} = 0.48$ vs. 0.50 and $Mdn_{CRE} = 54$ vs. 66 , respectively in M0 and M1) and active ($Mdn_{MS} = 0.37$ vs. 0.44 ; $Mdn_{CRE} = 52$ vs. 56) students presented higher values than girls ($Mdn_{MS} = 0.54$ vs. 0.57 ; $Mdn_{CRE} = 24$ vs. 31) and non-active ($Mdn_{MS} = 0.34$ vs. 0.43 ; $Mdn_{CRE} = 24$ vs. 28) students', respectively, in both moments in MS and CRE. *Figure 2 and 3* illustrates the differences between boys and girls from M0 to M1. The results indicated a significant difference in girls, both in muscular strength ($Z = -4.594$, $p < 0.001$, $r^2 = 0.570$) and CRE ($Z = -4.179$, $p < 0.001$, $r^2 = 0.485$). When comparing active and non-active students, all subgroups shown significant differences from M0 to M1, with higher size effect in non-active (muscular strength: $r^2 = 0.413$ and CRE: $r^2 = 0.530$) than in active students (muscular strength: $r^2 = 0.212$ and CRE: $r^2 = 0.258$).

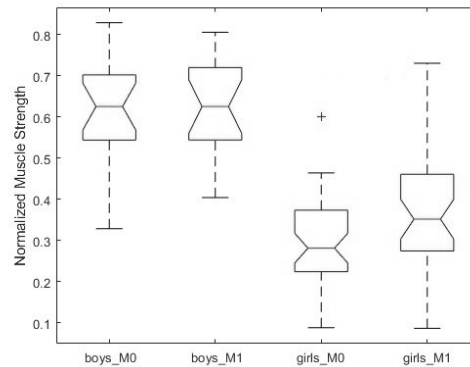


Figure 2. Composite muscle strength in boys and girls in the two moments of fitness testing (M0 and M1)

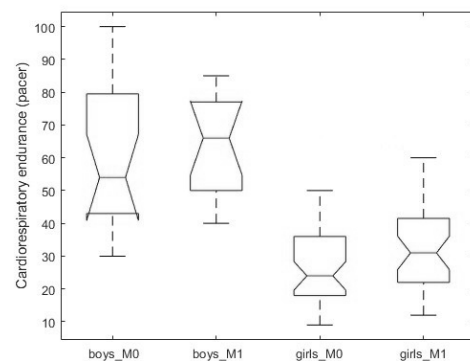


Figure 3. CRE in boys and girls in the two moments of fitness testing (M0 and M1)

It is important to emphasize that the improvements in the push-up test from M0 to M1 were also noticeable (around 45% of increase). From the 61 students, at M0, 15 of them couldn't do a single push-up (one boy and 14 girls). One student even stated that they recognized this improvement and "*Now I can do a perfect push up!*" / *Student*.

Discussion

The information outlines a comprehensive PE programme, which suggests positive outcomes in students' engagement and commitment to PA. However, research focused on PA and PF development in PE and school settings (Pate et al., 2011; Saiz-González et al., 2023) points out challenges in comparison data due to student diversity and programme heterogeneity. Moreover, it is difficult to determine whether the changes are attributed solely to the programme or if the students' level of activity outside the school context might have influenced the results.

Mong and Standal (2019) identified two main streams of thought regarding teaching practices in HE: the pathogenic and the salutogenic approaches. This experience followed a salutogenic perspective and a notable strength is the noticeable rise in student engagement and commitment from the start to the end of the school year. The successful implementation of the four cycles based on McConnell's (2010) model using a salutogenic approach proved to be pivotal in increasing engagement. The model emphasised pedagogical student-centred approaches which were aimed at nurturing students' abilities to become future educators themselves, enabling them to continue being actively engaged outside the school environment and pursue lifelong autonomous wellbeing.

Throughout the progression of the cycles, students exhibited notable improvements in autonomy, particularly evidenced by their increasing pride in planning their own fitness plans, showing evident signs of

enhanced understanding of what and why they were doing it. During the third cycle, it became evident how important it is to recognize students' abilities, give them autonomy in decision-making, and tailoring activities based on their preferences and abilities. If one of the PE goals is to encourage lifelong PA, it is important for students to have the skill to create a personal fitness plan, enabling them to stay active beyond the school environment (Mercier et al., 2016). Autonomy will not only foster student's engagement, but also contribute to students' overall growth and self-awareness for future life, empowering them to take responsibility for their actions (Tolgfors & Öhman, 2016). Emphasizing students' enjoyment on the PE activities developed, particularly in the PF component, can be a strategy to make PE enjoyable.

Since PE can improve students PA levels (Pate et al., 2011), it is important to find strategies to amplify students' commitment. In this experience, using external objects such as dumbbells, working in small heterogeneous and homogeneous groups, dividing the class in two (one in PF and the other in the invasive sport and then change, doing both parts the same) and using competition/prizes allowed to improve students' engagement to PE and PA. Students faced various difficulties and individual challenges, all managed due to the daily PSTs presence and CT guidance. Several adjustments were made throughout the programme to achieve the desired goals of this teaching experience. Per example, difficulties were found, from M0, in performing push-ups. Multiple efforts were made to improve students' upper body strength and the test conducted in December showed a 45% increase from M0, as expected given the maturational phase of the students (Ortega et al., 2008). Furthermore, students also attributed value to the implementation of this programme, as it provided them with the opportunity to plan their own fitness plan, collaborate with their peers and enhance their PF levels. However, despite worldwide efforts to improve students' PA and PF, many children still struggle to engage in regular PA (Eastham, 2018).

In this teaching experience, at least when comparing the two moments of fitness testing, students' revealed improvements in the muscular strength and CRE. Still, although girls presented a significant increase in MS and CRE levels, boys fell short of the desired outcome, especially on the MS variable. Several potential explanations exist: 1) different conditions during the two moments of fitness testing; 2) PST's not considering students' level of fatigue; 3) lack of expertise among PST's in performing the tests; 4) boys higher level of muscle strength from the beginning of the school year, 5) students' distinct levels of PA outside the school context, and 6) students' lack of engagement to perform it, as they perceived it to be time-consuming and exhausting, leading to a significant increase in heart rate. Peralta's (2020) review mentions that PE classes can contribute to improve students' muscle and CRE levels. Yet, it might be needed to reconsider the CRE fitness test used (pacer) to accurately assess CRE levels in activities where this health-related fitness component is required. Besides that, the fitness tests were conducted in two specific points in time, with limited carry over and without considering student's level of PA outside the school at that specific moment.

Camhi et al. (2011) and Kolle et al. (2020) found that as age increases, fitness levels tend to decrease, and this is a problem that needs to be solved so that students can attain higher levels of PA in future life. Students' present higher levels of PF and of PA when submitted to a determined programme (first cycle) and many of them expressed willingness to continue working out outside the school context and even involve their family, which indicates a positive impact on their positive involvement in PA for life. The question that remains is if they are maintaining these levels into adulthood. Sustaining these levels requires a shift in focus beyond merely increasing students' fitness levels (Saiz-González et al., 2023). The review conducted by the authors found positive results in 70% of the studies that analyse PA outcomes, but the battle continues to be for students to know what they are doing and how everything must be done, with the competence and confidence to apply those principles for the rest of their lives.

Considering the broader goal of PE, which extends beyond short-term PA to promote habits conducive to long-term health and well-being, it is important to inform students about each step of the process. The gradual progression towards increased involvement in PA in a student-centred process was not only positive but also essential for enhancing not just students' PF, but also instilling a desire for lifelong PA.

Conclusions

This programme suggests that it is possible to boost both student engagement and involvement, as well as their levels of PA and PF, with just two PE classes per week. The programme's structure, divided into four cycles with a strong emphasis on student-centred approaches, fostered an increment in those aspects throughout the school year. Strategies such as small group work, personalized feedback and the use of external objects contributed to students' increased level of autonomy. Another notable approach involved students' planning their fitness plans with PSTs' support, in the third cycle of the teaching experience, contributing to their overall growth and self-awareness, aligning with the goals of promoting lifelong PA.

Despite facing numerous difficulties, dilemmas, and interruptions such as the COVID pandemic and school breaks, students successfully overcome these challenges. Initially, many struggled with the basic exercises, such as push-ups. However, the results in this specific movement showed a 45% of increase in student's performance, reflecting the programme's effectiveness. Besides that, students also struggled when planning and choosing their own exercises, because it's something they weren't used to do. Such constraints are

inherent in real school experiences, with experiences that go beyond the typical defined curriculum, underscoring the vital role of PST and of the CT in guiding students throughout the programme.

Students throughout the programme showed positive indicators of teamwork, autonomy, knowledge, engagement in PE and higher levels of PA, particularly in muscular strength and CRE. Furthermore, several students expressed a willingness to continue their fitness routines outside the school context and involve their families, indicating a possible means by which PSTs can install lifelong fitness values.

The results align with the broader educational goals of PE, aiming to equip students with the skills, knowledge, and confidence to maintain an active lifestyle in future life. However, it is also crucial to determine if students maintained their PA levels post-intervention (e.g., three months after), to explore the lifelong engagement to healthy lifestyles.

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References

- Abad, B., & Cañada, D. (2014). Unidades Didácticas Activas. *Madrid: Ministerio de Sanidad, Servicios Sociales e Igualdad/Ministerio de Educación, Cultura y Deporte*.
- Antonovsky, A. (1996). The salutogenic model as a theory to guide health promotion. *Health promotion international*, 11(1), 11-18. <https://doi.org/10.1093/heapro/11.1.11>
- Britton, Ú., Issartel, J., Fahey, G., Conyngham, G., & Belton, S. (2019). What is health-related fitness? Investigating the underlying factor structure of fitness in youth. *European Physical Education Review*, 26(4), 782-796. <https://doi.org/10.1177/1356336X19882060>
- Cairney, J., Dudley, D., Kwan, M., Bulten, R., & Kriellars, D. (2019). Physical literacy, physical activity and health: Toward an evidence-informed conceptual model. *Sports medicine*, 49(3), 371-383. <https://doi.org/10.1007/s40279-019-01063-3>
- Camhi, S. M., Phillips, J., & Young, D. R. (2011). The influence of body mass index on long-term fitness from physical education in adolescent girls. *Journal of school health*, 81(7), 409-416.
- Charmaz, K. (2006). *Constructing Grounded Theory*. Sage Publications.
- Eastham, S. (2018). Physical fitness test administration practices and students' cognitive understanding of physical fitness. *The Physical Educator*, 75(3), 374-393. <https://doi.org/10.18666/TPE-2018-V75-I3-7933>
- Fairclough, S. J., & Stratton, G. (2006). A review of physical activity levels during elementary school physical education. *Journal of Teaching in Physical Education*, 25(2), 240-258.
- Field, A. (2017). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage Publications.
- Goodyear, V., & Dudley, D. (2015). "I'm a facilitator of learning!" Understanding what teachers and students do within student-centered physical education models. *Quest*, 67(3), 274-289.
- Kolle, E., Solberg, R., Säfvenbom, R., Dyrstad, S., Berntsen, S., Resaland, G., Ekelund, U., Anderssen, S., Steene-Johannessen, J., & Grydeland, M. (2020). The effect of a school-based intervention on physical activity, cardiorespiratory fitness and muscle strength: the School in Motion cluster randomized trial. *Journal of Behavioral Nutrition and Physical Activity*, 17(1), 1-14.
- Mayorga Vega, D., & Viciano, J. (2015). Differences in physical activity levels in school-based contexts— influence of gender, age, and body weight status. *Kinesiology*, 47(2.), 151-158. <https://hrca.hrce.hr/150541>
- McConnell, K. (2010). Fitness education. In J. B. Publishers (Ed.), *Standards-based physical education curriculum development* (2nd ed., pp. 367-387). Pacific Lutheran University.
- McCuaig, L., & Quennerstedt, M. (2018). Health by stealth – Exploring the sociocultural dimensions of salutogenesis for sport, health and physical education research. *Sport, Education & Society*, 23(2), 111-122. <https://doi.org/10.1080/13573322.2016.1151779>
- Mercier, K., Phillips, S., & Silverman, S. (2016). High school physical education teachers' attitudes and use of fitness tests. *The High School Journal*, 99(2), 170-190. <https://www.jstor.org/stable/44075290>
- Miles, M., Huberman, A. M., & Saldaña, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook and The Coding Manual for Qualitative Researchers*. SAGE.
- Mong, H. H., & Standal, Ø. F. (2019). Didactics of health in physical education - A review of literature. *Physical Education and Sport Pedagogy*, 24(5), 506-518. <https://doi.org/10.1080/17408989.2019.1631270>
- Neil-Sztramko, S., Cadwell, H., & Dobbins, M. (2021). School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18 (Review). *Cochrane database of systematic reviews*(9). <https://doi.org/10.1002/14651858.CD007651.pub3>
- Newell, K. M. (2011). Physical education of and through fitness and skill. *Quest*, 63(1), 46-54. <https://doi.org/10.1080/00336297.2011.10483662>

- Ortega, F., Ruiz, J., Castillo, M., & Sjostrom, M. (2008). Physical fitness in childhood and adolescence: A powerful marker of health. *International Journal of Obesity*, 32(1), 1-11.
- Pate, R. R., O'Neill, J. R., & McIver, K. L. (2011). Physical activity and health: Does physical education matter? *Quest*, 63(1), 19-35. <https://doi.org/10.1080/00336297.2011.10483660>
- Patton, M. Q. (2002). *Qualitative research & evaluation methods*. Sage.
- Peralta, M., Henriques-Neto, D., Gouveia, É. R., Sardinha, L., & Marques, A. (2020). Promoting health-related cardiorespiratory fitness in physical education: A systematic review. *PloS one*, 15(8), e0237019. <https://doi.org/10.1371/journal.pone.0237019>
- Quennerstedt, M. (2019). Healthy physical education - On the possibility of learning health. *Physical Education and Sport Pedagogy*, 24(1), 1-15. <https://doi.org/10.1080/17408989.2018.1539705>
- Saiz-González, P., Iglesias, D., & Fernández-Río, J. (2023). Pedagogical Models, Physical Activity and Intention to be Physically Active: A Systematic Review. *Quest*, 1-15. <https://doi.org/10.1080/00336297.2023.2209734>
- Sallis, J., McKenzie, T., Beets, M., Beighle, A., Erwin, H., & Lee, S. (2012). Physical education's role in public health: Steps forward and backward over 20 years and HOPE for the future. *Research Quarterly for Exercise and Sport*, 83(2), 125-135. <https://doi.org/10.1080/02701367.2012.10599842>
- Stevens-Smith, D. A. (2016). Physical literacy: Getting kids active for life. *Strategies*, 29(5), 3-9. <https://doi.org/10.1080/08924562.2016.1205536>
- Tolgfors, B., & Öhman, M. (2016). The implications of assessment for learning in physical education and health. *European Physical Education Review*, 22(2), 150-166. <https://doi.org/10.1177/1356336X15595006>
- UNESCO. (2015). Quality Physical Education (QPE): Guidelines for policy makers. <https://doi.org/https://unesdoc.unesco.org/ark:/48223/pf0000231963>