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Study Protocol

An Internet-Supported Continuing Professional Development Training with Secondary School Physical Education Teachers: Protocol for the Physical Education for Moving (PE4MOVE) Trial

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Abstract: Most adolescents in industrialized countries are physically inactive and effective actions to counteract this situation are required. School physical education (PE) can promote students' active lifestyle. The paper presents the protocol of the "Physical education for moving" (PE4MOVE) project, based on an Internet-supported professional training program offered to PE teachers in a region of central Italy. Secondary school PE teachers and their students are randomly allocated to either an intervention group or a wait-list control group. Teachers participate in a continuing professional development training (CPDt) designed to increase knowledge and competences regarding students' physical activity (PA) promotion. The CPDt, developed according to recent recommendations, consists of a mixed-modality preliminary session on fitness testing, and webinars and online workshops on theory-driven strategies. Teachers are then required to apply contents during their PE classes. Teachers' variables related to PA promotion, as well students' approach to PA, PA levels and physical fitness are recorded at pre- and post-trial times. Upon its completion, the project may contribute to the field by providing evidence for the effectiveness of Internet-supported teachers' training programmes, for the transferability of students' motivation from PE to out-of-school settings, and for the relationship between teachers and students' motivation.

Keywords: PE teachers' education; leisure time; physical activity; motivation; intentions

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1. Introduction

1.1. Background

Regular physical activity (PA) is essential to children and adolescents' health, well-being, physical growth, and cognitive and social development [1–5]. Recent scientific literature links children and adolescents' PA levels with cognitive functioning and academic achievement, in particular highlighting physical fitness as an effective and economic indicator of PA [6–9]. Despite the large amount of literature highlighting the importance of an active lifestyle, a large proportion of youths in industrialized countries do not meet PA recommendations, with daily amounts of PA decreasing from childhood to adolescence [10–13], and significant gender differences, with boys being more active than girls in the age range 11–17 years [14].

In Italy, the country where the present study has been designed, prior to the COVID-19 pandemic it was estimated that only one out of 10 adolescents aged 11–15 years was

reaching the minimum recommended quantity of daily PA [15]; similar to other European industrialized countries, PA levels resulted lower for adolescents and girls when compared to children and boys, respectively [15]. The COVID-19 pandemic has worsened this already shocking situation, leading to lower levels of PA compared to the pre-pandemic period, and making young people an even more vulnerable population in terms of physical inactivity [16,17].

1.2. Rationale

The adoption of physically active behaviours is related to the combination of different individual, social, cultural, environmental, economic and political factors. Several authors suggested to consider multilevel socio-ecological models for developing and implementing PA promotion interventions, arguing that the knowledge and management of PA determinants plays a key role in planning and realizing effective interventions [18,19]. The majority of the most recent PA guidelines are in line with this approach, recommending multisystem-based actions [20,21]. Within this framework, school-based programmes and physical education (PE) have demonstrated the potential to increase youth's PA levels, and international agencies and authors advise investing in such kinds of interventions [20–26].

PE teachers in particular have been recognized as fundamental actors of transformative processes aimed at motivating youths to adopt an active lifestyle and to move more [11,26–31]. PE teachers can provide their students with motivation, confidence, competence, knowledge and understanding, which are essential to become sufficiently physically active [28,32–36]. To maximize their impact on students' PA, PE teachers need up-to-date knowledge, specific skills and adequate tools. Professional education is the way to equip teachers with the right competences; it has been proven that Continuing Professional Development training (CPDt) can positively influence both teachers' work engagement and students' motivation [37–39].

CPDt for PE teachers has gained increasing interest in the last few years [34,40–42], with authors strongly recommending the adoption of evidence-based approaches for designing CPDt programmes [39]. The effectiveness of these interventions is related to some well-identified characteristics [37,43]—programmes should: (a) be based on teacher's needs and interests; (b) consider teachers as active learners in a social environment; (c) offer collaborative opportunities within learning communities; (d) be ongoing and sustained, i.e., teachers should be accompanied in their long-term professional development; (e) enhance both pedagogical skills and content knowledge; (f) be facilitated by school teacher-leaders and/or principals; (g) be linked to students' learning, as this provides teachers' with feedback on their own work. With particular regard to the promotion of students' PA, CPDt programmes should address topics such as physical literacy [36,38,44–46], teachers' need-supportive behaviours [28,47–49], mastery-oriented motivational climate and enjoyment in PE [50–54], assessment for learning in PE [55], physical fitness testing [56,57], and techniques for behaviour change [58,59]. When teachers are provided with this specific content knowledge, pedagogical skills and competences [39,60], they can positively impact the student's experience in PE and, through this experience, student's motivation towards PA. Additionally, CPDt interventions can be beneficial for PE teachers themselves, favouring reflective practices and ensuring professional development [39].

The "Physical Education for Moving" (PE4MOVE) project presented in this paper has been inspired by the European project "Identifying and Motivating youth who mostly need Physical ACTivity" (IMPACT [34]), an Erasmus+ Sport project carried out between 2017 and 2019 across six European countries (France, Greece, Italy, Spain, Turkey and U.K.) and aimed at identifying physically inactive students and promoting out-of-school exercise and sport through PE. The theoretical foundations of the PE4MOVE lie on the same psychological theories, related to the processes underpinning motivations towards PA that sustained the IMPACT project. In particular, concepts from Prochaska and Markus's Stage-of-Change Transtheoretical Model [61]; the Self-Determination Theory by Deci & Ryan [47,48]; the Achievement Goal Theory, initially developed by Nicholls [62]; Ajzen's

Theory of Planned Behaviour [63]; and from the Trans-contextual Model by Hagger and Chatzirantis [28,64] were considered. According to this background, the determinants of PA considered in our study are at the personal (e.g., gender, age, socioeconomic status, intention and motivation towards PA); social (e.g., social support from parents, teachers and peers); and environmental levels (e.g., teachers' behaviour, motivational climate in PE). Moreover, student's physical fitness measurement has been included as one of the study variables, since this is considered a reliable indicator of PA regular practice and related health outcomes [9].

From an applied perspective, the main strategy of the PE4MOVE project is a specific CPDt programme for PE teachers. The programme was developed in accordance with the most recent guidelines on effective PE teachers' continual professional training, modalities and contents on the one hand, and the compelling need to promote youths' PA (at any cost) on the other hand, with the request coming from teachers and school institutions to increase the availability of professional training during the COVID-19 pandemic. The CPDt programme consists of an Internet-supported educational intervention that is designed: (a) to cope with the restrictive measures implemented to contain the COVID-19 pandemic and with the recommendations to make professional training more accessible to all teachers [65,66]; (b) to recognize the use of technology as a good opportunity to improve PE Teacher Education (PETE) [67,68].

1.3. Aim and Objectives

The present paper aims to report the development of the PE4MOVE project, a randomized trial designed to promote secondary school students' out-of-school PA through PE teachers' continuing education, in an Italian region. Specifically, the trial will pursue the following consequential objectives: (1.a) enhancing PE teachers' PA promotion competence through an Internet-supported CPDt; (2.a) improving students' approach to PA; (3.a) increasing students PA levels; (4.a) finding a positive relationship between teachers' behaviour in PE and students' motivation. The intervention could also have secondary positive effects on teachers' work engagement (labelled 1.b), as a relationship can be expected between this construct and the acquisition of new job-related competence and students' physical fitness (3.b). Students' physical fitness in particular will be labelled 3.b, as it can be considered related with students' physical fitness, which is the goal of 3.a. The study design, recruitment process, CPDt intervention, materials adopted for the assessment, statistical plan and project timeline are outlined in the following paragraphs. Potential strengths and possible difficulties of the PE4MOVE project are also discussed, together with a plan for the dissemination of results.

2. Methods and Materials

2.1. Study Design and Setting

The study is designed as a multicentre randomised controlled trial (RCT) and is conducted for the 2021/2022 school year. The trial is implemented in collaboration with the Marche Regional School Office (USR Marche); the setting is represented by lower and upper secondary schools in this Region.

2.1.1. Ethical Approval and Trial Registration

Ethical approval for conducting the study was obtained on 15 April 2021 from the Approval Ethics Committee for Research of the Free University of Bozen-Bolzano; the corresponding ethical approval code is P4Move Cod. 2021_01 (see Supplementary Materials File S1). Subsequently, the trial was registered with the ISRCTN registry, a WHO-approved institution, on 24 February 2022. The trial registration code is ISRCTN16155799 (see Supplementary Materials File S2).

2.1.2. Trial Description

An opportunity sample of secondary school PE teachers is involved and randomised into an intervention (IG) and a wait-list control group (CG). PE teachers in the IG attend an Internet-supported CPDt and implement their following curricular PE classes according to the acquired skills and competence, while PE teachers in CG are required to deliver their PE programme as usual in the same school year. The training is first offered to participants in the IG and, one year later in the post-trial phase, to the CG. Similarly, students have also initially been divided into IG or CG. PE teachers participating in the study are supposed to work with the same classrooms for all the duration of the study; consequently, students are assigned to the IG or the wait-list CG according to their teacher allocation. Pre-trial data are collected for all participants (IG and CG teachers and students) at the beginning of the project (i.e., at the beginning of the school year); post-trial data are collected again among all participants at the end of the intervention (i.e., at the end of the school year). See Figure 1 for an overview of the study SPIRIT schedule.

	STUDY PERIOD				
	Enrolment	Allocation	Post-allocation		Close-out
TIMEPOINT	$-t_1$	t_0	t_1	t_2	t_3
ENROLMENT:					
Eligibility screen	X				
Informed consent from teachers	X				
Informed consent from students	X				
Randomization and Blinding	X				
Allocation		X			
INTERVENTIONS:					
Continuing Professional Development training (CPDt) with the Intervention Group (IG)		⟷	⟷		
CPDt with the wait-list Control Group (CG)				⟷	⟷
ASSESSMENTS:					
Demographic data for teachers (i.e., age, sex, teaching experience, school level, educational qualification and type of employment contract)		X	X	X	X
Primary outcomes for teachers (e.g., self-efficacy in promoting out-of-school PA, ...; see Table 2 for full details)		X	X	X	X
Secondary outcomes for teachers (e.g., work engagement)		X	X	X	X
Demographic data for students (i.e., age, sex, weight, height, country of birth, years in Italy, school grade, and socioeconomic status)		X	X	X	X
Primary outcomes for students (e.g., intention to practice physical exercise/sport, amount of moderate-to-vigorous physical activity, ...; see Table 3 for full details)		X	X	X	X
Secondary outcomes for teachers (e.g., cardiorespiratory and musculoskeletal fitness, BMI)		X	X	X	X

Figure 1. SPIRIT schedule of the study. X indicates that the step has been completed within that period of time. Solid lines indicate that the step has been completed over different periods of time.

2.2. Recruitment Process

All the secondary school PE teachers of the Marche Region, Italy, were invited to participate in the PE4MOVE project during the 2020/2021 school year. In the recruitment phase, links with local schools and PE teachers were established thanks to the USR Marche. Online meetings with school principals and PE teachers were organised in the last part of the 2020/2021 school year. These meetings helped to present the project rationale, aims, methods, and training activities and to explain why participation could be beneficial. In a second step, an invitation letter, information related to the study and the informed consent forms were sent to all the schools and the PE teachers of the Region. At this point, teachers had to return their signed informed consent, and then select 3–5 of their classrooms.

2.2.1. Eligibility Criteria

Formal eligibility criteria were set for inclusion in the trial. Specifically, PE teachers must: (1) be in-service teachers in lower or upper secondary schools; (2) teach in the same classrooms during all the 2021/2022 school year; (3) participate in the project with 3–5 of their classrooms; (4) return their signed informed consent. The inclusion criteria for students were: (1) being a lower or upper secondary school student (age range between 11 and 19 years old); (2) being a student of one of the teachers involved in the project; (3) returning their signed informed consent (in the case of minors, the document had to be signed by a parent or legal guardian). Participants not meeting these requirements are not involved in the PE4MOVE project.

2.2.2. Randomization and Blinding

A total of 146 secondary schools of the Marche Region are involved in the project. At the beginning of the 2021/2022 school year, schools and eligible teachers (N = 107; n = 61 for the IG; n = 46 for the CG) were randomly assigned to the IG or to the CG. The randomisation was performed by a staff member of the USR Marche. Eligible students (N = 5307; n = n/a for the IG; n = n/a for the CG) were allocated according to the group of their teacher. Furthermore, randomization was performed so that it was not possible to have teachers and classrooms of the IG and teachers and classrooms of the CG in the same school. This was done in order to avoid the possibility of teachers or students from the IG influencing those in the CG. Participants have been provided by the USR Marche with an anonymous personal code, and they have been asked to report this code when completing surveys and physical fitness tests. In order to preserve the blindness of the study, researchers do not know the link code-participant, and USR Marche staff members do not know the link between the code and the related dataset. A flow chart representing the recruitment process is reported in Figure 2.

2.3. Intervention

2.3.1. The Continuing Professional Development Training for PE Teachers

The intervention with secondary school PE teachers consists of an Internet-supported CPDt programme that is designed according to recent recommendations for PE settings [37,39,43]. Participant teachers will receive context-specific training and will be considered active learners within their professional community. An initial 90-min preliminary session with all PE teachers (IG, CG) was organised in a mixed modality to train them in testing students' physical fitness and reporting test results (6-min walk test [69]; handgrip test and standing long jump [70,71]). This first meeting helped to prepare teachers for the pre-trial data collection with students (t_0). Then, the proposed professional training programme for teachers in the IG consisted of four 75-min webinars, including content knowledge regarding youths' PA promotion, and four 90-min workshops, aiming to enhance PE teachers' skills and competences. Webinars are held with all PE teachers in the IG, while workshops are conducted with smaller groups of 15–20 participants to engage them in active and collaborative learning activities (i.e., individual self-reflections, small group discussions, completing tasks, etc.) and peer-to-peer interactions. An adequate

online platform (i.e., Microsoft Teams) is chosen to carry out training activities both in a single meeting room and in several breakout rooms. PE teachers are invited to use live chats, web-based tools for active learnings (i.e., Mentimeter and Kahoot), and webcams and microphones to ask questions, provide feedback, share their professional experience and take part in small and large group discussions. CPDt webinars and workshops are presented in chronological order in Table 1, which includes the details of meetings modality, contents and learning strategies.

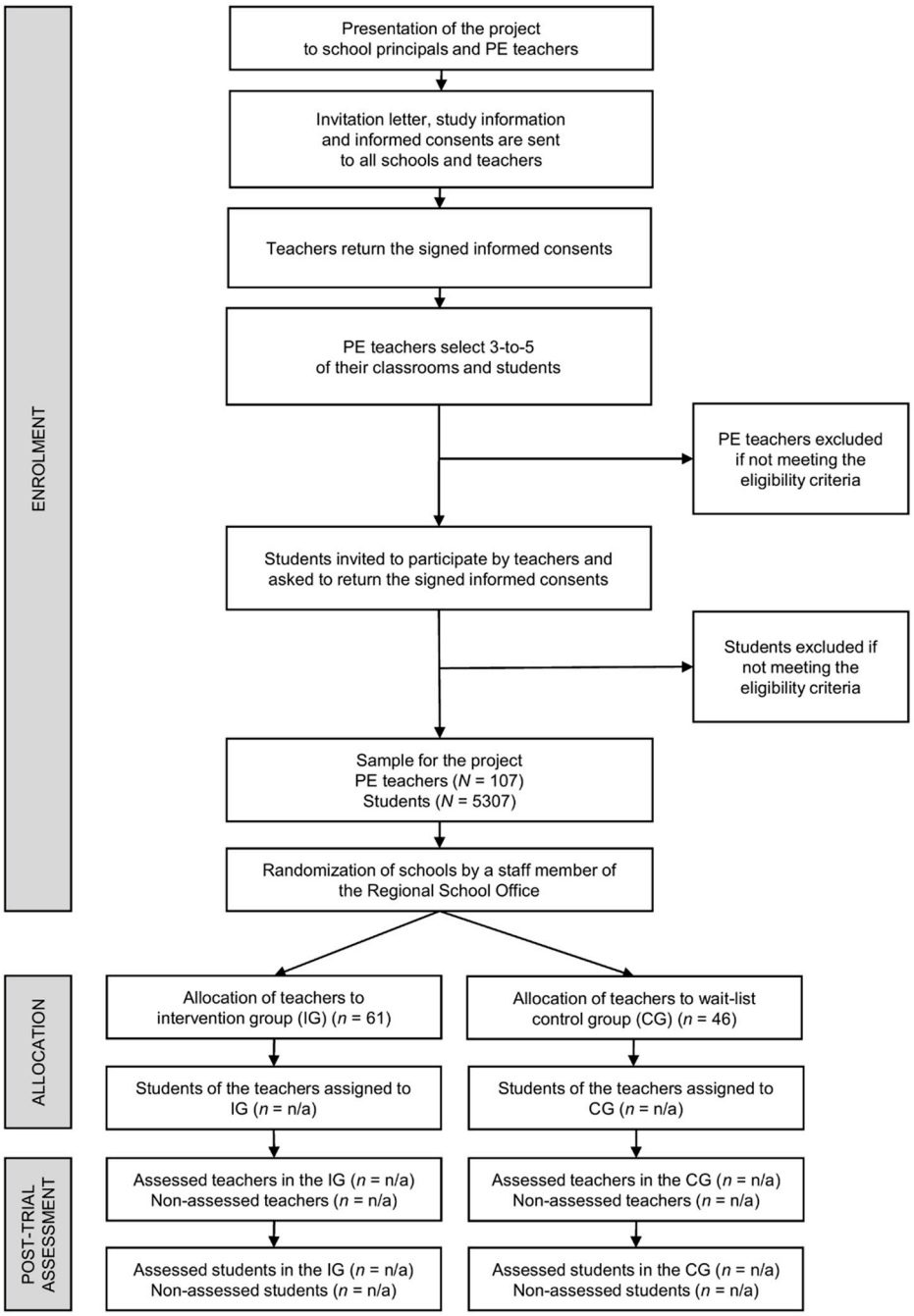

Figure 2. Flow chart for the recruitment process.

Table 1. CPDt meetings in chronological order, including modality, contents, and learning strategies.

Modality	Session Topic	Content	Active Learning Strategy
Preliminary meeting • mixed (online, in-presence) • all PE teachers (IG, CG)	Data collection	- How to fill in the survey for PE teachers - How to administer survey to students - Description of fitness tests aims and materials - How to conduct fitness tests at school with students - How to report result of fitness tests	• Clarification pauses
Webinar 1 • online • 1 group (IG)	PA promotion and SB prevention at school and in PE	- Prevalence of physical inactivity in Italy - Documents with evidence-based guidelines to promote PA and prevent SB - The socio-ecological model of PA by Bauman et al., 2012 - PE teacher's role in promoting PA through PE - The concept of physical literacy and the physically educated person - Practical implications for PE teachers - National and international guidelines on PA and SB - Reflections on PA and PE during the COVID-19 pandemic	• Visual list • Clarification pauses
Workshop 1 • online • 4 subgroups (IG)	Barriers and facilitators to PA	- Individual introduction of participants - Barriers and facilitators to personal and students' PA - How PE teachers can help students in overcoming PA barriers	• Think–pair–share • Visual lists • Large group discussion
Webinar 2 • online • 1 group (IG)	Underpinning theories and concepts beyond youth PA promotion	- The construct of motivation - Self-Determination Theory - Benefits of intrinsic motivation - Basic needs satisfaction and PE teachers' need-supportive behaviours - Motivational climate in PE and its impacts on students - Enjoyment in PA and PE and its determinants/barriers - How to investigate students' enjoyment in PE	• Clarification pauses
Webinar 3 • online • 1 group (IG)	Strategies and techniques to promote PA among students	- PA types and settings - Self-regulation mechanism, goal setting, action planning, self-monitoring - How to help students to set SMARTER. goals - How to guide students to plan and monitor PA - Using non-controlling and informal language in PE - Digital technologies to manage an active lifestyle - How to use digital technologies with students to encourage planning and self-monitoring of PA and receive objective feedback - Presentation of the FitBack web-based tools to receive feedback on fitness	• Individual feedback • Large group discussion
Workshop 2 • online • 4 subgroups (IG)	Team Pentathlon	- Principles, structure, timeline and aims - How to measure intensity and duration of PA - How to compute pentathlon points and PA categories - Example of paper materials to monitor students' activities	• Brainstorming • Large group discussion
Workshop 3 • online • 4 subgroups (IG)	Adaptations of Team Pentathlon	- How to adapt the Team Pentathlon to students and classes' needs - How to use, create and propose paper and digital materials to self-monitoring and planning of PA - New PA categories for students within the PE4MOVE project - Example of Team Pentathlon adaptation	• Problem solving • Large group discussion

Table 1. *Cont.*

Modality	Session Topic	Content	Active Learning Strategy
Workshop 4 • online • 4 subgroups (IG)	Assessment in PE	- Assessment, measures, test, data - AIESEP position statement on PE assessment - Assessment for learning	• Visual lists • Individual feedback • Large group discussion
Webinar 4 • online • 1 group (IG)	Preliminary results and community of practice	- Results from data collection (t_0) with students of the PE4MOVE project - PE teachers' community of practice and future prospective	• Clarification pauses

The CPDt contents are inspired by those of the IMPACT project [34] and enriched with considerations on the impact of the restrictive measures imposed by the COVID-19 pandemic [17,72–76]. Precisely, the CPDt programme addresses the following topics: (1) the concept of physical literacy and its practical implication in PE [35,36,77]; (2) the role of school and PE teachers in students' active lifestyle promotion [20,21,30,34,78]; (3) the most recent national and international guidelines on PA and sedentary behaviour [1,78]; (4) the theories relating to self-determination and motivational climate in PE [18,28,47,48,50,62,79,80]; (5) the need-supportive motivation teaching style in PE [28,49,81–83]; (6) the role of enjoyment in PE setting and PA participation [84–87]; (7) goal-setting, monitoring and action planning techniques to increase PA levels [58,59,88–93]; (8) the use of technologies to foster students' out-of-school PA [94–101]; (9) the "Team Pentathlon" intervention in school settings and its revision by IMPACT project researchers [34,102–104]; (10) assessment practices in PE [55,105,106]. Each session was developed by the academic research team involved in the present project, which includes experts in the fields of Sport Pedagogy, Sport and Exercise Sciences, Sport Psychology, and PE teacher Education. The contents, aims, learning outcomes, interactive activities, tools, and educational materials are specifically tailored for PE settings.

2.3.2. Monitoring and Intervention Adherence Plan

Recent guidelines for group-level studies of complex interventions [107] are followed to ensure the fidelity of the present trial. In particular, attention is given to training delivery and the academic research team was also composed based on their competence on the project topics. Additionally, the training is delivered by the same research team to all participants, and it is known that a single team deliverer ensures higher fidelity [107]. Valid and reliable measurement instruments for physical fitness, socio-psychological and pedagogical variables have been chosen to guarantee an accurate statistical assessment. Additionally, the academic research team and the USR Marche are constantly organising staff meetings to plan training sessions and data collections, to discuss contents and communications to school principals and PE teachers, to monitor study progress, and to implement final focus groups with teachers. Training sessions with teachers are arranged in the afternoon from Monday to Friday and the frequency is adapted as much as possible to the teachers' work activities in order to facilitate participation. Educational materials such as slides, training session recordings, manuals, articles and guidelines, are provided to participants to support their adherence to the programme. During workshops, teachers are involved in a social learning environment through discussion and relevant feedback. A dedicated email address has been provided in case further support is needed, and participants are followed-up to remind them of meetings and data collection dates. This ensures fidelity in terms of the receipt and enactment of training contents and helps maintain a low rate of missing data.

2.4. Materials

To pursue the aim and objectives outlined in the introduction, several variables are investigated using validated self-report and objective measures that are already adopted in

previous projects and studies in this field [32,34,96,108,109]. In particular, self-report measures employed with students derive from the IMPACT project [34]. Self-report measures for physical education (PE) teachers have also been used already in similar studies on this topic [32,33,110]. Finally, objective measures adopted for the present investigation have already been used in previous studies [108,109] and Erasmus+ European projects, such as the IMPACT and the FitBack projects, in order to monitor physical activity and physical fitness among children and adolescents [34,96]. Demographic data and personal variables are also collected both for teachers (i.e., age, sex, teaching experience, school level, educational qualification and type of employment contract) and students (i.e., age, sex, weight, height, country of birth, years in Italy, school grade, and socioeconomic status). All these variables are measured at the baseline (t_0) and at the end of the trial (t_1). Dependent variables are divided in primary and secondary outcomes, according to the project objectives described in the introduction.

2.4.1. Primary Outcomes for PE Teachers and Their Students

PE teachers' approach to PA promotion (1.a) is measured with self-report scales, which evaluate self-efficacy in promoting out-of-school PA [33,110]; self-efficacy in creating a positive motivational climate in PE [110]; self-determined motivation in promoting students' out-of-school PA [33,111]; interpersonal behaviours in PE [112]; the intention to promote students' out-of-school PA [33,110,113]; behaviours to promote students' out-of-school PA [32,33]; and pedagogical formats and feedback to promote students' out-of-school PA [32,33] (see Table 2 for full details).

Students' approach to PA (2.a) is also measured with self-report scales in terms of perceived motivational climate in PE [114]; basic psychological needs satisfaction [115–117]; the behavioural regulation of motivation towards PE classes [118]; the achievement goals in PE [119]; enjoyment in PE [87,120,121]; the intention to practice physical exercise/sport in leisure time [80]; perceived behavioural control regarding physical exercise/sport in leisure time [64,122]; attitudes towards physical exercise/sport in leisure time [64]; perceived social support from friends and family towards PA [123]; action planning [124]; self-monitoring [125,126]; and subjective vitality [127] (see Table 3).

Table 2. Synthesis of the measured outcome variables for teachers.

Dimension	Variable	Instrument
Primary outcomes		
PE teachers' approach to PA promotion (1.a)	- Self-efficacy in promoting out-of-school PA	4 items, 11-point scale [33,110]
	- Self-efficacy in creating a positive motivational climate in PE	4 items, 11-point scale [110]
	- Self-determined motivation in promoting students' out-of-school PA	15 items, 5 subscales, 7-point scale [33,111]
	- Interpersonal behaviours in PE	Interpersonal Behaviours Questionnaire (IBQ) in Sports, 24 items, 6 subscales, 7 point-scale [112]
	- Intention to promote students' out-of-school PA	3 items, 7 point-scale [33,110,113]
	- Behaviours to promote students' out-of-school PA	3 items, 11 point-scale [32,33]
	- Pedagogical formats and feedback to promote students' out-of-school PA	4 items, 5 point-scale [32,33]
Secondary outcomes		
PE teachers' work engagement (1.b)	- Work engagement	Utrecht Work Engagement Scale (UWES), 9 items, 3 subscales, 7 point-scale [128,129]

Table 3. Synthesis of the measured outcome variables for students.

Dimension	Variable	Instrument
Primary outcomes		
Students' approach to PA (2.a)	- Perceived motivational climate in PE	12 items, 3 subscales, 5-point scale [114]
	- Basic psychological needs satisfaction	15 items, 3 subscales, 5-point scale [115–117]
	- Behavioural regulation of motivation towards PE classes	Behavioural Regulation in Exercise Questionnaire (BREQ-2), 20 items, 5 subscales, 5-point scale [118]
	- Achievement goals in PE	13 items, 2 subscales, 5-point scale [119]
	- Enjoyment in PE	Physical Activity Enjoyment Scale (Short PACE-it), 12 items, 2 subscales, 5-point scale [87,120,121]
	- Intention to practice physical exercise/sport in leisure time	3 items, 7-point scale [80]
	- Perceived behavioural control regarding physical exercise/sport in leisure time	3 items, 7-point scale [64,122]
	- Attitudes towards physical exercise/sport in leisure time	4 items, 4 subscales, 7-point scale [64]
	- Perceived social support from friends and family towards PA	8 items, 2 subscales, 5-point scale [123]
	- Action planning	5 items, 5-point scale [124]
	- Self-monitoring	4 items, 5 point-scale [125,126]
	- Subjective vitality	5 item, 7 point-scale [127]
Students' out-of-school PA levels (3.a)	- Objective PA levels	Accelerometer wGT3X-BT ActiGraph [130]
	- Frequency of moderate-to-vigorous PA (Days/week)	PACE+ Adolescent PA Measure, 2 items [131]
	- Amount of moderate-to-vigorous PA (Hours/week)	1 item [132]
	- Extracurricular out-of-school training with a coach/instructor (Times/week)	1 item [34]
	- Extracurricular in-school training (Days/week)	1 item [34]
	- PA at school, PA outside of school, and sedentary behaviours	Youth Activity Profile (YAP), 15 items, 3 subscales, 5 or 6-point Likert scales [133]
Secondary outcomes		
Students' physical fitness (3.b)	- Cardiorespiratory fitness	6-min walk test [69]
	- Musculoskeletal fitness	Handgrip; Standing long jump tests [70,71]
	- Body Mass Index (BMI)	2 items (self-report weight and height)

Students' out of school PA levels (3.a) are measured through both self-report instruments and objective tests; objective PA levels are measured using accelerometers (ActiGraph [130]), whereas frequency and the amount of moderate-to-vigorous PA, extracurricular out-of-school training with a coach/instructor, extracurricular in-school training, PA at school, PA outside of school, and sedentary behaviours are all measured through self-report instruments [131–133]. The full details of these measures are provided in Table 3.

With regards to goal 4.a, i.e., finding a positive relationship between teachers' behaviour in PE and students' motivation, the variables relating to PE teachers' approach to PA promotion and to students' approach to PA (see Tables 2 and 3) will be taken into consideration for further multilevel analyses.

2.4.2. Secondary Outcomes for PE Teachers and Their Students

PE teachers' work engagement (1.b) is measured with a self-report scale, the Utrecht Work Engagement Scale [128,129]. Additionally, students' physical fitness (3.b) is assessed objectively in terms of cardiorespiratory fitness via the 6-min walk test [69], and musculoskeletal fitness via the handgrip and the standing long jump tests [70,71]. Students are also asked to report anonymously in the survey their weight and height both at t0 and t1, so that it is possible to calculate their Body Mass Index (BMI). Even for these measures, full details are provided in the Tables 2 and 3.

2.5. Statistical Plan and Sample Size Calculation

A statistical analysis plan was developed before the implementation of the project in order to define the type of tests to be performed, to calculate the required effect size or the required number of participants, and then to start the recruitment process.

2.5.1. Types of Data and Statistical Analyses to Be Used

Different types of data are collected in this project, including nominal, ordinal and scalar variables, and these will be treated according to statistical criteria. Initial descriptive analyses will be performed to outline the study participants characteristics and evaluate data distribution. Computed scores of self-reported variables will be reckoned by means; this will allow us to preserve an entire data row if a single item response is missing. In case of the students' samples, a few variables are based on single-item measures, and if a missing value is present, it will not be possible to compute a mean by row. In that case, missing values will be replaced with columns' means or they will be deleted. This decision will be made based on the amount of missing data and taking into consideration the considerable large sample of students. At this point, a series of preliminary tests will be run in order to identify possible relevant variables to be included as fixed factors (e.g., sex and/or school type) or covariates (e.g., age and/or teaching experience) in the following analyses. Main analyses will be planned based on the initial objectives, and a series of repeated measures analyses of variance will allow for assessing the differences between IG and CG and changes between t_0 and t_1 in terms of: (1.a) PE teachers' approach to physical activity promotion; (2.a) students' approach to PA; (3.a) students out-of-school PA levels. Differences and changes in teachers' work engagement (1.b) and students' physical fitness (3.b) will also be assessed as possible secondary outcomes of the intervention. Multilevel analyses will allow us to observe the relationship between teachers' behaviour in PE and students' motivation (goal 4.a). Finally, path analyses will also be conducted to confirm the validity of the IMPACT model.

2.5.2. Sample Size Calculation

Power analyses were performed using the G*Power software, version 3.1, Heinrich Heine University, Düsseldorf [134]. Due to the limited number of secondary school PE teachers in the Marche Region, we decided to run sensitivity power analyses to compute the required effect size to find significant differences among teachers. For repeated measures Analyses of Variance (ANOVAs) and Multiple Analyses of Variance (MANOVAs) within–between interaction, with a total sample size of 100 teachers (divided in the two groups), a two-tailed probability level set at 0.05, a power of 0.80, and four measurements (IG and CG at t_0, and IG and CG at t_1), a minimum effect size of 0.34 would be required to find significant differences.

Differently, due to the high number of recruitable students in the Region, we ran a priori power analyses to compute the required sample size to detect even a small effect (i.e., 0.1 [134,135]). Even in this case, we considered both repeated measures ANOVAs' and MANOVAs' within–between interaction. The two-tailed probability level was set at 0.05, the power at 0.80, the number of groups at 2, and the number of measurements at 4. Based on these input parameters, a minimum sample of 1095 students would be required.

2.5.3. Data Management Plan, Data Availability, and Safety Considerations

Collected data will be managed according to Wilkinson and colleagues' principles (2016 [136]) and they will be stored on the research team's university cloud services. They will be made available to reviewers, scholars and other interested parties upon reasonable request. The participants' anonymity will be ensured by the blinding process outlined above (see Section 2.2.2 "Randomization and blinding").

Alongside the safe data management described above, other considerations should be made with regards to the implementation of the CPDt and the subsequent PE classes led by teachers. Teachers involved in the IG will be free to withdraw from the intervention at any point, and students will be allowed to withdraw from the survey (i.e., withdraw from questionnaires and/or physical tests). Regardless, both teachers and students should benefit from the intervention, and those allocated in the wait-list control group will also have the possibility to take part in the training at a later time. PE classes implemented by

teachers following the CPDt principles will not involve any risk apart from those associated with regular PE classes.

2.6. Timeline and Current Status of the Trial

The partnership established between the research team and the USR Marche, the approval for the study by the UniBz Ethic Committee, the presentation of the project to principals and PE teachers of the Marche Region, the invitation of participants and the beginning of teachers' and students' recruitment occurred during the 2020/2021 school year, from January to August 2021. Then, pre- and post- trial collection times with all participants of the PE4MOVE project (i.e., IG and CG) and the intervention with PE teachers in the IG and their students took place during the 2021/2022 school year, from September 2021 to July 2022. Finally, data elaboration, statistical analysis, papers preparation and dissemination activities (e.g., participation at events and conferences) will be carried out in the last quarter of 2022. At the time of this writing, pre-trial data at t_0 were collected and seven out of eight training sessions with PE teachers in the IG were conducted. Currently, trained teachers are applying training contents with students during PE classes, while teachers in the CG are leading their PE classes as usual.

3. Discussion

Findings from the PE4MOVE project will contribute to both the applied and the research fields, as they will: (1) provide international, national and local educational institutions, teachers and researchers with reliable information regarding the PA levels, physical fitness and PA determinants of lower and upper secondary school students; (2) increase the knowledge about the effectiveness of PE-based interventions aimed to foster youths' PA; (3) provide support for Internet-supported CPDt for PE teachers.

3.1. Strengths and Limitations

The present project can potentially provide several practical implications regarding the effectiveness of the CPDt in influencing PE teachers' approach to PA promotion, the transferability of the motivation from the teachers to their students, and the transferability of students' motivation from PE to out-of-school settings. The key strengths of the current study are: (1) the use of valid and reliable measurement instruments for PE settings and youth PA already adopted in previous research [32–34,69,75,109,137]; (2) the use of context-specific contents for PE teachers' professional training; (3) the development of the CPDt according to recent guidelines for PE [37,39]; (4) the partnership with local school authorities, which is considered a key-point to ensuring intervention effectiveness [138].

From a research perspective, the possibility of recruiting a sample of students that is much larger (i.e., 5307 students) than the minimum required according to a priori sample size calculation (i.e., 1095 students) will allow us to observe powerful tests for this population. On the other hand, due to the not unlimited number of in-service PE teachers in the observed Region and their small sample size (i.e., 107 PE teachers), statistical tests with this population might have a lower observed power and might fail to detect differences between IG and CG.

Although the PE4MOVE project has the potential to increase PA levels among students and to change PE teachers' approach to PA promotion, these expected outcomes could be undermined by the ongoing COVID-19 pandemic. In fact, over the last three school years, the learning experience of Italian students has been influenced by severe restrictions in the PE context, and by COVID-19 infections or preventive quarantine affecting students and teachers. This scenario impacts school programmes, and PE classes are delivered with frequent interruptions and unpredictable alternations between face-to-face and distance learning, likely having an impact on the success of the project.

3.2. Dissemination Plan

In order to disseminate research results, a plan has been made as follows: (1) the publication of the present protocol paper in open access format; (2) the publication of original research papers at the end of the project; (3) presentation at international and national conferences; (4) promotion among teachers, school principals, Regional School Offices, stakeholders and policy makers.

4. Conclusions

In conclusion, the findings of the present study will potentially contribute to advising educational institutions, professionals and other interested parties on the importance of providing effective professional training to in-service PE teachers and on the central role of PE settings in promoting students' physically active lifestyle. The study results may also support the implementation of CPDt interventions based on theoretical models, such as the Transtheoretical [61] and the Trans-contextual models [28], the Theory of Planned Behaviour [63], the Achievement Goal Theory [62], or the Self-Determination Theory [48]. Additionally, the study outcomes will enrich the literature on Internet-supported interventions, which have been largely adopted during the COVID-19 pandemic and may be useful in similar situations, for example, when teachers are constrained at home for reasons of illness or injury. Further insight can be provided by this study with regards to the link between teachers' professional training and their work engagement. Focusing on students, the PE4MOVE project may be beneficial for a large sample of youths in the observed region, and consequently, provide support for similar interventions based on the transferability of motivation from one context to another [28]. The study results may also demonstrate how psychological changes can lead to behavioural changes [63], i.e., an increased motivation towards PA results in increased PA levels. Even for students, secondary positive outcomes can be expected; in particular, increased PA levels may result in improved physical fitness.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su141811579/s1, Figure S1: SPIRIT schedule of the study; Figure S2: Flow chart for the recruitment process; Table S1: CPDt meetings in chronological order, including modality, contents, and learning strategies; Table S2: Synthesis of the measured outcome variables for teachers; Table S3: Synthesis of the measured outcome variables for students. File S1: Ethical approval; File S2: Trial registration is available at: https://doi.org/10.1186/ISRCTN16155799 (accessed on 9 August 2022).

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable (no datasets were analysed for the current study protocol. All relevant data from this study will be made available on reasonable request upon study completion).

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