Co-funded by the Erasmus+ Programme of the European Union

Identifying and Motivating youth who mostly need Physical ACTivity (IMPACT)

An Erasmus+ Sport Project

Final Report

Co-funded by the Erasmus+ Programme of the European Union

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Short description of the project

The aim of the IMPACT project is to provide tools to policy makers and Physical Education (PE) teachers to promote Physical Activity (PA) of youth who mostly need it. The project focused on PE, which is the only PA setting involving both physically inactive and active pupils. This allows one to identify youth who mostly need PA and motivate them to become more physically active. The outputs of the project are also relevant to policy makers who wish to identify schools, neighborhoods and towns with low levels of physical activity and support them through specific actions that are adjusted to their characteristics and needs.

The aims, methodology, tools, results and recommendations of the IMPACT project were shaped by the following theorization:

> *Accurate **self-monitoring** of physical activity that consistently occurs within a **positive motivational climate** facilitates **self-determined goal-setting** to **improve youth physical activity**. In turn, self-determined goal-setting leads to the initiation of actions that increase levels of physical activity.*
>
> *Positive motivational climate in PE is the psycho-social environment that ascribes high value to physical activity and to the person's health and well-being, emphasizing people's progress and supporting participants' needs for competence, autonomy and relatedness.*

This principle was applied in Physical Education (PE) to identify pupils who mostly need physical activity and motivate them to set goals to become more physically active. This principle is also important to policy makers because monitoring of PA, goal-setting and positive motivational climate for physical activity have much stronger effects when they are applied across large populations.

The major tools developed through this project were as follows:

(1) A short and a long measure of youth motivation and physical activity, which exhibited the minimum requirements of invariance across six European countries. This measure allows one to **identify** European youth inactivity, low motivation in PE and their determinants.

(2) Educational material for PE teachers in seven European languages, to **train European PE teachers** how to create a **positive motivational climate in PE** and how to teach intrinsically motivated self-monitoring and goal-setting to **promote pupils' out-of-school PA**.

(3) The **IMPACT project website** (www.impactpe.eu) to deliver the measures and educational material across different European schools in an economical way, through **electronic measures and webinars**. The educational material was transformed in **five webinars** that were delivered to 189 PE teachers across four European countries (France, Greece, Italy, Turkey). These webinars are also OPEN ACCESS in the **IMPACT project website** (www.impactpe.eu).

(4) The present **report** containing findings from measurements from over 14000 pupils from six European countries (France, Greece, Italy, Spain, Turkey and U.K.). Moreover, the effects of PE teachers' training on their pupils' motivation and PA are reported. In addition, findings from smaller size studies are reported to provide further insight on the quality of the present tools and the perceptions of the participants.

(5) **Recommendations** for policy makers stemming from these tools and actions that are presented at the end of this report.

In the first Chapter of this report the aims of the IMPACT project and the model that was adopted are presented.

In the second Chapter the IMPACT project website is presented. This website integrates in one instrument online applications for web conferencing, online surveys, online communication/ networking and dissemination of project outcomes.

In the third Chapter the methodology for the development of the IMPACT project measure is reported. It includes findings from a preliminary study involving 2271 pupils aged 13.70 ± 1.55 years old from six countries (France, Greece, Italy, Spain, Turkey and U.K.). The results supported the construct validity, reliability and metric invariance of this measure across these countries. They also supported the hierarchical structure of the IMPACT project model, indicating that the selected determinants of PA explained a considerable percentage of variance (above 44%) of youth physical activity and well-being (above 44%). The results also offered the first evidence of high levels of youth physical inactivity across these countries.

The fourth Chapter contains results from the completion of the measure from 12355 pupils from six countries (France, Greece, Italy, Spain, Turkey and U.K.), aged 10 to 18 years old. The majority of the pupils were physically inactive, with one in every three pupils being entirely inactive (0-1 hours PA per week), and with girls and older pupils being more inactive than boys and younger mates.

Within the same country large between-school differences emerged in PA, underscoring the importance of this measure for policy makers interested in the identification of schools with high levels of inactivity. Number of days of PE per week was positively related to pupils' PA. Lack of time and increased homework for school was the most important barrier for PA. Socio-Economic Status (SES) and family support were important determinants of youth PA. Low SES pupils were 2.2 times more likely to be physically inactive in comparison to high SES pupils.

A positive motivational climate in PE was consisted of teachers' emphasis on mastery/progress of each pupil and teacher' support of pupils' needs for autonomy, competence and relatedness. This PE climate was positively associated with PA inside and outside school, intrinsic motivation and positive affect in PE, self-monitoring and planning for PA and vitality and it was negatively associated with negative affect in PE. These findings underscore the importance of creating this positive motivational climate in PE to promote pupils' PA and well-being.

In the fifth Chapter the development of the educational material for the training of PE teachers is described. Moreover, an example of good case intervention study using this educational material is reported. The educational material was delivered through 5 or 6 webinars across 189 PE teachers in four countries (France, n = 27; Greece, n = 68; Italy, n = 31; Turkey n = 63). In total 2688 pupils (experimental group) from the PE teachers who received the training during the academic year 2018-2019 and 1481 pupils (control group) from PE teachers who did not receive training this period, completed the IMPACT project measure before and after the PE teachers' training.

The results revealed that the training of PE teachers had positive effects on their pupils' PA, as well as on positive motivational climate in PE and on pupils' self-regulation skills such as self-monitoring and action planning. Specifically, in the experimental group where pupils also reported that their teachers implemented self-monitoring and goal-setting for PA promotion, the percentage of very inactive pupils decreased by 11% and the percentage of relatively active pupils increased by 7%. On the other hand, in the control group where PE teachers did not apply self-monitoring and goal-setting strategies, the percentage of inactive pupils increased by 5%. The findings indicate that the educational material and its delivery through the webinars were effective with regard to the promotion of pupils' physical activity.

In the 6th Chapter the results of a study including pupils from three countries (France, n = 60; Greece, n = 75; Italy, n = 53) who wore accelerometers for 4-8 days to measure their objective PA are reported. The findings confirmed the very low levels of physical activity of pupils in these countries and that girls and older

pupils are more inactive than boys and young pupils. Moreover, **days of PE per week was positively associated with pupils' objective PA**.

In Chapter 7 findings from some small complementary studies are reported while in Chapter 8 findings concerning the evaluation of the IMPACT project outputs are described. In sum, the large majority of PE teachers who received the IMPACT project training and all IMPACT project partners who implemented this project were very satisfied with the methodology and the quality of project outputs. Interviews from PE teachers and partners provided additional insights about the quality and the importance of the project tools as well as recommendations for policy makers, which are summarized in Chapter 9.

CHAPTER 1. INTRODUCTION

The problem of youth inactivity. Regular Physical Activity (PA) has been linked to many physical and psychological benefits for adults and youth (e.g., Biddle et al., 2019; Hardman & Stensel, 2009; Janssen, & LeBlanc, 2010; Kohl & Murray, 2012; Physical Activity Guidelines Advisory Committee, 2018). Still, a substantial number of children fail to meet the recommendations of World Health Organization (WHO, 2010) suggesting engagement in moderate-to-vigorous PA (MVPA) for at least 60 minutes daily. Also, a large number of studies have shown that PA of children and adolescents has dramatically decreased during the last years (e.g., Basterfield et al., 2011; Brodersen et al., 2007; Sallis et al., 2000). Examples of research evidence of low levels of PA among European youth:

- Guthold and colleagues (2020) conducted a pooled analysis of 298 population-based surveys with 1.6 million participants (from 2001 to 2016) and found that 81% of pupils worldwide (aged 11 to 17 years) were physically inactive in 2016.
- Verloigne and colleagues (2012) found that only 4.6% of the girls and 16.8% of the boys in 5 European countries (Belgium, Switzerland, Greece, Netherlands and Hungary) meet the criteria set by WHO (2010) for active lifestyle in ages 5-17.
- Van Hecke and colleagues (2016) found large variations in children's and adolescents' PA levels between European countries. The percentage of youth PA meeting the guidelines of at least 60 minutes of MVPA daily varied across European countries from 5% to 47%, according to self-reports of PA of European children and adolescents.

Understanding Physical Activity determinants in youth. Many studies have attempted to examine the environmental, socio-economic and individual factors that appear to have a significant impact on the levels of PA of children and adolescents (Bauman, Reis, Sallis, Wells et al., 2012). Experts in the field such as Van der Horst et al (2007, p. 1241) suggested that understanding the correlates of PA and sedentary behavior of youth will provide important information for policies and effective interventions aiming to promote PA. Examples follow below.

Sallis and colleagues (2000) reported that gender, prior involvement in PA, parents, access to sport facilities, intention to participate in PA, healthy eating and spending time in outdoor activities were significantly related to PA of children aged 3 to 12 years old. PA of adolescents 13 to 18 years old was significantly related to gender, age, nationality, prior involvement in PA, sedentary behavior after school and during weekends, perceived competence, social context (parents or friends), intention to be physically active, depression, support from parents, and opportunities to participate alone or with friends. Girls and older adolescents were generally even more inactive than boys and younger children.

Van der Horst and colleagues (2007) found that physical activity of children, between 4 to 12 years old, had a positive relationship with gender, self-efficacy, parents' involvement in PA, parents' support, while adolescents between 13 to 18 were related positively with gender, education of parents, attitudes towards PA, self-efficacy, achievement goals and motivation in Physical Education (PE) in school, influence of the family and support of friends.

Bauman and his colleagues (2012) examined the casual relationship of children's PA with other significant factors through evaluation of seven review studies. They revealed that gender, age, health status, self-efficacy, family support and previous engagement in sport or exercise programs, affect the levels of PA in youths (Bauman et al., 2012).

Results from qualitative studies also showed that (a) **personal factors**, such as time, self- efficacy, perceived competence, (b) **social factors,** such as parents, teachers and support from friends and (c) **environmental factors**, such as sport venues, the school environment, the security seem to play an important

role in the participation of children and adolescents in systematic PA, especially for those who come from low-economic stages (e.g., Casey et al., 2009; Eyre et al., 2015; Kirby et al., 2013).

A series of studies also found that children and adolescents from high socio-economic backgrounds report higher level of PA compared to low Socio-Economic Status (SES) (e.g., Richter et al., 2009; Stalsberg & Pedersen, 2010).

Role of Physical Education in the "Identification and Motivation of youth who mostly need Physical ACTivity" (IMPACT)

International Health Organizations emphasize the importance of Physical Education (PE) in the promotion of youth PA both inside school (e.g., Mayorga-Vega et al., 2018) and outside of school (e.g., WHO/Europe, 2018). The positive effects of PE in the harmonious development of the child are also well documented (e.g., Twisk, 2001).

Importantly, PE is a unique setting where all youth participate, particularly the most inactive youth who cannot be found in sport and other youth PA contexts. Hence, PE is an ideal setting to identify the most at-risk kids with regard to PA, and motivate them to become more physically active.

Monitoring of Physical Activity, Goal-Setting and Students' Motivation at different levels of generality

At the center of the IMPACT project is the hypothesis that an important cause of inactivity is the lack of systematic and accurate monitoring of PA across individuals, schools, towns, countries. Indeed, at the:

- Individual level: Self-monitoring is an important determinant of individuals' PA (Carraro & Gaudreau, 2013; Olander et al., 2013).
- School level: According to ***Recommendation 27*** of the European Commission Expert Group on health-enhancing PA (2015) "Monitoring: *Effort should be encouraged to improve data collection on HEPA with objective measurements at the school level".*

Accordingly, we need tools assisting us to continuously monitor PA at pupil/individual, class, school, neighborhood, town, country level (Figure 1.1.). Information from monitoring is important (1) to pupils and PE teachers in order to set goals to increase pupils' PA and (2) to policy makers to set goals and implement strategies to increase PA at neighborhood, town and country level. Hence, monitoring of PA should be accompanied by respective goal-setting programs at these levels of generality.

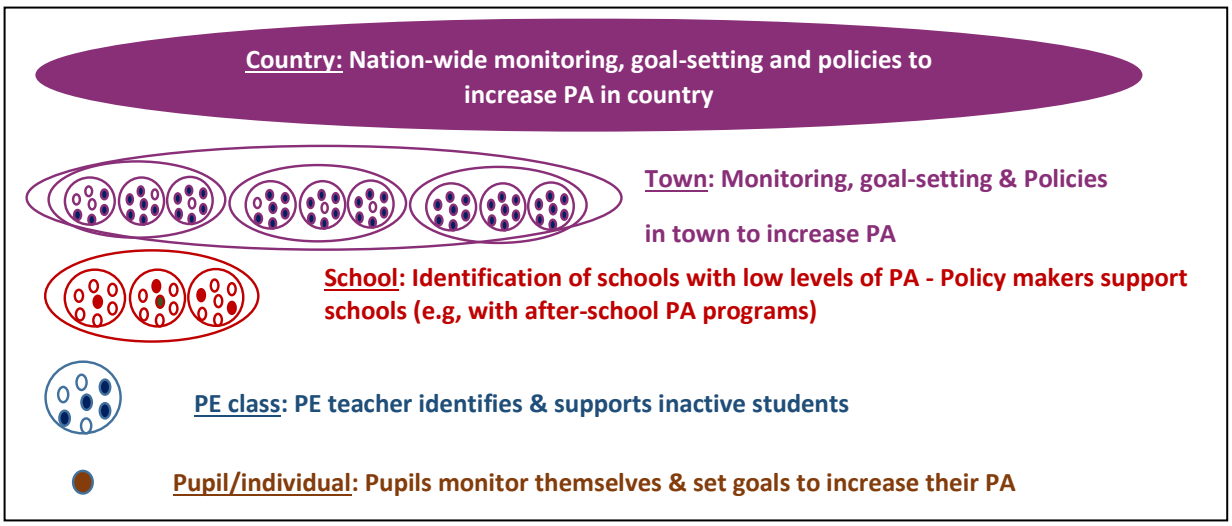


Figure 1.1. Monitoring and goal-setting to increase youth PA at different levels of generality

Nevertheless, **identification** of inactive pupils is not enough to increase PA of those pupils, because these individuals are amotivated with regard to PA and the least likely to set PA goals. Thus, mere self-monitoring and goal-setting are not enough to promote PA if they are not accompanied by strategies aiming to develop **physically literate** people who are continuously motivated to monitor themselves and improve their levels of PA.

Physical literacy is developed through Physical Education (PE) whose broader aim is to promote youngsters' health and well-being. Accordingly, the aim of the IMPACT project is to develop tools and educational material for European PE teachers that will support their efforts to make pupils more literate about the importance of PA, **motivate** pupils to increase their levels of PA and make them happier in PE and in life.

Challenges for PE teachers to motivate inactive pupils to be physically active

Although PE teachers are aware of the importance to promote pupils' PA, there many important constraints that limit their effectiveness.

Across most European countries **PE lasts less than 120 minutes per week** (European Commission/EACEA/Eurydice, 2013), implying that most of pupils' MVPA should take place in extra curricula activities in non-school contexts (e.g., in sport & dance clubs) where PE teachers and schools have no impact.

PE teachers can only direct pupils to participate in extra curricula PA, but there are several social determinants of pupils' involvement in extra curricula PA that are not controlled by teachers. Across European countries exist some or most of the following teacher uncontrollable factors with negative impact on pupils' PA:

1. **Parents** who do not have the **information/education, or time, or financial resources** to transfer young kids to extra-curricular PA settings within a built environment that is often dense, with heavy traffic and dangerous for many kids to travel alone.
2. Availability of **sport facilities and various PA programs** close to pupils' residence.
3. Adolescents' **lack of time** to participate in extra-curricular PA due to increased **school demands** for academic performance.
4. The **competitive nature of sport** that do not attract pupils with **low perceived athletic competence** and the lack of many alternative non-competitive PA programs for youngsters.
5. Lack of low cost PA programs for adolescents with **special needs.**
6. **Lack of free PA programs** for youth from underprivileged pupils, migrants, low SES pupils.

These socio-economic factors lead to large variability in athletic competences and PA experiences among pupils participating in PE classes. The large within-PE-class differences in pupils' physical competences and PA experiences affect pupils' perceived physical competence, expectations, intrinsic motivation, affect and behavior in PE and their PA in school too, with inactive and low athletic ability pupils being in the most disadvantaged position because **they are receiving the most negative feedback** during their participation in PE and in school sport and PA (Papaioannou, 1997).

These challenges make the work of PE teachers even more difficult with regard to the increase of motivation in PE and in PA settings of most inactive pupils. This is exacerbated by the lack of training of European PE teachers with regard to how to increase the motivation in PE of most inactive pupils and how to promote PA of these pupils. The relevant scientific literature is still under development and it has not passed yet in the pedagogy courses of pre-service PE teachers.

Cross-contextual & Cross-national model of IMPACT project

Figure 1.2. Cross-contextual model of IMPACT project methodology

The IMPACT project methodology is **based on theories** of psychology, education and physical activity that have been tested through research **in PE and youth sport and exercise** settings to explain PA behaviour both in PE and in youth sports. **A cross-contextual model** of out-of-school PA promotion through PE has been adopted (e.g., Standage et al., 2003; Hagger et al., 2003; Papaioannou et al., 2004).

The IMPACT model presented in Figure 1.2 is a trans-contextual model because it focuses on pupils' motivation in PE but as shown in Figure 3 it also takes into consideration the determinants of youngsters' motivation and participation in sport and PA settings. The IMPACT project methodology was developed taking into consideration constructs and recommendations stemming from most theories that have been applied in youth PA research: Social Cognitive (Bandura, 1986), Self-Determination (Ryan & Deci, 2000), Achievement Goals (Nicholls, 1984), Competence Motivation (Harter, 1978) and their applications in PE and PA/sport settings (e.g., Duda, 2013; Papaioannou, 1995), as well as Planned Behaviour (Ajzen, 1991), Goal Setting (e.g., Lerner & Locke, 1995; Locke & Latham, 1990; Roberts & Kristiansen, 2012), Ecological model of PA (Sallis et al., 2006), Transtheoretical (Prochaska et al., 1994) and self-regulation models and behavior change techniques (Abraham, & Michie, 2008; Lock & Latham, 2006) targeting PA promotion (Carraro & Gaudreau, 2013; McEwan et al., 2016; Olander et al., 2013).

As shown in Figure 2, European PE teachers and the motivational climate in their classes is important in the IMPACT project intervention described later in this report (example of a good case). The process is as follows: In PE classes, teachers create a positive motivational climate focused on pupils' mastery/progress and support of pupils' needs for autonomy, competence and relatedness. This positive climate promotes pupils' mastery goals adoption and increases their intrinsic motivation, which has direct benefits on PE outcomes (e.g., learning outcomes, enjoyment in PE) and pupils' well-being.

This positive motivational climate in PE also facilitates teachers to persuade pupils to harmoniously internalize the reasons to be physically active in their after-school life. In turn, when PE teachers teach pupils to monitor their levels of PA and to set goals for PA, pupils are self-determined to set goals, i.e., they are intrinsically motivated to do so without feeling pressure and controlled to set goals for extra-curricular PA. This process also helps pupils to feel that they can increase their after-school PA (high perceived behavioral control/self-efficacy).

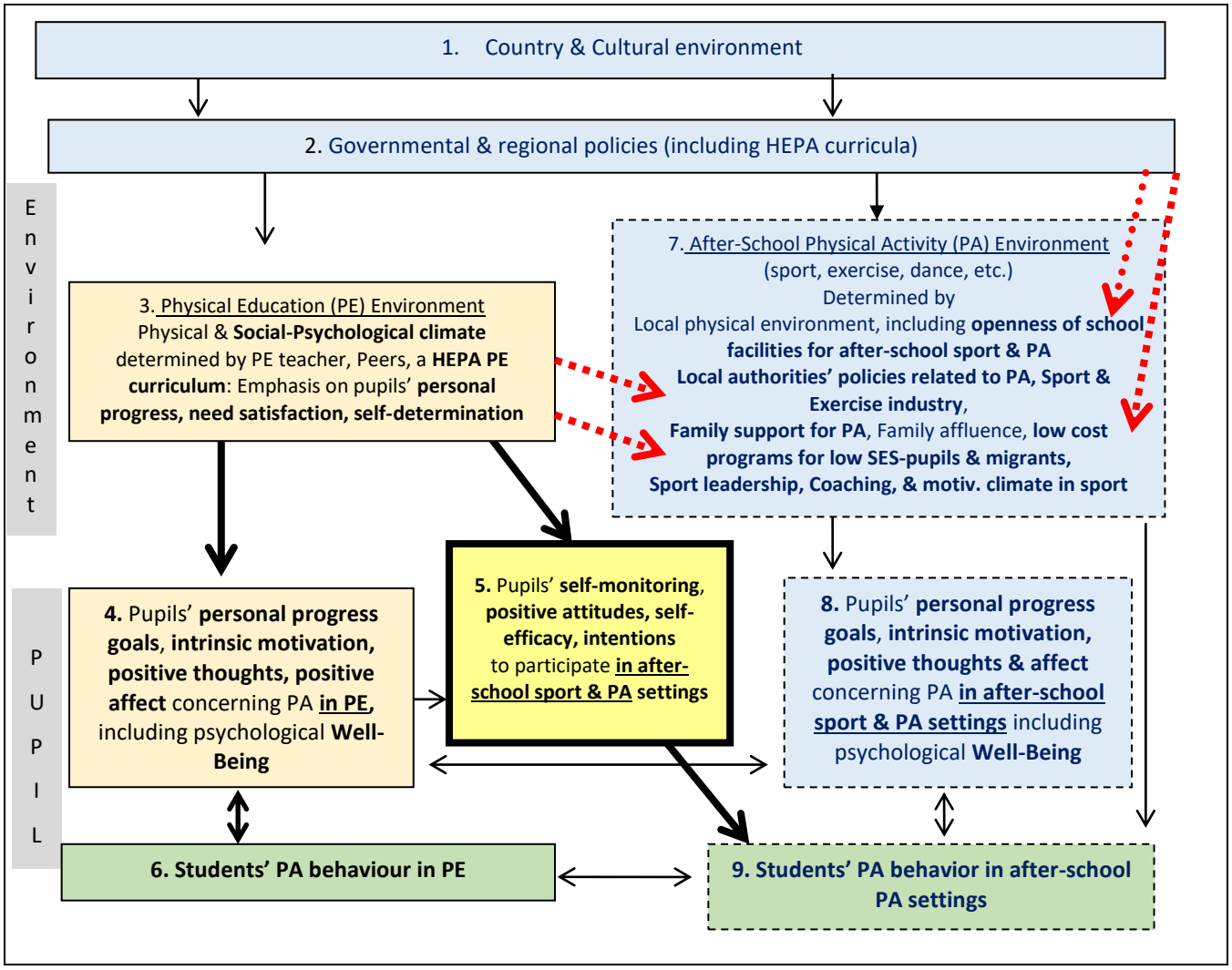


Figure 1.3 Overview of the cross-contextual model of this project

As shown in Figure 1.3, the IMPACT project methodology is also trans-national because it recognizes the **large variability existing among European countries** in:

1. Environmental/socio-economic factors affecting the determinants of youth PA (e.g., built environment, sport facilities, parents' SES, weather).
2. History of sports' development, PE curricular and teachers' training with regard to youth PA promotion.

Across two contexts, PE and after-school sport & PA, through training of PE teachers, the present methodology directly and indirectly targeted similar and associated motivational processes (e.g., intrinsic motivation) and motivational outcomes including cognitive (e.g., self-monitoring, goals/intentions), emotional (e.g., positive affect, satisfaction) and behavioural outcomes particularly PA. Typically, in each context pupils' PA behavior is influenced through the vertical and horizontal arrows. Because many European PE teachers are not trained to promote out-of-school PA, special emphasis was given on square Number 5 focused on self-monitoring of PA and goal-setting to promote after-school PA. The expected IMPACT project intervention positive effects are shown in thick arrows.

Through the IMPACT project PE teachers were also asked to communicate with parents of inactive pupils and explain them the importance of PA and family support for pupils' PA. Moreover, through the identification of schools with high levels of inactivity, policy makers would be aware to adopt policies at

school level to increase youth PA. These effects shown in red arrows were not direct and there was no expectation that they would affect pupils' PA through the present project. However, policy makers were also involved in the project to monitor its methodology and its results in order to adopt relevant future policies in collaboration with schools.

Major tools developed through the IMPACT project

1. To **identify** European youth inactivity, low motivation in PE and their determinants, an **invariant measure** across six European countries was developed. This captured the central constructs shown in Figures 1.2 and 1.3. These measures and related results are presented in this report.
2. To **train European PE teachers** how to create a **positive motivational climate in PE** and how to teach self-regulation skills (self-monitoring and goal-setting/action planning) to **promote pupils' out-of-school PA**, educational material for PE teachers in seven European languages was developed.
3. To deliver the measures and educational material across different European schools in an economical way, we used **IT**, specifically **electronic measures and webinars**. All electronic measures are OPEN ACESS in the **IMPACT project website** (www.impactpe.eu). The educational material was transformed in **five webinars** that were delivered to PE teachers across four European countries. These webinars are also OPEN ACCESS in the **IMPACT project website** (www.impactpe.eu).
4. To investigate the effects of PE teachers' training, we delivered the electronic measures **before and after the training of the PE teachers** in the four European countries. The results of this intervention are presented in this report.
5. Recommendations for policy makers stemming from these tools and actions are presented at the end of this report.

CHAPTER 2. THE WEBSITE OF THE PROJECT – THE IMPACT VIRTUAL WORKPLACE

The development of the IMPACT website https://www.impactpe.eu/ had a central role in the implementation of the project activities. It was used to:

1. Present the project aims and activities and to disseminate its products.
2. Support online teacher education.
3. Support online surveys and provide instantly updated information about physical activity and motivation in physical education with free access to policy-makers, PE teachers and researchers.
4. Contribute to the communication between teachers and researchers, sustainability and extension of this project in the future.

PE teachers can easily find information about how to increase pupils' motivation and physical activity through the stored multilingual webinars. Teachers and students can receive useful feedback about levels of PA and they can set goals to improve them. The instrument can provide instantly updated information about schools' and students' levels of physical activity. Policy makers can find here access to always updated information about schools with high levels of inactivity and low levels of sport involvement. Researchers can easily collect data from surveys capturing children's motivation and inactivity. Researchers and P.E. teachers can communicate through the web conferencing and forum settings (Figure 2.1).

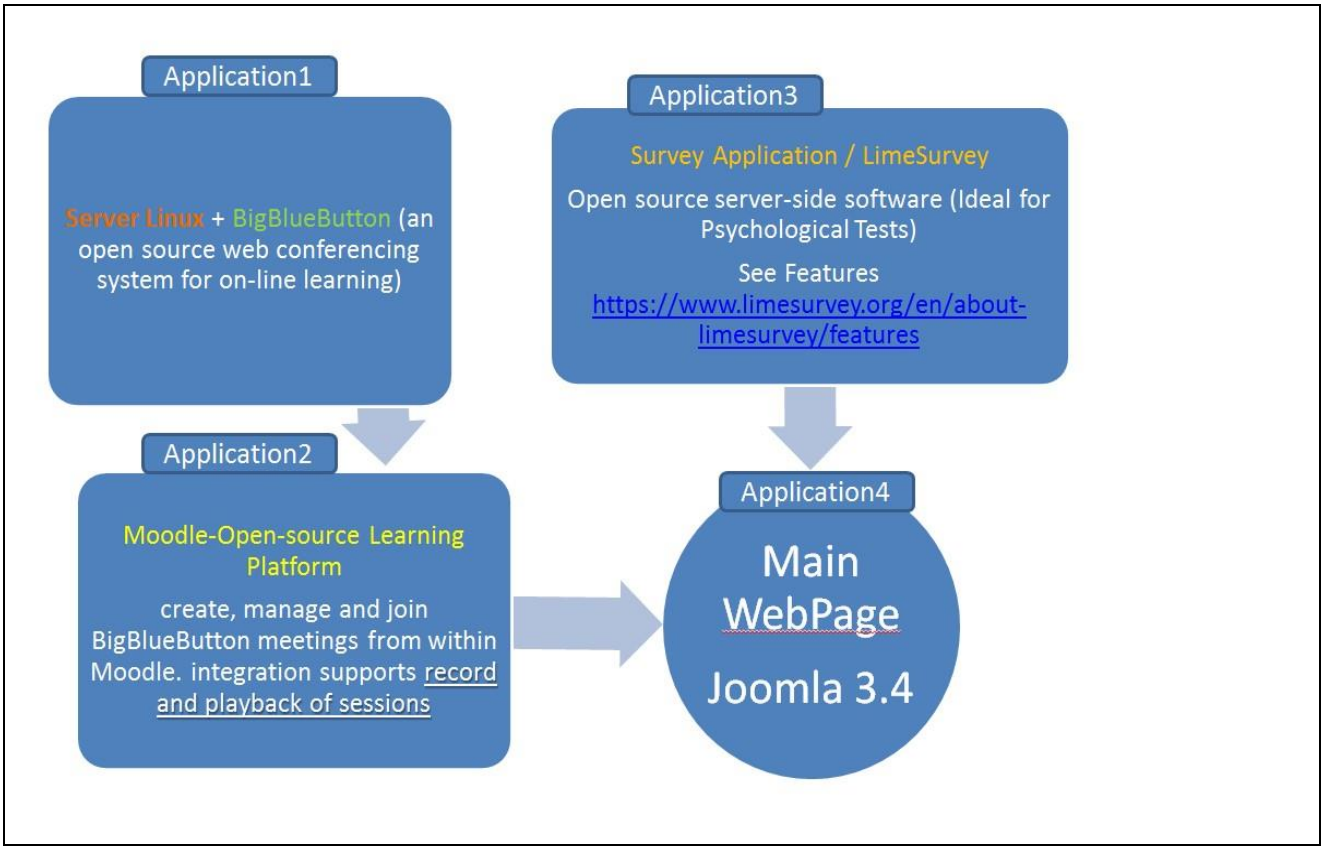


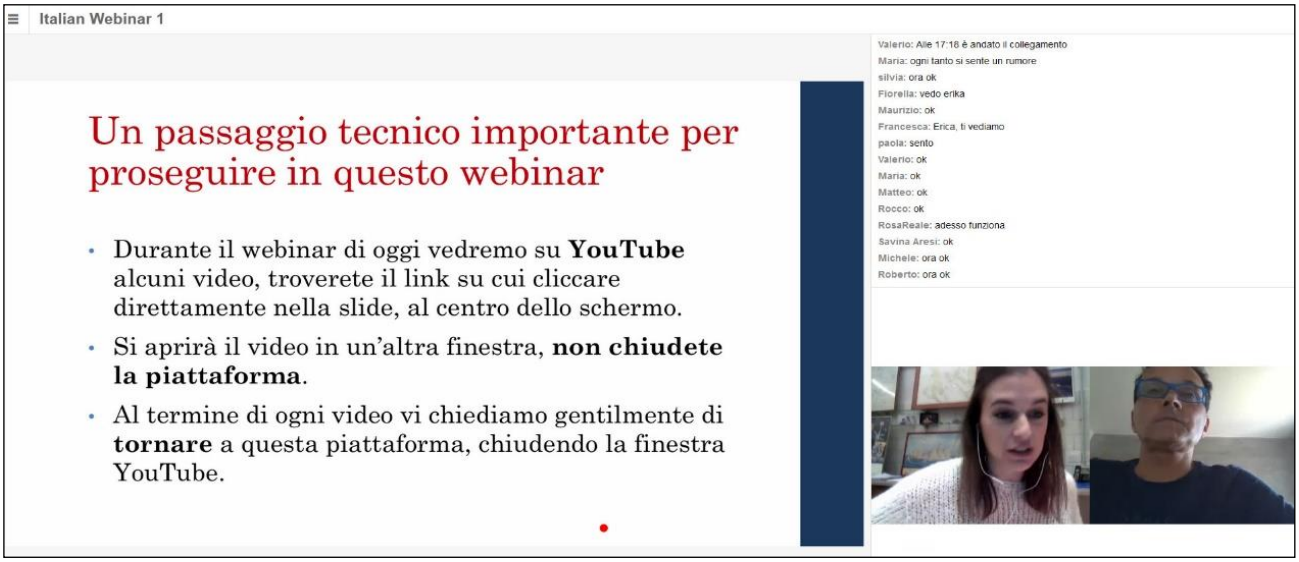
Figure 2.1. Structure of the IMPACT project website

Web-conferencing for distance education

An open-source web conferencing system for distance education was used in order to provide real-time desktop sharing, presentation, VoIP, webcam and chat. It supports multiple audio and video sharing, presentations with extended whiteboard capabilities - such as a pointer, zooming and drawing - public and private chat, desktop sharing, integrated VoIP, and support for the presentation of PDF documents and

Microsoft Office documents (Application 1). Moreover, users may enter the conference in one of two roles: the viewer or moderator. Also, it has the capability to create video files of the recording. These video files are playback on desktop and laptop devices. The playback of a video includes the chat messages to the right (Photo 1).

An open-source eLearning platform (word-press) was used in order to fully intergrade with BigBlueButton webserver (Application 2). From word-press web conferencing system created meetings. All these sessions have been recorded and saved in our BigBlueButton webserver (Photo 2.1).



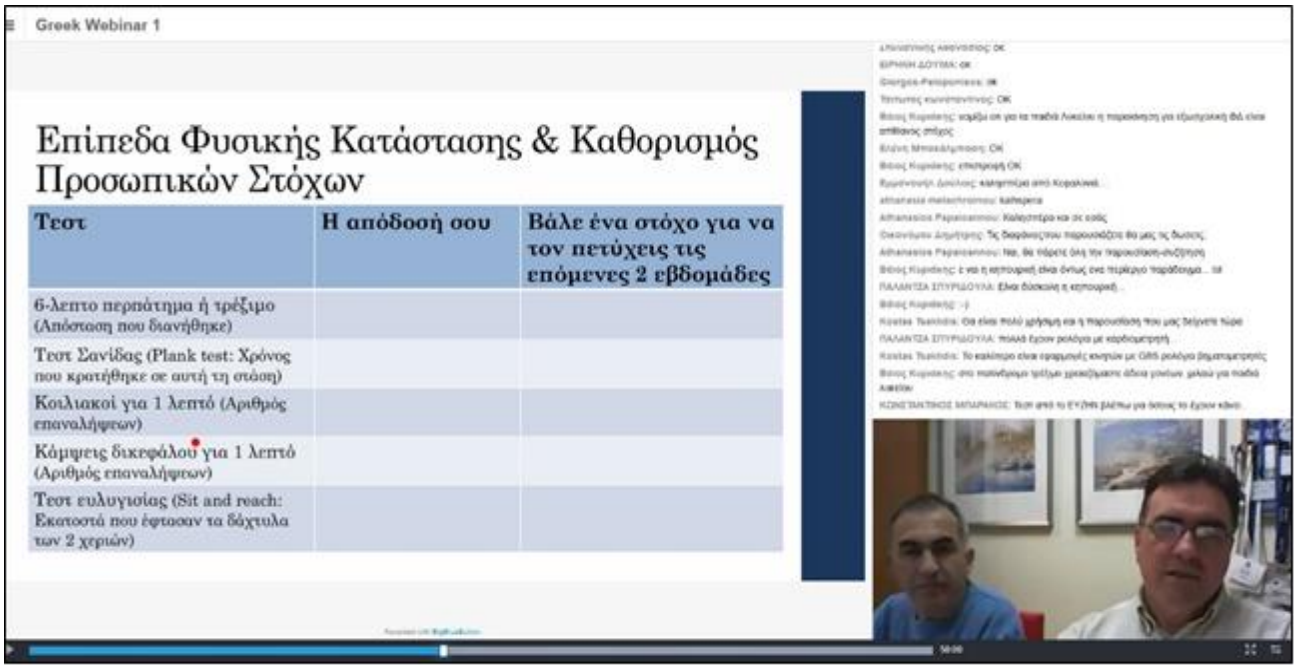


Photo 2.1. Example of a delivered webinar in Greece and Italy

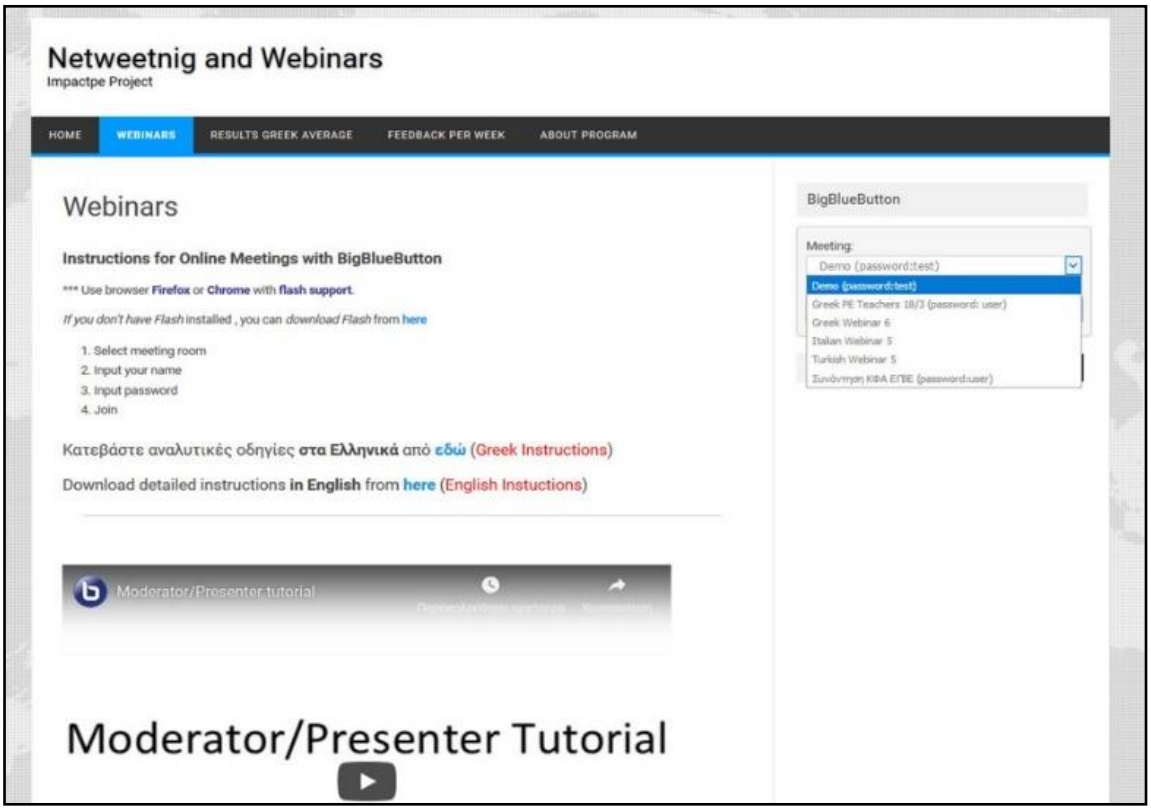


Photo 2.2. BigBlueButton webserver

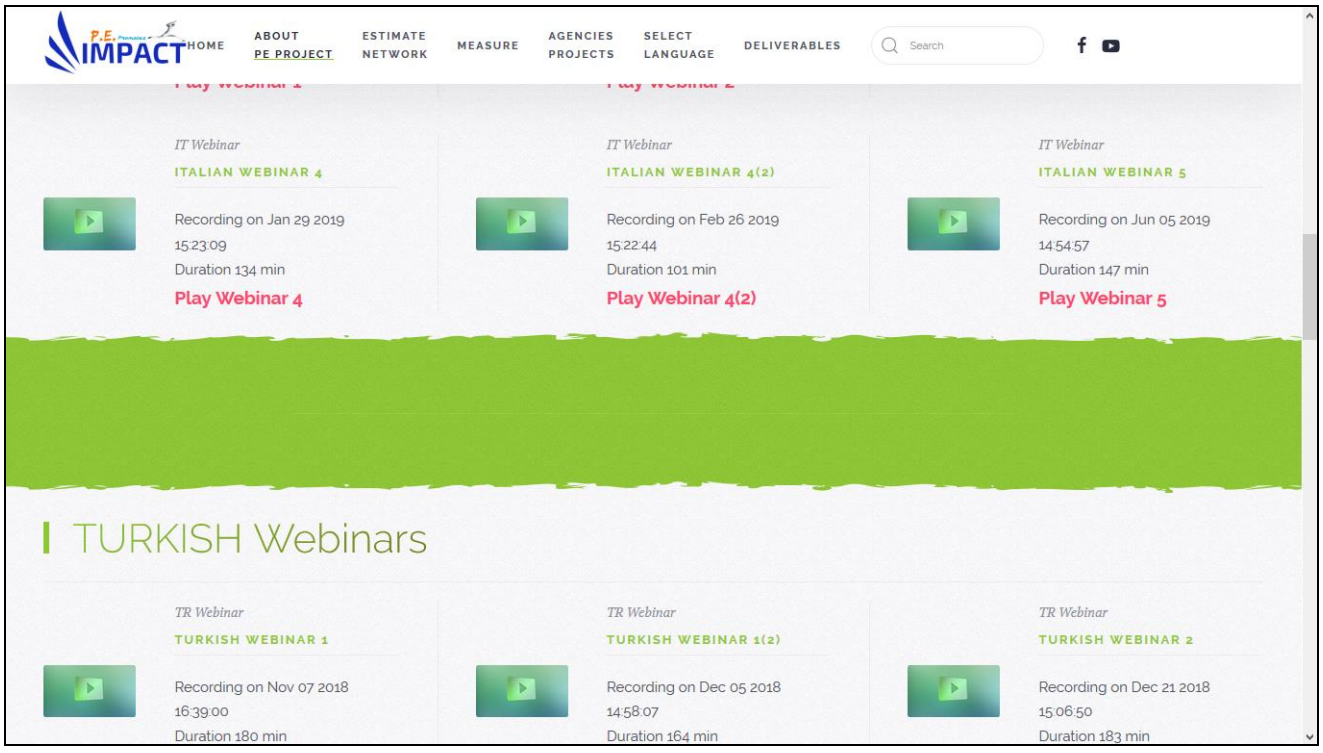


Photo 2.3. Example of recorded webinars

Online Surveys capturing physical activity and pupils' motivation in PE

Survey Tool (Lime Survey) is a free and open-source online survey application written in PHP and based on a MySQL database (Application 3). As web server-based software, it enables users using a web interface to develop and publish on-line surveys, collect responses, create statistics, and export the resulting data to other applications. LimeSurvey has no limit on the number of surveys a user can create, nor is there a limit on how many participants can respond. Aside from technical and practical constraints, there is also no limit on the number of questions each survey may have. LimeSurvey is multilingual and provides a basic statistical and graphical analysis of survey results (Photos 2.4 & 2.5).

Table 2.1. Number of pupils' surveys created

Pupils' Surveys			
	Countries	**Questionnaires**	**Total Participants**
Pilot study	6	6	1994 online *(+ 247 on paper)*
T1 Measure	6	15	10294 online
T2 Measure	4	12	4965 online
Feedback (T1 - T2)	1	16	1970 online
TOTAL			**19223** online *(+ 247 on paper)*

Photo 2.4. Lime Survey tools (*n* = 64)

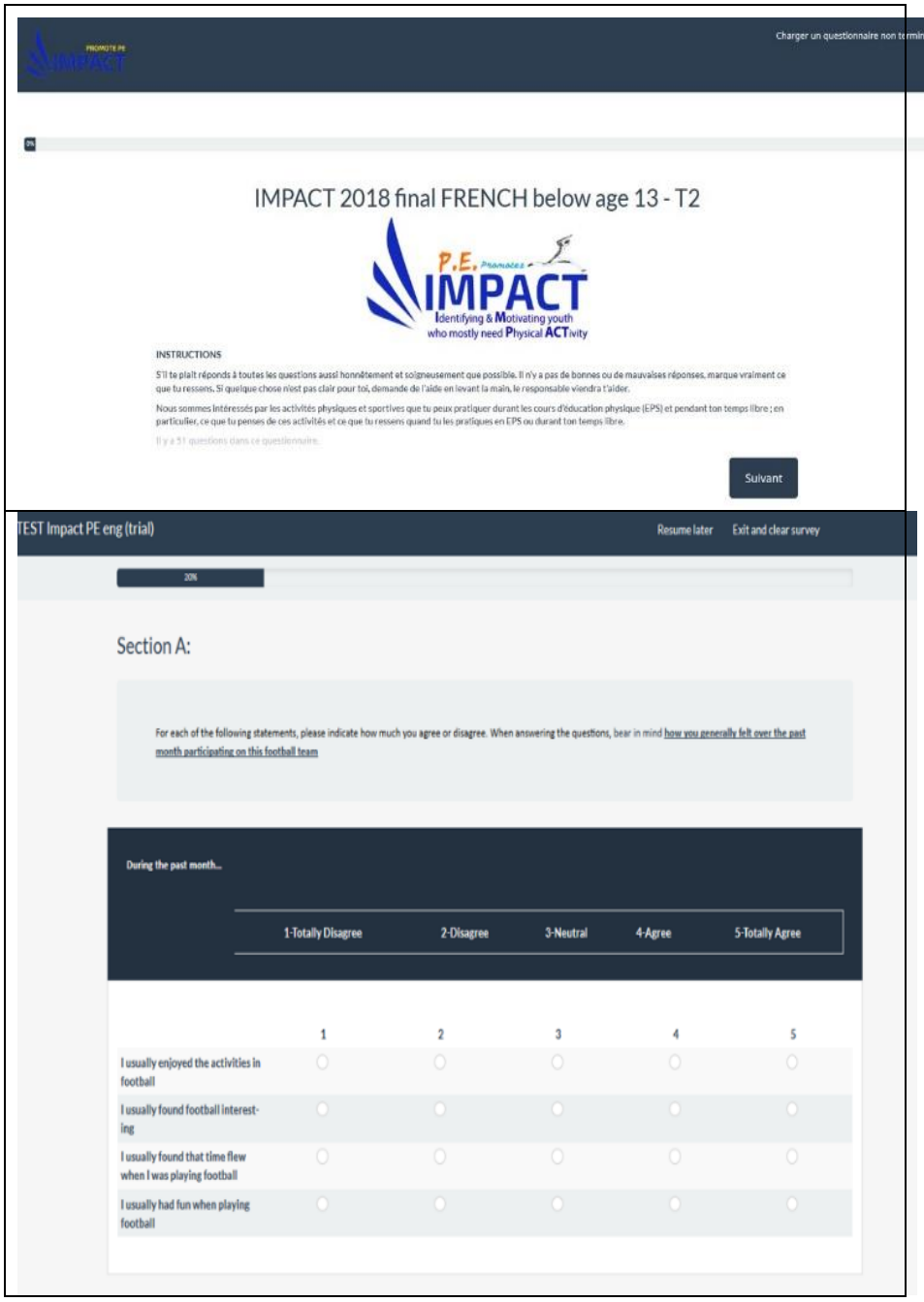


Photo 2.5. Example of survey tools

The ImpactPE main webpage is the main connector between the other 3 applications (Application 4). Within the **ImpactPE website** is stored a lot of information about the program and partners. There is also a visual connection to data that has been created or stored from the other three applications. These connections are available via the site menu and provide access to:

- ImpactPE **Forum**, a forum created by open-source platform phpBB and supports **4 countries** discussion forum (Photo 2.6),
- Multilingual Survey List (**64 surveys in 6 languages** with stored answer data) (Photo 2.7),
- Webinars recorded by synchronous conferencing system BBB (**35 recorded webinars in 4 languages;** Photo 2.3).

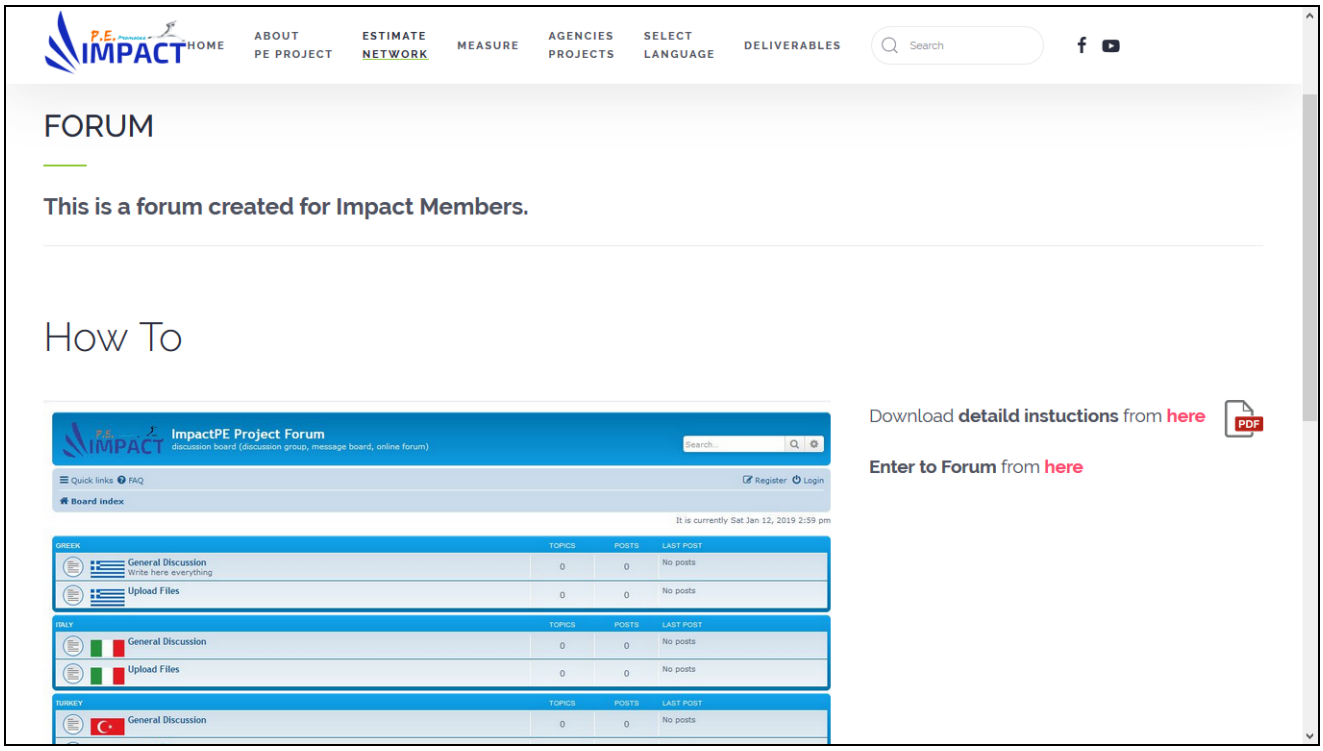


Photo 2.6. Forum for IMPACT participants

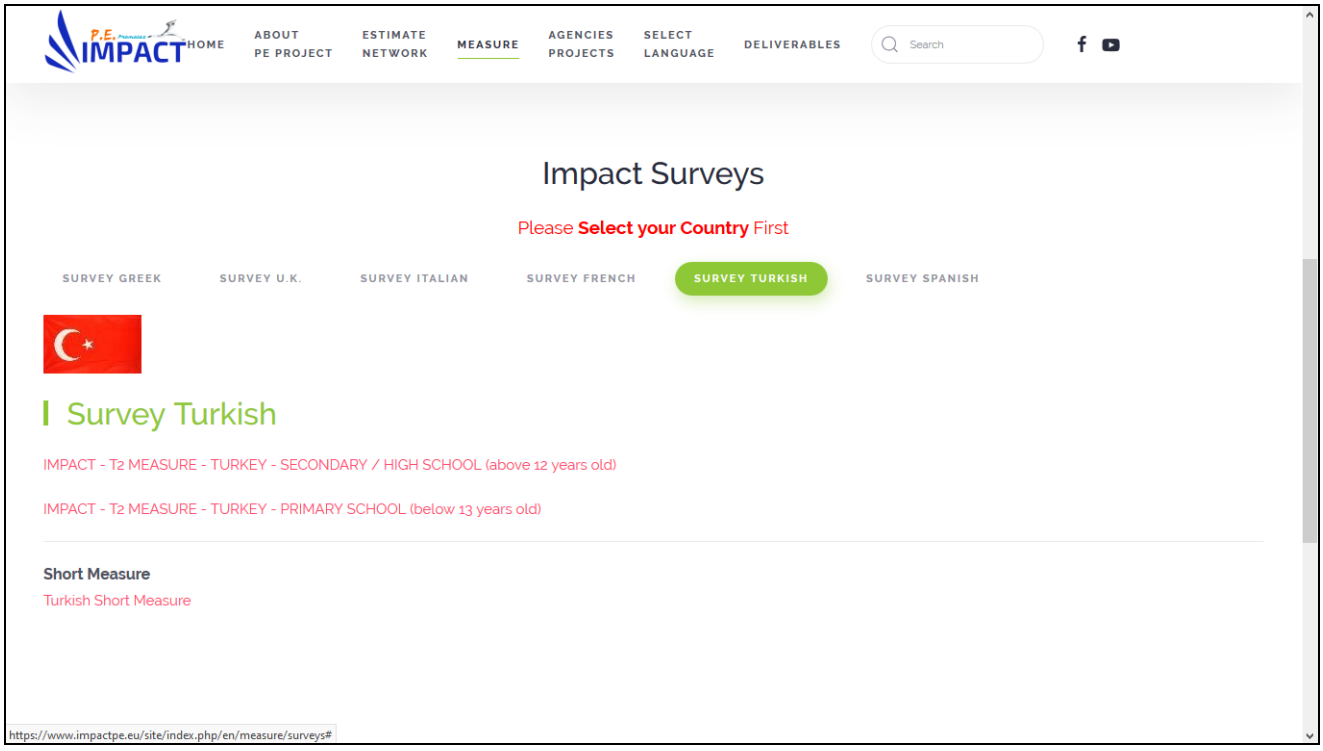


Photo 2.7. Multilingual surveys

Diagnosis of Inactivity: Feedback to PE Teachers

An automatic email was sent to PE teachers immediately after all pupils' answers to survey items. The email provided teachers an output of means and frequencies of pupils' scores in some critical variables, like frequency of pupils' participation in sport and exercise, or pupils' intention to participate in sport and exercise, etc. It also offered them a report for each pupil's response on sports involvement, HEPA and family affluence, which would help them identify the inactive and vulnerable pupils.

Feedback to Pupils

Immediately after the completion of student's answers to the survey, the student received immediate feedback about the appropriateness of his/ her involvement in moderate-vigorous intensity PA in a graphical/animation format that had a positive tone. Its aim was to direct them towards a more active lifestyle. Teachers and pupils were able to watch and compare the student's intention to participate in regular PA (The FEEDBACK tool; Figure 3).

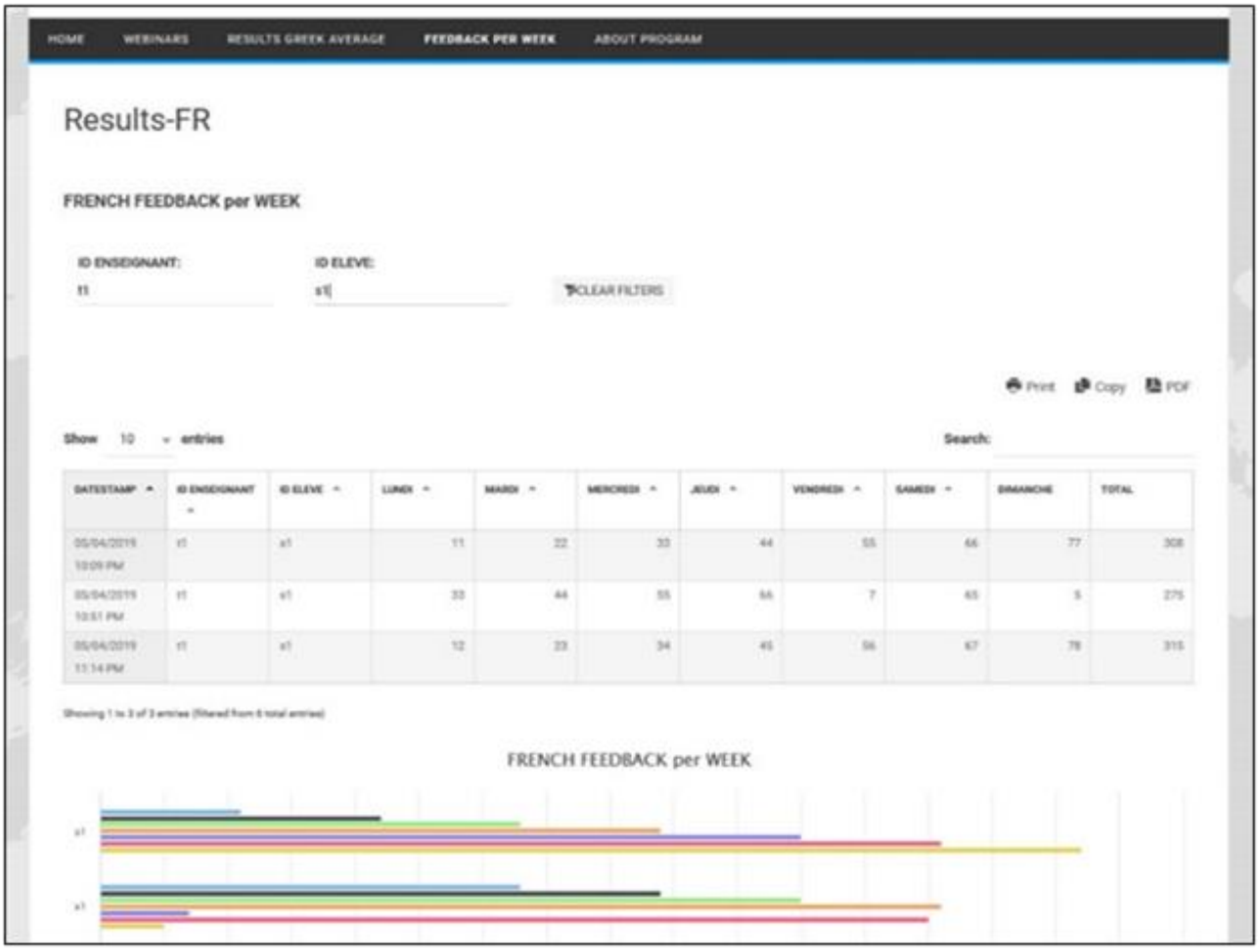


Figure 8. The FEEDBACK tool

CHAPTER 3. MEASURE DEVELOPMENT

Procedure for measure selection

Based on the IMPACT project methodology and the available related literature, each partner proposed a number of measures for the assessment of each construct that were classified in the following clusters:

(1) Youth Physical Activity (PA),
(2) Proximal determinants of youth PA,
(3) Motivational outcomes in PE,
(4) Pupil motivation and pupil-centred determinants of motivational outcomes in PE and PA,
(5) PE teacher/class-centred determinants of motivational outcomes in PE and PA,
(6) Socio-Economic Status (SES),
(7) Demographic information.

All IMPACT project partners reviewed all measures and provided comments about the strengths and weaknesses of each measure. The measures and all comments were available to all partners for some time and finally all partners (the leader of each organization) voted which measure to select as the most appropriate for each construct. Based on this procedure, the following measures were selected.

Measure Development - Diagnostic Tools

Two versions of the measures were developed.

A. The **long IMPACT version** that can be completed approximately in 30 minutes. This includes the following scales:

1. Demographic information (gender, age, school, class in school, town, country, ethnicity),
2. Socio-Economic Status (i.e., SES; FAS Revised; 7 items; Torsheim, et al., 2016; FAS III; 1 item; Schnohr et al., 2008),
3. Frequency of Physical Activity (PA; the 2-item screening measure for PA - PACE+ Adolescent PA Measure; Prochaska et al., 2001),
4. Amount of PA (one item measuring hours per week spent in MVPA; Booth et al., 2001),
5. Youth Activity Profile (YAP; Saint-Maurice & Welk, 2014; 5 items capturing PA inside school, 5 items capturing out of school PA and 5 items assessing pupils' sedentary behaviors),
6. Motivational climate in Physical Education (PE; Papaioannou et al., 2007; 6 items for mastery climate, 6 items for performance approach and 6 items for performance avoidance climate),
7. Basic needs satisfaction in PE, consisted of three scales, Autonomy (Standage et al., 2005; 5 items), Competence (McAuley et al., 1989; 6 items) and Relatedness (Richer & Vallerand, 1998; 4 items),
8. Achievement goals in PE (Duda & Nicholls, 1992; 7 items for Task Orientation and 6 items for Ego Orientation),
9. Behavioral regulations of motivation in PE (BREQ 2; Markland & Tobin, 2004; 4 items for intrinsic motivation, 4 items for identified Regulation, 4 items for introjected Regulation, 4 items for extrinsic regulation and 4 items for amotivation),
10. Positive and negative affect in PE (PACES; Motl et al., 2001; 8 items for positive affect and 8 items for negative affect in PE),
11. Intentions to be active in leisure-time (Standage et al., 2003; 3 items),
12. Perceived behavioral control regarding PA (Hagger et al., 2009; Rhodes & Courneya, 2005; in total 3 items),
13. Attitudes towards PA (Hagger et al., 2009; 6 items),
14. Social support towards participation in out-of-school PA (Dewar et al., 2013; 4 items for Friend Support and 4 items for Family Support),
15. Self-Efficacy (Dishman et al. 2014; 5 items; Dewar et al., 2013; 1 item).

16. Self-monitoring (2 items from Sniehotta, et. al., 2005 and 2 adapted items from Theodosiou & Papaioannou, 2006; in total 4 items),
17. Action planning of out-of-school PA (4 items from Sniehotta et al., 2005 plus one item added by IMPACT researchers),
18. Subjective vitality (Ryan & Frederick, 1997; 5 items),
19. Barriers to PA (15 items selected from various instruments, e.g., Dishman et al., 2005; Gunnell, et al., 2015).

Motivational climate, basic needs satisfaction, achievement goals, behavioral regulations, positive and negative effect were used to assess motivation-related variables in PE and are considered ***distal determinants*** of out-of-school PA, while social support, self-monitoring, action planning, attitudes, intentions and perceived behavioral control were the ***proximal determinants*** of out-of-school PA. Self-reported PA and vitality were the main outcomes. Moreover, in the PE context, positive and negative affect were considered motivational outcomes.

B. The **short IMPACT measure** for the **diagnosis of inactivity** that can be completed in 5 minutes. It includes the Physical Activity (PA) items in the aforementioned paragraphs (3) and (4), sport involvement, intentions to be physically active in leisure-time, self-monitoring, demographic information (gender, age, school, class in school, country) and an open-ended question capturing the most important barrier to be physically active.

More details about the measures can be found on the IMPACT project website (www.impactpe.eu/site/index.php/en/measure/surveys).

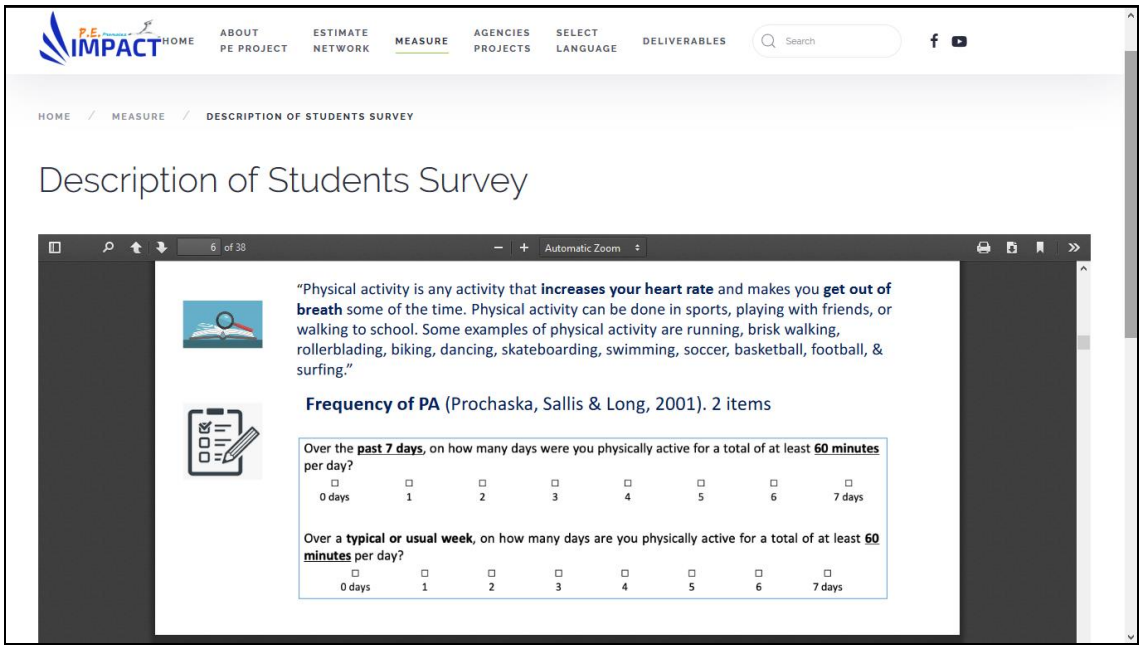


Photo 3.1. Description of students' survey in the IMPACTPE.EU website

Participants in Preliminary-Pilot Study

In spring 2018 a preliminary-pilot study was carried out to establish construct validity and measurement equivalence across six European countries of the IMPACT project measures. Participants **(*n* = 2271)** were PE pupils from France (*n* = 219 males, *n* = 224 females), Greece (*n* = 145 males, *n* = 134 females), Italy (*n* = 190 males, *n* = 167 females), Spain (*n* = 238 males, *n* = 229 females), Turkey (*n* = 254 males, *n* = 233 females) and UK (*n* = 64 males, *n* = 74 females). Their mean age was 13.70 (*SD* = 1.55).

Initially, ethical approval of the Universities' Bioethics Committees was taken and the Ministries of Education was asked where was necessary. Parents and students also gave their written consent. A back to back-translation procedure was used in countries where the scales had not been used in the past (e.g., Beaton et al., 2000; Harkness, 2003). All measures were delivered online during PE classes. Only 247 pupils of them, coming from Italy, completed the questionnaires by using paper and pencil (not online). They responded to a battery of widely-used questionnaires assessing:

Factor Structure and Invariance Analysis

An important aim of IMPACT project was to develop invariant measures across European countries of PA and motivation in PE and in PA. This would allow one to draw the same conclusions for each country as for the total European population of pupils based on findings stemming from these measures.

Table 3.1. Results of the measurement invariance tests across 6 countries

Variables	Number of Items	Number of Factors/ Latent Variables	Unconstrained		Metric inv.	Scalar inv.
			TLI	CFI	ΔCFI	ΔCFI
Physical Activity	8	4 (1H/3L)	.965	.982	.007	.085
Vitality	5	1	.915	.958	.008	.024
Intention, PBC, Attitudes	12	3	.953	.964	.004	.018
Planning & Monitoring	9	2	.960	.971	.002	.022
Social Support	8	2	.945	.963	.005	.022
Motivational Climate	13 (-5)	3	.900	.932	.008	.199
Mastery climate	6	1	.947	.977	.007	.045
Enjoyment	4	1	.952	.984	.008	.020
Self-efficacy	6 (-2)	1	.911	.940	.005	.104
Basic Needs Satisfaction	13 (-2)	3	.924	.940	.004	.020
Behavioural Regulations	19 (-1)	5	.909	.926	.003	.037
Achievement Goals	12 (-1)	2	.916	.932	.007	.014
Positive & Negative Affect	16	2	.930	.940	.007	.014

Note: In parentheses number of items excluded to achieve metric invariance; H = High-order factor; L = Lower-order Factor

Confirmatory Factor Analyses (CFAs) supported the factorial validity of the measures in each country, because Tucker-Lewis Indices (TLI) which is unaffected by sample size (Marsh et al., 1988) was above .90 as required (Table 3.1). Moreover, multi-group CFAs across six groups of data from 6 countries respectively supported metric equivalence across the six countries (FR, IT, GR, SP, TR, UK) because the ΔCFI for metric invariance was below .01 as required (Cheung & Rensvold, 2002) (Table 3.1). This allows summation of the data from all countries and investigation of correlations among these variables in the entire sample in the same way as in separate samples of each country. However, scalar invariance was not supported, implying that one cannot draw conclusions based on differences in scale scores between countries.

Scale Reliability

All scales (except performance approach climate) had Cronbach's alphas above .70 across all countries, while the average level of alpha reliability across all scales was .86, indicating acceptable and good levels of reliability respectively (Table 3.2).

Table 3.2. Descriptives (for the total sample) and scale alpha reliabilities per country and total sample

Variables	M±SD	FRANCE	GREECE	ITALY	SPAIN	TURKEY	UK	TOTAL
Frequency of PA	3.39 ±1.88	.82	.90	.93	.90	.92	.90	**.90**
Mastery Climate	3.62±.87	.81	.82	.90	.79	.91	.89	**.87**
Perf. Approach Climate	2.70±.82	.68	.71	.74	.72	.71	.76	**.69**
Perf. Avoidance Climate	2.25±.88	.77	.80	.76	.69	.76	.87	**.78**
Autonomy needs satisf.	3.01±1.00	.73	.63	.77	.69	.87	.88	**.80**
Competence needs sat.	3.58±.93	.90	.88	.92	.85	.94	.96	**.90**
Relatedness needs sat.	3.29±.89	.74	.77	.79	.77	.90	.89	**.82**
Intrinsic Motivation	3.75±.99	.81	.85	.86	.88	.92	.96	**.88**
Identified Regulation	3.77±.94	.82	.79	.86	.82	.91	.93	**.86**
Introjected Regulation	2.53±.99	.77	.83	.70	.82	.82	.88	**.79**
Extrinsic Regulation	2.23±.98	.75	.87	.80	.80	.87	.89	**.82**
Amotivation	2.25±1.10	.90	.88	.89	.83	.77	.92	**.86**
Task Orientation in PE	3.76±.85	.90	.83	.91	.88	.93	.95	**.90**
Ego Orientation in PE	2.77±1.02	.83	.85	.88	.83	.86	.89	**.86**
Positive Affect in PE	3.71±.93	.95	.91	.93	.91	.97	.96	**.94**
Negative Affect in PE	2.10±.93	.90	.87	.89	.89	.92	.94	**.90**
Intention	4.51±1.90	.95	.93	.95	.93	.92	.93	**.94**
Perc. Behav. Control	4.80±1.65	.81	.79	.87	.79	.86	.89	**.83**
Attitudes towards PA	5.45±1.51	.94	.92	.94	.94	.94	.97	**.94**
Friend Support	3.07±.99	.80	.81	.79	.79	.84	.81	**.81**
Family Support	3.21±.99	.81	.81	.74	.77	.85	.81	**.79**
Action Planning	3.32±1.14	.92	.87	.91	.92	.94	.95	**.92**
Self-monitoring	3.17±1.14	.91	.82	.90	.88	.88	.93	**.89**
Vitality	3.54±.91	.88	.89	.87	.86	.92	.92	**.89**

Notes. PA: Physical Activity; PBC: Perceived Behavioral Control

Explanation of Physical Activity and Well-Being variance

Correlations of PA and well-being with proximal predictors of PA. As was expected, proximal predictors of PA had positive relationships of moderate size (Pearson correlations r > .40) with pupils' out of school PA and well-being variables (subjective vitality, positive affect in PE; Table 3.3). Vitality was also positively related to PA. The correlation of PA with Perceived Behavioral Control (PBC) was somewhat higher than the respective correlation between PA and self-efficacy. Because the PBC and self-efficacy are quite similar constructs and in order to further reduce the length of the entire measure, self-efficacy was not included in the following main studies.

Table 3.3. Correlation analysis of out of school self-reported PA and well-being variables with proximal predictors of out-of-school PA

Predictors of PA and well-being	Total Physical Activity	Subjective Vitality	Positive Affect	Negative Affect
Intention	.53**	.34**	.32**	-.22**
Perc. Beh. Control	.49**	.38**	.34**	-.25**
Attitudes	.41**	.40**	.43**	-.34**
Self-efficacy	.36**	.33**	.40**	-.09**
Friend Support	.43**	.43**	.35**	-.11**
Family Support	.43**	.44**	.34**	-.12**
Action Planning	.50**	.50**	.39**	-.18**
Self-monitoring	.49**	.50**	.41**	-.17**
Vitality	.36**	-	.53**	-.28**

Notes. Total Physical Activity = standardized (PA frequency score) + standardized YAP out of school PA score); PA: Physical Activity; YAP: Youth Activity Profile; ** $p < .001$

Correlations of PA and well-being with distal predictors of PA. The relationship of PE-related motivational variables with out-of-school PA was statistically significant (p< .001), positive and low, which is expectable because motivation in PE is distal predictor of out-of-school PA (Table 3.4). On the other hand, several of these variables (mastery climate, all needs satisfaction, intrinsic motivation, identified regulation, task orientation) had moderate to high positive correlations with positive affect in PE and moderate positive relationships with vitality. The variables that had non-significant or negative correlation with positive affect in PE were positively related to negative affect in PE, in line with theoretical predictions. In the next main studies performance approach climate and introjected regulation were excluded because their relationships with PA and well-being were weak and it was necessary to reduce the measure's completion time.

Table 3.4. Correlation analysis of out of school self-reported PA and well-being variables with PE-related motivational variables

Variables in PE	Total Physical Activity	Subjective Vitality	Positive Affect	Negative Affect
Mastery Climate	.12**	.34**	.53**	-.31**
Perform Approach Climate	.15**	.12**	.10**	.22**
Perform Avoidance Climate	.08**	-.01*	.03	.39**
Autonomy needs satisfaction	.16**	.28**	.42**	-.14**
Competence needs satisfaction	.35**	.43**	.59**	-.35**
Relatedness needs satisfaction	.22**	.41**	.56**	-.28**
Intrinsic Motivation	.31**	.45**	.78**	-.52**
Identified Regulation	.24**	.43**	.71**	-.43**
Introjected Regulation	.08**	.14**	.14**	.18**
Extrinsic Regulation	-.02	-.02	-.10**	.43**
Amotivation	-.07**	-.08**	-.24**	.57**
Task Orientation	.24**	.45**	.73**	-.39**
Ego Orientation	.20**	.14**	.17**	.19**
Positive Affect	.32**	.53**	-	-.50**
Negative Affect	-.16**	-.28**	-.50**	-

Notes. Total Physical Activity = standardized (PA frequency score) + standardized YAP out of school PA score); PA: Physical Activity; YAP: Youth Activity Profile; ** $p < .001$

Explanation of variance of PA and well-being. Separate hierarchical regression analyses were conducted, entering predictor variables in steps in line with the assumptions of the IMPACT project model (Figure 3.5). The results imply that most of the predictors contributed significantly in the explanation of variance of motivational outcomes, explaining in total 44% of out-of-school PA, 47% of vitality, 74% of positive affect in PE and 53% of negative affect in PE (Table 3.5). Moving from one step to the next the percentage of the explained variance significantly increased, providing support to the hierarchical structure of the model of the IMPACT project.

Table 3.5. Results from Hierarchical Regression Analyses

		Out of School PA		Vitality		Positive Affect in PE		Negative Affect in PE	
	Predictors	ΔR^2	β	ΔR^2	β	ΔR^2	B	ΔR^2	β
Step 1		**.05****		**.06****		**.04****		**.01****	
	Age		**-.10****		**-.18****		**-.17****		**.08***
	gender		**-.21****		**-.17****		**-.13****		.07
Step 2		**.03****		**.09****		**.24****		**.25****	
	Mastery Climate		**.10****		**.27****		**.47****		**-.28****
	Perf. Approach Cl.		**.13****		**.14****		**.10***		.03
	Perf. Avoidance Cl.		.00		-.10*		**-.14****		**.38****
Step 3		**.08****		**.10****		**.18****		**.07****	
	Autonomy		.00		.06		**.12****		-.05
	Competence		.33		**.24****		**.37****		**-.27****
	Relatedness		.01		**.15****		**.10***		-.01
Step 4		**.01****		**.04****		**.18****		**.06*****	
	Task Orientation		**.12****		**.25****		**.53*****		**-.28****
	Ego Orientation		.05		.03		.00		**.17****
Step 5		**.01****		**.01****		**.08****		**.16*****	
	Intrinsic		.04		.07		**.41*****		**-.34*****
	Identified		.05		**.14****		**.09***		-.03
	Introjected		.03		.03		.01		-.02
	Extrinsic		-.03		-.01		-.01		**.10***
	Amotivation		**-.08***		-.01		-.04		**.33****
Step 6		**.01****		**.04*****		-		-	
	Positive affect in PE		**.18****		**.36****		-		-
	Negative affect PE		.05		-.03		-		-
Step 7		**.12*****		**.07*****		**.01****		.00	.00
	Friend Support		**.16****		**.17****		.01		.03
	Family Support		**.30****		**.17****		**.06***		.02
Step 8		**.07*****		**.04*****		.00		.00	
	Action Planning		**.19****		**.12****		.01		-.02
	Monitoring		**.18****		**.18****		**.07***		.00
Step 9		**.06*****		**.01****		**.01****		.00	
	Intention		**.23*****		-.03		-.02		.00
	Per. Behav. Control		**.08***		.00		-.05		-05
	Attitudes		.06		**.12*****		.03		-.05
	Self-efficacy		.06		.02		**.09****		.02
	Total R^2	**.44*****		**.47*****		**.74*****		**.54*****	

***$p < .001$; **$p < .01$; *$p < .05$

Physical Activity

The Moderate to Vigorous intensity Physical Activity (MVPA) levels of pupils from the six countries participating in the preliminary study were low and in line with recent international surveys (Guthold et al., 2020). Only 12% of the total sample (*n* = 2271) reported that they participated in moderate-to-vigorous PA (MVPA) for about 7 hours per week (Figure 3.1), which is the recommendation of the World Health Organization for children and adolescents. Moreover, boys reported higher levels of out of school PA compared to girls (Table 3.4). Findings were in line with hypotheses based on trans-contextual models of motivation and PA, supporting the construct validity of these measures and their subsequent use in the main studies of this European project.

Table 3.4. Descriptive statistics and gender differences in out of school PA

	Boys	Girls	Total
Youth Activity Profile (YAP; 5 items)	2.90±.99[a]	2.60±.94[a]	2.75±.98
PACE+ Adolescent PA Measure (2 items)	3.70±1.88[b]	3.08±1.83[b]	3.40±1.89

[a, b, c] Significant differences in Youth Activity Profile, PACE+ Adolescent PA Measure & Standardized out of school PA (YAP + PACE+) between boys and girls ($p < .001$); PA: Physical Activity

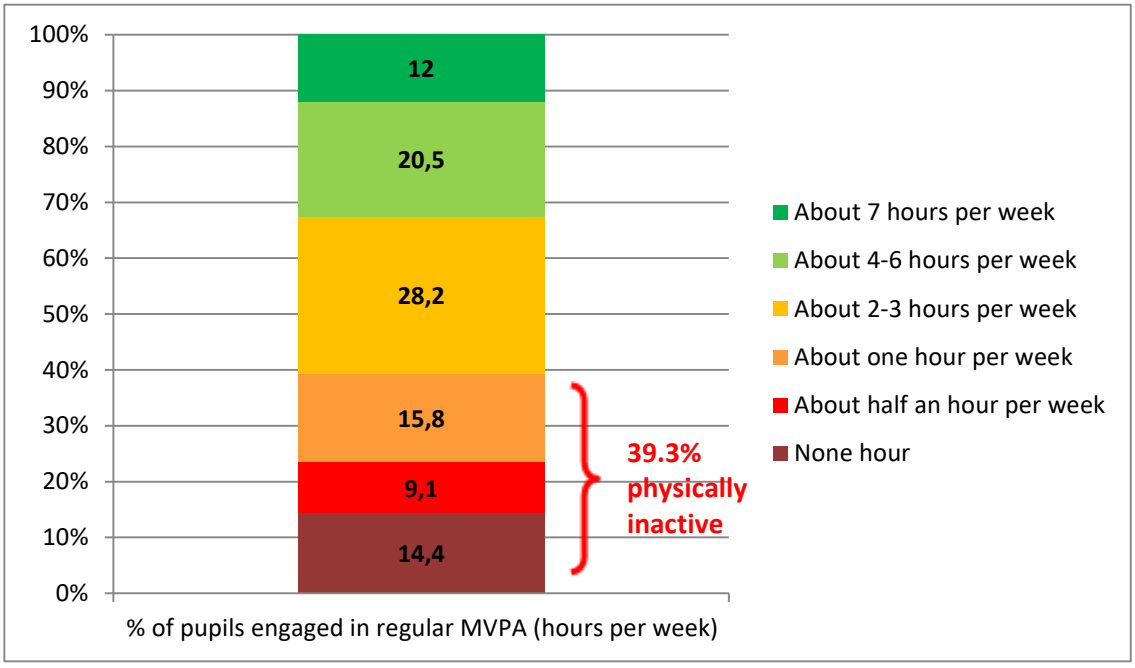


Figure 3.1. Preliminary-Pilot Study (*n = 2271*) in 2018: Percent (%) of pupils engaged in regular MVPA (hours per week)

Summary

The IMPACT project measure was developed and tested in a preliminary study involving a large sample of pupils (***n* = 2271)** from six European countries.

The results revealed that:

- All scales of this measure were **reliable** across the six countries.
- **Factorial validity** for each scale was supported across each country.
- All scales exhibited **metric invariance across all countries**, which allows summation of data from all European countries and investigation of hypotheses related to explanation of Physical Activity (PA) from these scales.
- The selected scales had statistically significant relationships with PA, well-being, positive and negative affect in Physical Education (PE) in line with expectations, providing evidence of **convergent validity**.
- The selected scales **explained substantial amount of variance of PA,** well-being, positive and negative affect in PE.
- The contribution of each scale in the explanation of variance of PA, well-being and affect in PE was in line with the structure of the IMPACT project model, providing **a preliminary verification of the application of the IMPACT project model for the promotion of pupils' PA**.
- The findings from this preliminary study indicate that more than a third of pupils in these countries is almost entirely physically inactive and more than two for every three pupils need to increase their levels of MVPA, suggesting the **importance of targeting PA promotion through PE** where physically inactive pupils are involved.

CHAPTER 4. PUPILS' PHYSICAL ACTIVITY & MOTIVATION IN IMPACT PROJECT COUNTRIES

Main Study (T1 Measure)

Participants. In main study participants (***n* = 12355**) were pupils from France (*n* = 1207), Greece (*n* = 3066), Italy (*n* = 2554), Spain (*n* = 1358), Turkey (*n* = 3462) and UK (*n* = 708), aged 9 to 18 years old (*MEAN* age: 13.75, S.D. = 1.96 years). Boys were 5882 and girls were 6297 (42 pupils answered "other", while 134 did not report their gender). We classified them in three age groups: (1) aged 10-12, *n* = 1291, (2) aged 13-15, *n* = 6317, and (3) aged 16-18, *n* = 4675 (72 did not report their age or educational level).

Measures. These pupils completed most of the invariant online measures stemming from the Pilot study:

- demographics (e.g., birthdate, age, gender, country, ethnicity, school, educational level, class),
- their socio-economic status (SES; FAS Revised; 7 items; Torsheim et al., 2016; FAS III; 1 item; Schnohr et al., 2008),
- the 2-item screening measure for PA (PACE+ Adolescent PA Measure; Prochaska et al., 2001), one item measuring hours per week spent in MVPA (Booth et al., 2001), sport type, days of PE in school per week,
- the Youth Activity Profile (YAP; Saint-Maurice & Welk, 2014; 5 items capturing PA inside school, 5 items capturing PA outside of school and 5 items assessing pupils' sedentary behaviors),
- an open-ended question measuring pupils' sport participation, one item measuring frequency of PE lesson per week (Saint-Maurice & Welk, 2015),
- the perceived motivational climate in PE Questionnaire (Papaioannou et al., 2007; 6 items for mastery climate and 6 items for performance avoidance climate; note: the performance approach scale was excluded due to its low correlation with PA in pilot study),
- the Basic Psychological Needs Satisfaction Questionnaire of Autonomy (Standage et al., 2005; 5 items), Competence (McAuley et al., 1989; 6 items) and Relatedness (Richer & Vallerand, 1998; 4 items),
- the Behavioural Regulation in Exercise Questionnaire 2 (BREQ 2; Markland & Tobin, 2004; 4 items for Intrinsic Motivation, 4 items for Identified Regulation, 4 items for Extrinsic Regulation and 4 items for Amotivation; note: introjected regulation was excluded due to its low correlation with PA in pilot study),
- the Achievement Goals in PE (Duda & Nicholls, 1992; 7 items for Task Orientation and 6 items for Ego Orientation),
- the Physical Activity Enjoyment Scale (PACES; Motl et al., 2001; 6 items for Positive Affect and 6 items for Negative Affect in PE; note: 4 items with lower correlations with other variables were excluded to reduce completion time),
- their Intentions to be active in leisure-time (Standage et al., 2003; 3 items),
- their Perceived Behavioral Control (Hagger et al., 2009; Rhodes & Courneya, 2005); 3 items,
- their Attitudes to be physically active (Hagger et al., 2009; 4 items),
- the Social Support Scale to be physically active (Dewar et al., 2013; 4 items for Friend Support and 4 items for Family Support),
- the Action Planning leisure-time PA scale (based on Dombrowski & Luszczynska, 2009; Nurmi et al., 2016; Sniehotta et al., 2005; 5 items),
- the Self-Monitoring scale (Sniehotta et al., 2005 2 items; Theodosiou & Papaioannou 2 items),
- the Subjective Vitality (Ryan & Frederick, 1997; 5 items) and an open-ended item measuring pupils' most important barrier to be active in their leisure-time. More details about the measures can be found on our website (www.impactpe.eu/site/index.php/en/measure/surveys).

Physical Activity

The present results suggest that the vast majority of the pupils (87.6%) do not meet the latest World Health Organization's (WHO) PA activity recommendations for 7 hours of moderate to vigorous-intensity PA per week (Figure 4.1). Unfortunately, one every three European pupils reported that they were totally inactive (0-1 hours of physical activity per week).

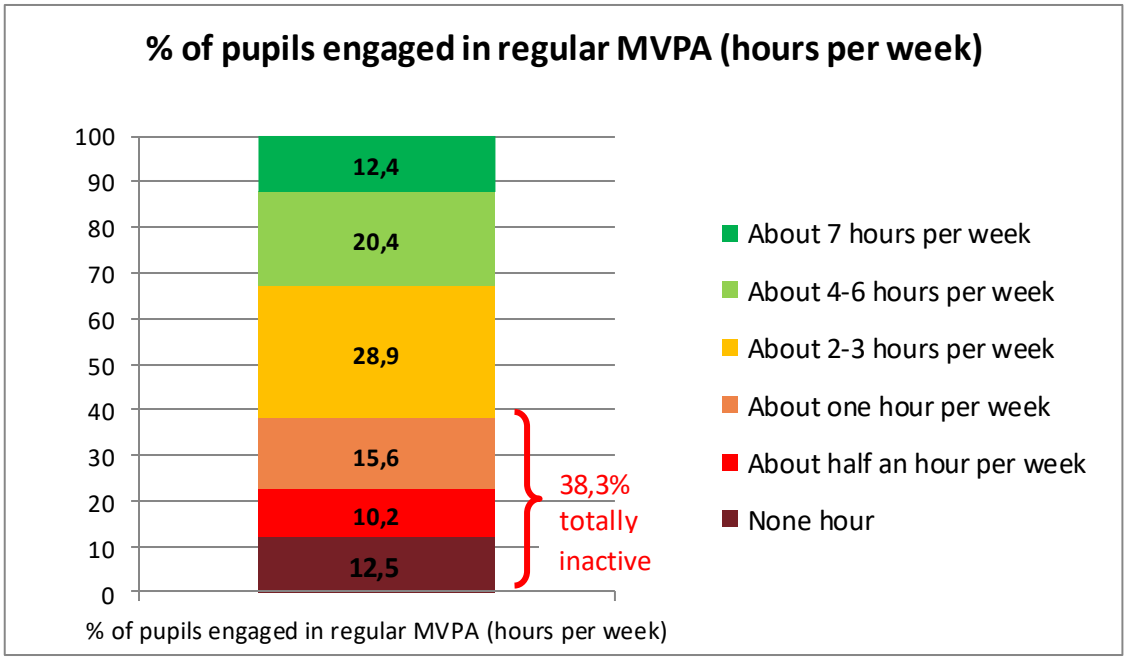


Figure 4.1. T1 Measure - Main study: Percent (%) of pupils engaged in regular MVPA (hours per week)

Pupils' Sport Participation

Participants responded to an open-ended question ("*Please write in which sports/ physical activities you participate this year?*"). From the total sample responding on T1 Measure, 9615 pupils (aged 9 to 18 years old from 6 European countries, FR, GR, IT, SP, TR, UK), completed this item capturing their sport participation (Table 12). Based on their answers we classified participants to the sports shown in Table 4.1.

Almost 40% of the sample participated in team sports such as football, basketball, volleyball and handball. Football is by far the most favorable sport in adolescence attracting most participants (*n* = 1785; 18.6%), followed by equal numbers of basketball and volleyball young athletes (9.1% in each sport respectively. Regarding individual sports, the most popular are martial arts, gym activities, dance, tennis, gymnastics, and track and field. A large number of the sample reported that they did not participate in any sport (*n* = 1375; 14.3%) while most of the pupils who did not reply to this item (*n* = 2740, 22.2% of the total sample) probably did not participate in any sport too. Moreover, a considerable number of pupils (*n* = 555; 5.8%) did not participate in an organized sport but they reported that they were doing walking, running or exercise in home.

Table 4.1. Pupils' sport participation

Sports	Frequency	Percent	Cumulative Percent
Nothing	1375	14.3	14.3
Football, indoor football	1785	18.6	32.9
Basketball, korfball	871	9.1	41.9
Volleyball	872	9.1	51.0
Swimming, artistic swimming	541	5.6	56.6
Handball	163	1.7	58.3
Martial arts (karate, judo, wrestling, TKD, boxing)	552	5.7	64.1
Track & field	301	3.1	67.2
Dance (ballet, hip hop, Latin)	689	7.2	74.4
Gymnastics (rhythmic, trampoline, acrobatics)	237	2.5	76.8
Tennis (table tennis, badminton, squash)	403	4.2	81.0
Gym (aerobic, Zumba, yoga, Pilates, cheerleading, CrossFit, weight lifting)	638	6.6	87.6
Rowing (canoe kayak)	16	.2	87.8
Cycling	147	1.5	89.3
Climbing	58	.6	89.9
Shooting	4	.0	90.0
Parkour	7	.1	90.1
Water polo	24	.2	90.3
Walking, running, exercise at home	555	5.8	96.1
Sailing	9	.1	96.2
Skating (ice skating, skateboard, roller skating, figure skating)	71	.7	96.9
Fencing	9	.1	97.0
Horseback riding	81	.8	97.8
Archery	33	.3	98.2
Skiing	34	.4	98.5
Baseball, rugby, cricket	74	.8	99.3
Triathlon	13	.1	99.4
Hockey (ice hockey, field hockey)	13	.1	99.6
Dodgeball	20	.2	99.8
Netball	11	.1	99.9
Human Towers	1	.0	99.9
Frisbee	8	.1	100.0
Total	9615	100.0	

Gender and Age groups differences in Physical Activity

All findings concerning Moderate to Vigorous intensity Physical Activity (MVPA) revealed that boys were more physically active compared to girls (Figures 4.1 and 4.2).

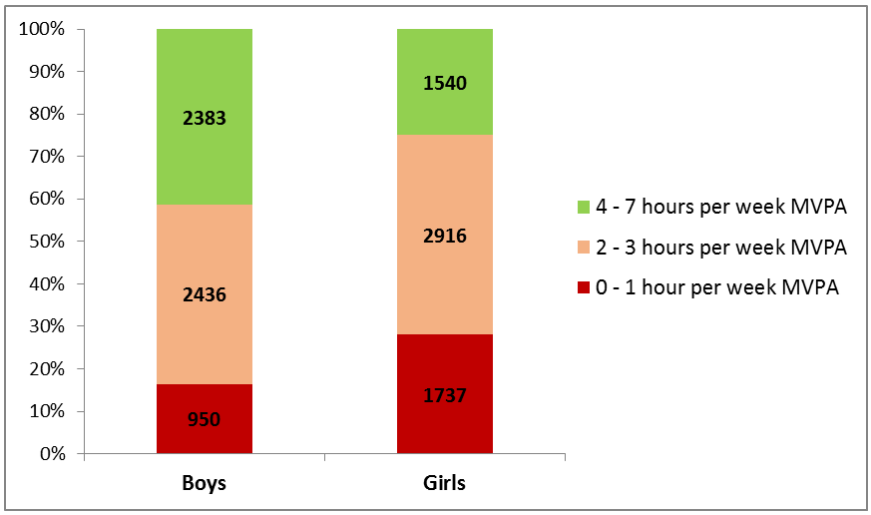


Figure 4.1. Number and percentage of boys and girls who are physically active (MVPA) and inactive out-of-school

After splitting pupils' sample into 3 groups based on their reported age (Group 1: 10 to 12 years old; Group 2: 13 to 15 years old; Group 3: 16 to 18 years old), results showed significant age group differences in all measures of PA, with younger pupils reporting higher levels of PA compared to older pupils.

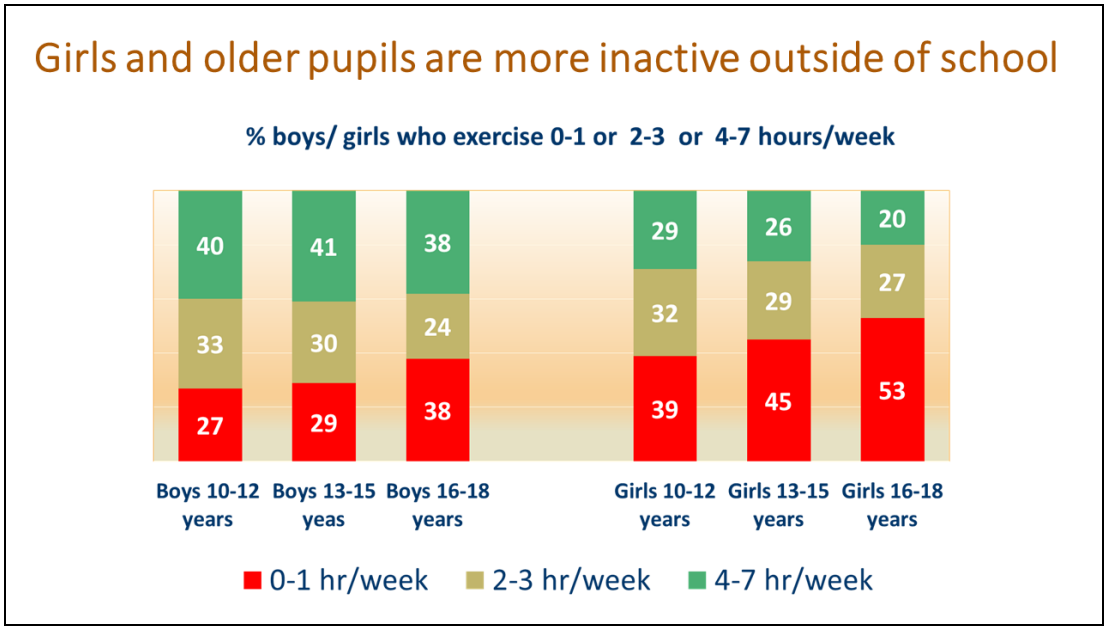


Figure 4.2. Percentage of pupils per age group and gender who are inactive (0-1 hours/week MVPA) or relatively active (4-7 hours/week MVPA) in their leisure time

As shown in Figure 4.2 more than 50% of girls aged 16-18 were totally inactive in their leisure time, while 39% of girls were totally inactive in the age group 10-12 years old. Likewise, 38% of boys 16-18 years old were totally inactive, while 28% of boys 10-15 years old were totally inactive. Only 20% of girls 15-18 years old reported that they were relatively active. Across all age group similar percentage of boys reported that they were relatively active (38%-41%).

Number of Days with Physical Education (PE) classes per week and pupils' PA

Across the six countries most of the pupils (58%) have 2 days with PE per week. A substantial number of pupils (38%) have just one day of PE per week, while a negligible percentage of pupils (4%) reported more than 2 days of PE per week.

Still, there are important differences between countries in the days of PE per week. The least days of PE per week were reported in Italy and Turkey, where the majority of the pupils reported one day of PE per week. The most days with PE per week were reported in Greece, but even here there were just two days per week for 90% of the Greek pupils, while 7% of the Greek pupils reported one hour per week (these were pupils in the 11th grade, aged 16-17).

Table 4.2. Number of days with Physical Education per week

PE days/ Week	UK		France		Greece		Italy		Spain		Turkey		total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	216	32	201	17	216	7	1498	59	321	24	2068	63	4520	38
2	369	54	934	79	2730	90	993	40	1009	75	951	29	6986	58
3	87	13	27	2	76	3	35	1	7	0	64	2	296	2
4	7	1	20	2	8	0	9	0	12	1	213	6	269	2
TOTAL	679		1182		3030		2535		1349		3296		12071	

Importantly, adjusting for age differences, the number of days of PE per week was positively related to total hours of MVPA in outside school PA. As shown in Figure 4.3 just one additional day per week lead to considerable increase of pupils' MVPA in out-of-school PA.

In the group of 15-17 year old pupils (n = 4266) and more specifically in the subgroup (n= 2069) of pupils reporting one day of PE per week there were more physically inactive pupils in out-of-school PA (0-1 hours/week = 52%) than in the subgroup (n= 2197) reporting 2 days of PA per week (0-1 hours/week = 36%). On the other hand, in the group of 15-17 year old pupils reporting one day of PE per week there were less active or relatively physically active pupils in out-of-school PA (4-7 hours/week = 24%) than in the group reporting 2 days of PA per week (0-1 hours/week = 37%).

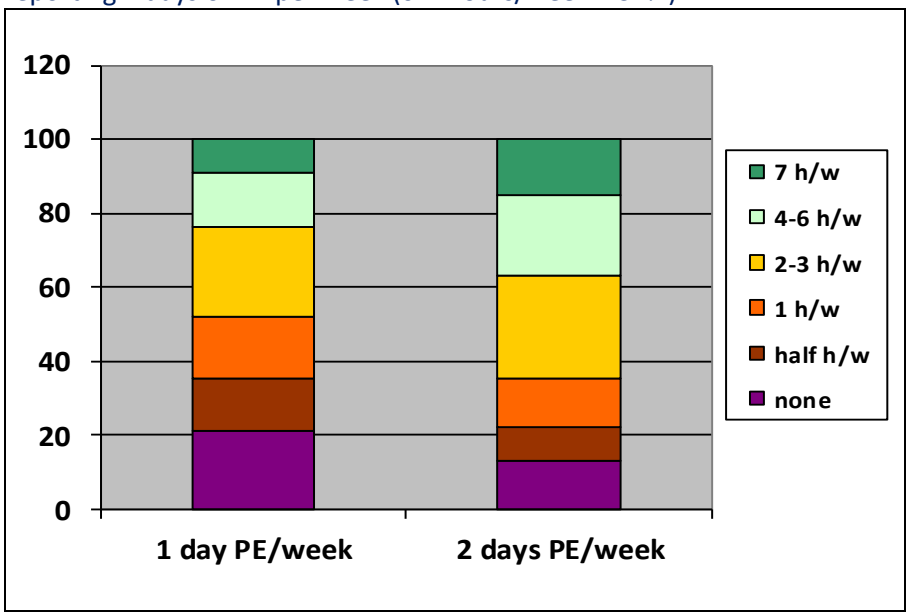


Figure 4.3. Association of days of PE per week with out-of-school MVPA for 15-17 year olds

Physical Activity per Country

One should be relatively cautious to make direct comparisons between countries in pupils' levels of self-reported physical activity due to lack of scalar invariance between countries in these measures. The findings are reported here to compare them with objective measures of PA reported later. Together, they imply that Greek pupils might be relatively more physically active than pupils in Italy and maybe in Turkey due to more days of PE per week. Moreover, as is explained below, levels of inactivity are positively linked to pupils' Socio-Economic Status. Hence, the relatively higher level of inactivity in Turkish adolescents shown in Figure 4.4 might be partly ascribed to lower levels of Turkish pupils' SES in relation to other European pupils.

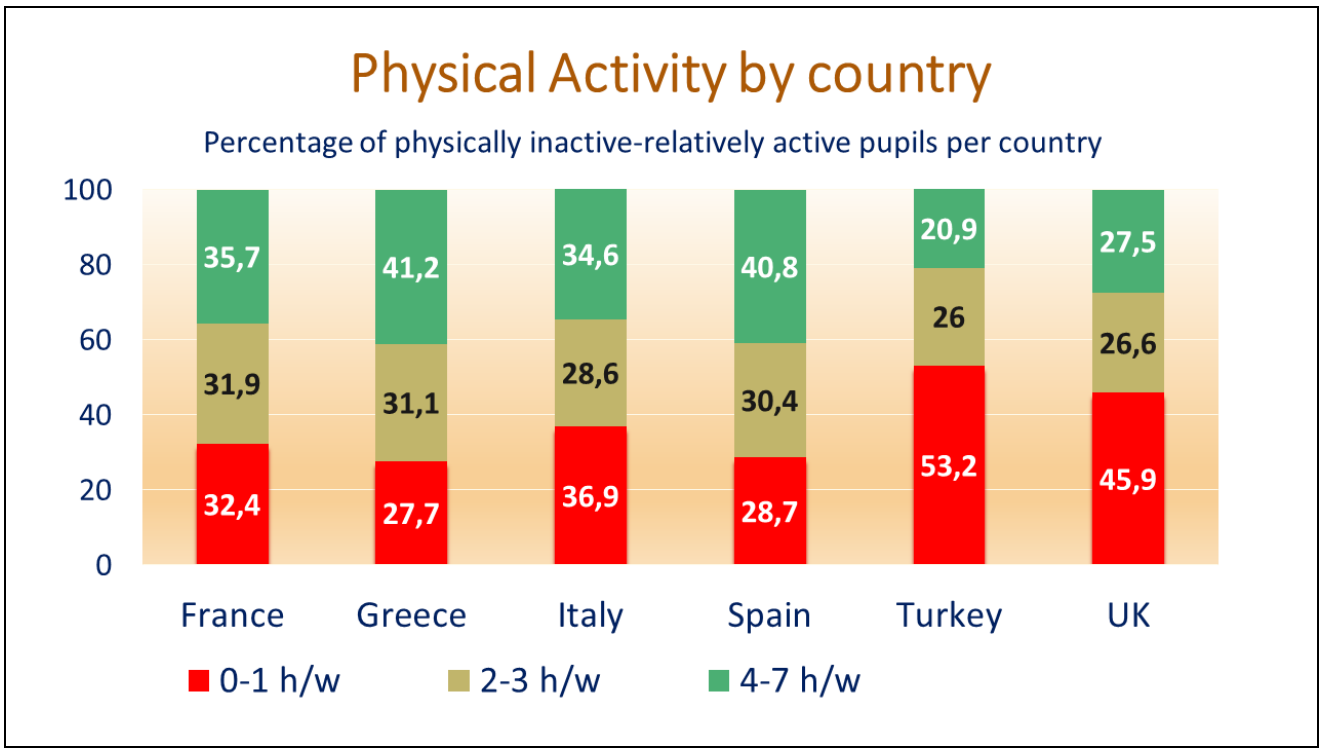


Figure 4.4. Hours of Moderate to Vigorous Physical Activity per week reported by pupils across the six countries

Pupils' Barriers to be Physically Active

Regarding barriers to be physically active, 8857 pupils, aged 9 to 18 years old from the 6 European countries (FR, GR, IT, SP, TR, UK), responded to an open-ended item ("*Write the MOST IMPORTANT reason that prevents you from doing REGULAR SPORT OR EXERCISE. Write it immediately, the first one that comes to your mind*") in order to capture the most important barrier in order to be physically active (Tables 4.3 & 4.4).

- **Almost half of the pupils** reported that **no free time** (other obligations) and **homework-preparation for school** (reading, out of school classes) were the most important barriers to be physically active (*N* = 4000; 45.2%).
- A large number of pupils (totally 31.6% of the total sample) reported **personal - internal barriers**, such as I do not like sport, I do not want it (4.9%) or I feel boring, tired, lazy (13.1%) or I have motor difficulties, I am injured - ill (11.1%), or use of video games, computers, TV (2.5%).
- A considerable percentage of pupils **(8.7%) mentioned that the most important barriers for PA were linked to lack of support and low Socio-Economic Status (SES)**, such as no support from family, no place around for training, lack of vehicle for transportation, expensive for participation and no equipment.

Table 4.3. Pupils' barriers to be physically active

Barriers	Frequency	Percent
Homework (reading, out of school classes)	2653	30
No free time (other obligations)	1347	15.2
Bored, tired, lazy, sleep	1160	13.1
Motor difficulty, injury, health issues, ill, obesity	985	11.1
Nothing (no barriers)	986	11.1
I do not like it, I do not want, it's hard	434	4.9
No support (family, friends, significant others)	324	3.7
No place around for training, distance, training time	245	2.8
TV, video games, computer, mobile phone	221	2.5
Weather	180	2.0
Bullying, make me shame, anxiety, fear of failure, negative thoughts	93	1.1
No vehicle (car, transportation)	86	1.0
Money-related reasons (expensive)	73	.8
No sport equipment	37	.4
Coaching (emphasis on championship-competition)	16	.2
Food related reasons	11	.1
Religious reasons	6	.1
TOTAL	8857	100.0

Table 4.4. Pupils' barriers to be physically active per country

	Country						
	U.K.	France	Greece	Italy	Spain	Turkey	Total
Homework for school	5.9%	10.7%	38.5%	44.4%	23.5%	23.6%	30.0%
No free time	13.8%	24.5%	17.8%	12.1%	21.7%	11.5%	15.2%
Boring, tired, lazy	20.2%	18.9%	7.5%	10.9%	22.8%	14.8%	13.1%
Nothing no barriers	2.6%	6.8%	11.9%	5.4%	5.5%	17.1%	11.1%
Motor difficulty injury health issues obesity ill	16.3%	12.0%	8.8%	12.3%	11.0%	11.5%	11.1%
I do not like, it's hard	4.6%	8.2%	1.2%	8.0%	2.5%	5.8%	4.9%
No support from family, significant others	6.1%	4.1%	5.7%	.6%	4.8%	3.1%	3.7%
No place around for training, distance, training time	1.8%	1.9%	3.0%	.5%	.4%	4.7%	2.8%
TV video-games computer mobile	12.2%	5.0%	1.2%	1.5%	4.8%	1.8%	2.5%
Weather	4.3%	4.3%	1.2%	1.0%	.7%	2.7%	2.0%
Bullying, fear of failure, negative thoughts	5.1%	.8%	.3%	1.4%	1.6%	.9%	1.1%
No vehicle no car for transportation	1.0%	1.9%	1.6%	1.1%	0.0%	.3%	1.0%
No money, expensive	1.3%	.7%	.8%	.7%	.5%	.9%	.8%
No equipment	.5%	.1%	.2%	0.0%	.2%	1.0%	.4%
Coaching, too much competition	0.0%	.1%	.3%	0.0%	.2%	.2%	.2%
Food	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	.1%
Religion	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	.1%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Nevertheless, there were important differences between countries in the most important barriers for Physical Activity reported by pupils (Table 4.4). Pupils from Greece and Italy were the most likely to report barriers related to lack of time and homework/preparation for school (56.6%), while UK pupils were the least likely (19.6%) to report lack of time and homework. On the other hand, UK pupils were the most likely to report internal reasons (53.3%), while Greek pupils were the least likely to report internal reasons (18.6%). While about 10%-11% of pupils from Greece, Turkey and UK reported barriers related to low SES as important reasons for PA, just 3% of Italians reported the respective barrier.

Differences between schools in Physical Activity

Adjusting for country and age-group differences, large between-school significant differences in Physical Activity (PA) emerged, explaining considerable amount of variance that varied from 12% to 21% due to school differences within the same country and age group.

We focused particularly on school averages in PA stemming from more than 15 pupils from the same school. As shown in Figure 4.5, within the same country and age group there were schools whose average PA varied between 2 and 3 days per week, indicating schools that were characterized by very high levels of PA and school characterized by very low levels of PA.

Pupils in schools with very high levels of PA were very active in sports, while pupils in school with very low levels of PA were not involved in any sport. Following discussions with some PE teachers, it emerged that there were schools in neighborhoods of big towns or villages where no sport clubs were active, thus precluding opportunities for your pupils to participate in sports in these areas.

Another cause of school differences in PA is the different Socio-Economic Status (SES) of pupils across different schools. Some of these schools are located in low SES areas while other schools are located in high SES areas. As shown below, SES differences explain large differences in pupils' PA.

These findings indicate that policy makers can use the short IMPACT measure to monitor schools' PA and support those schools with specific policies to increase pupils' levels of PA.

Large variations in Physical Activity across Schools

within the same country

data at school level each school with more than 15 pupils/school

		Physical Activity days/week at school level		
	Age group	Min	Mean	Max
Greece	11-12	2.39	4.05	6.94
	13-15	2.60	3.78	4.89
	16-17	1.47	3.43	4.34
Italy	11-12	2.61	3.12	4.22
	13-15	2.02	3.11	5.45
	16-17	2.19	2.62	4.00
Turkey	11-12	1.98	3.83	4.58
	13-15	1.50	3.37	5.01
	16-17	2.06	3.66	5.19

Within the same country & within the same age group there were schools with less than 2 days of Physical Activity per week at he average school level

…and schools with more than 5 days of Physical Activity per week at he average school level

These schools (and probably their neighborhoods) need different kind of support & resources!!!

Figure 4.5. Between school differences in Physical Activity. Adjusting for age and country differences

Pupils' Self-reported PA Levels and Socio-Economic Status (SES)

Using the FAS Revised version we calculated pupils' Socio-Economic Status (SES) mean score. Then, based on their answers we divided them into three groups according to their SES score:

- low SES = the lowest quartile (n = 2610)
- moderate SES = pupils ranging in SES scores between 24.8%-81.4% (n = 5824)
- high SES = the top 18.6% (n = 1935)

The level of SES was unequally distributed among the six countries. A considerable percentage of Turkish pupils (45%) was classified in the low SES group, while less than 13% was the percentage of French, Spanish and Italian pupils that was classified in this lowest SES quartile.

Table 4.5. Percentage of pupils classified in the three SES groups per country

	country						Total
SES	UK	France	Greece	Italy	Spain	Turkey	
Low	27.6%	7.6%	20.3%	13.1%	12.9%	45.0%	25.2%
Moderate	50.1%	50.0%	64.3%	58.5%	52.3%	50.6%	56.2%
High	22.3%	42.4%	15.4%	28.4%	34.8%	4.4%	18.6%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Analyses across all PA measures revealed that the lowest the SES the highest the physical inactivity. As shown in Figure 4.6, low SES pupils were 2,2 times more physically inactive in comparison to high SES pupils. In fact, one in every two low SES pupils (51.4%) was absolutely inactive (0-1 hours per week). Pupils with moderate SES were 1,6 times more inactive in comparison to high SES pupils. Pupils with high SES were (i) 2 times more likely to be relatively active in comparison to low SES pupils, and (ii) 1,4 times more likely to be relatively active in comparison to moderate SES pupils.

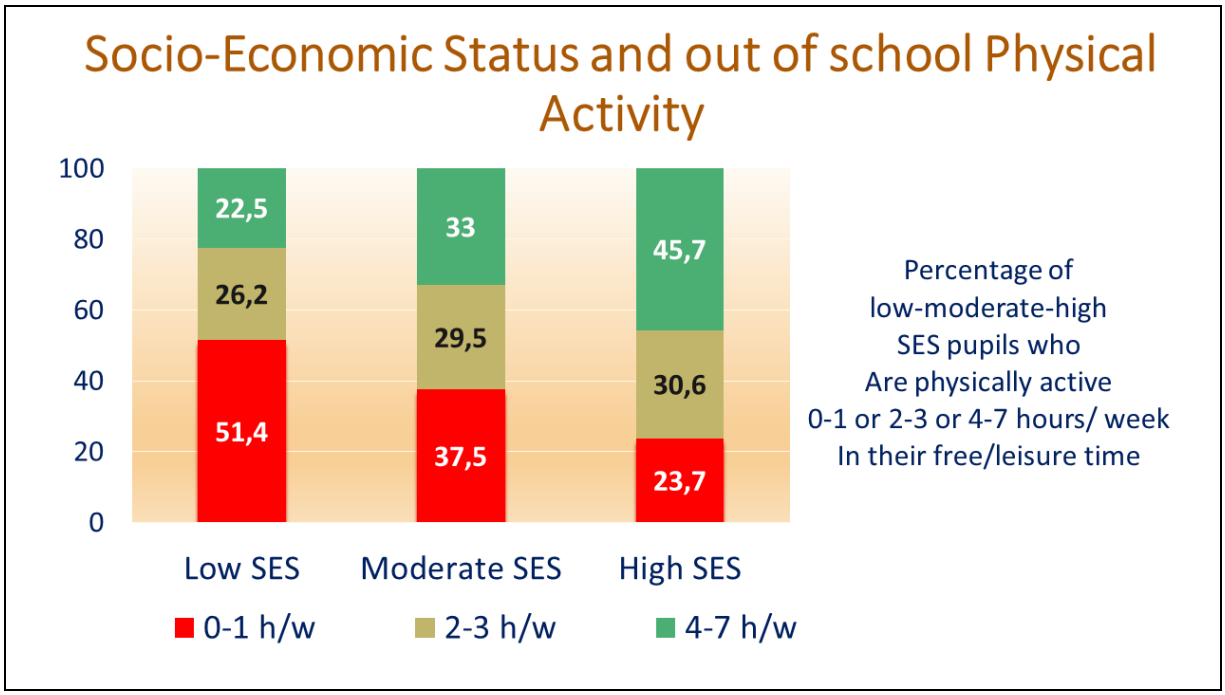


Figure 4.6. Percentage of low-moderate-high Socio-Economic Status (SES) pupils who are physically inactive/active out-of-school

Correlation analysis between pupils' self-reported PA and psychosocial predictors

Psychosocial measures delivered in the main study of this project were significant positive correlates of physical activity according to expectations (Table 4.6). With the exception of performance avoidance climate, all psychosocial variables were positively correlated to PA. Some of these relationships were very low, which was also in line with expectations: PA had very low positive relationship with ego orientation and very low negative relationship with external regulation and amotivation in PE. The findings confirm that interventions targeting these variables, like the intervention reported in this report, are important to promote PA.

Table 4.6. Correlation analysis between pupils' self-reported PA and psychosocial variables

	Youth Activity Profile (YAP)	**PACE+** Adolescent PA Measure
Mastery-oriented climate in PE	.17**	.09**
Performance-avoidance climate	.02	.00
Autonomy need support	16**	.14**
Competence need support	.32**	.29**
Relatedness need support	.22**	.18**
Task Orientation in PE	.24**	.19**
Ego Orientation in PE	.11**	.12**
Intrinsic Motivation in PE	.27**	.24**
Identified regulation in PE	.25**	.20**
External regulation in PE	-.05**	-.07**
Amotivation in PE	-.08**	-.08**
Positive Affect in PE	.27**	.22**
Negative Affect in PE	-.17**	-.15**
Vitality	.35**	.30**
Intention to do PA	.44**	.47**
Perceived Behavioral Control	.42**	.43**
Attitudes towards PA	.32**	.30**
Friend Support	.38**	.33**
Family Support	.39**	.34**
Action Planning	.45**	.42**
Self-Monitoring	.48**	.46**
PA prevention due to barrier	-.20**	-.24**

***p* < .001; PA: Physical Activity

Gender Differences in motivational variables in PE, affect in PE, well-being

As was expected, boys exhibited a more positive motivational profile in PE in comparison to girls. For example, they were more intrinsically motivated in PE, they had higher positive affect and lower positive affect in PE than girls. This more positive motivational profile seems to be linked with boys' higher perception that their needs are satisfied in PE in comparison to girls. Importantly, boys also reported higher vitality than girls (Figure 4.7).

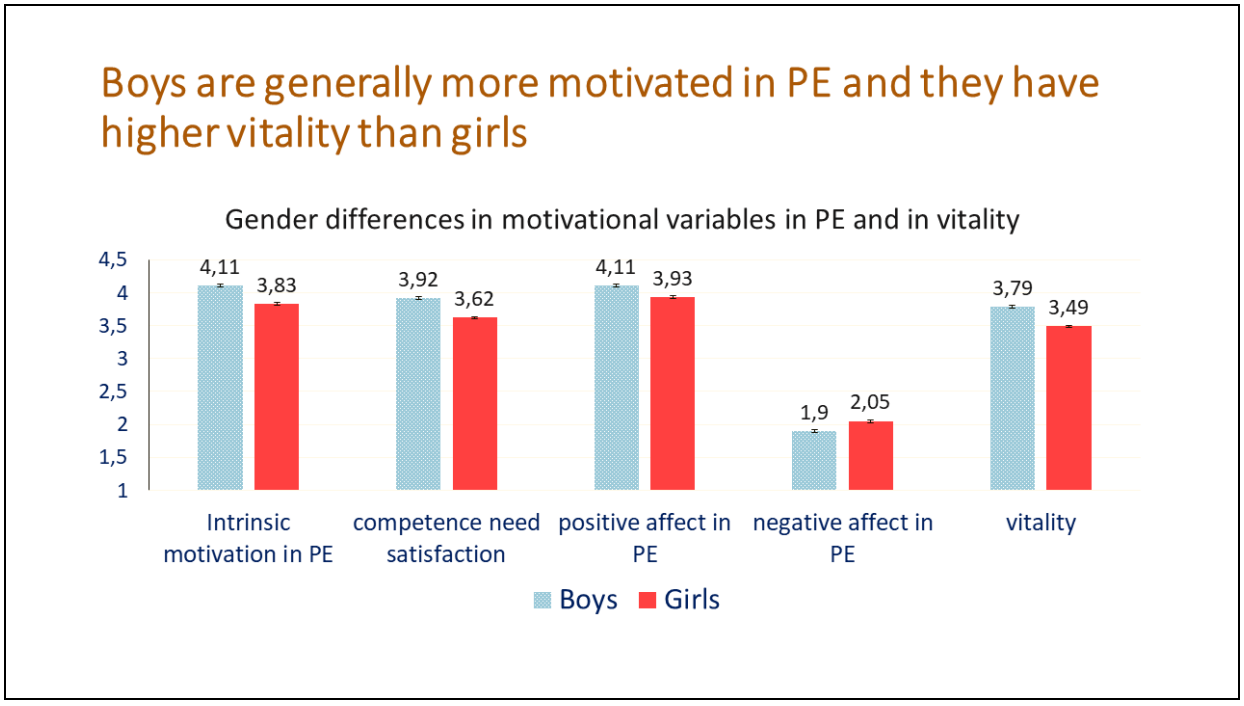


Figure 4.7. Significant gender differences in motivational variables in PE and in vitality (for all differences: $p < .001$)

Age Group Differences in motivation in PE

In general, younger pupils aged 10-12 years old were more motivated in PE than older pupils. For example, pupils aged 10-12 years old had higher scores in intrinsic motivation and positive affect in PE but lower scores in amotivation and negative affect in PE (Figure 4.8). These differences correspond to similar age differences in satisfaction of needs for competence: 10-12 years old pupils felt that their needs for competence were more satisfied than their older counterparts.

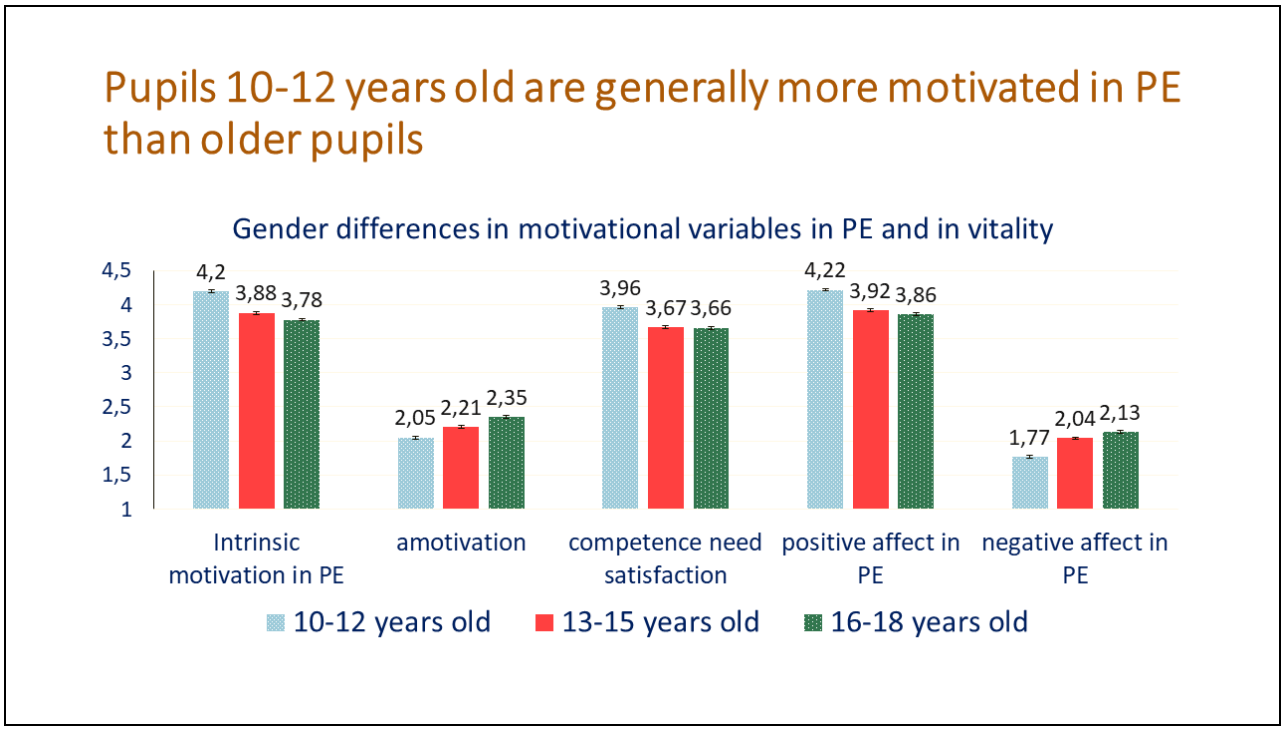


Figure 4.8. Age group differences on pupils' motivational variables (all difference significant at $p < .001$)

Differences in school PA, motivation in PE, and in vitality among pupils with different sport and out-of-school PA experiences

It is known that pupils with sport experiences are more motivated in PE (e.g., Papaioannou 1997). Hence, it was important to examine if out-of-school sport/physical activity experiences has an impact on European pupils' PA levels in school, their motivation in PE and their well-being. Therefore, we divided the sample into three (3) groups based on the hours spent per week in MVPA (totally Inactive: 0 to 1 hour PA per week; rather inactive: 2 to 3 hours PA per week; active or rather active: 4 to 7 hours per week). After adjusting for age and gender differences, results from Multivariate Analyses of Covariance shown below indicated that,

the more physically active in out-of-school contexts were the pupils:

- the more physically active they were also in school ($F_{2, 7333} = 56.9$, $p < .001$),
- the more intrinsically motivated they were in PE ($F_{2, 7333} = 133.6$, $p < .001$),
- the more task oriented (pursuing mastery goals) they were in PE ($F_{2, 7333} = 97.1$, $p < .001$),
- the more positive emotions & enjoyment they had in PE ($F_{2, 7333} = 122.1$, $p < .001$),
- the less negative emotions they had in PE ($F_{2, 7333} = 96.4$, $p < .001$),
- the greater the vitality ($F_{2, 7333} = 190.2$, $p < .001$) they feel in their life.

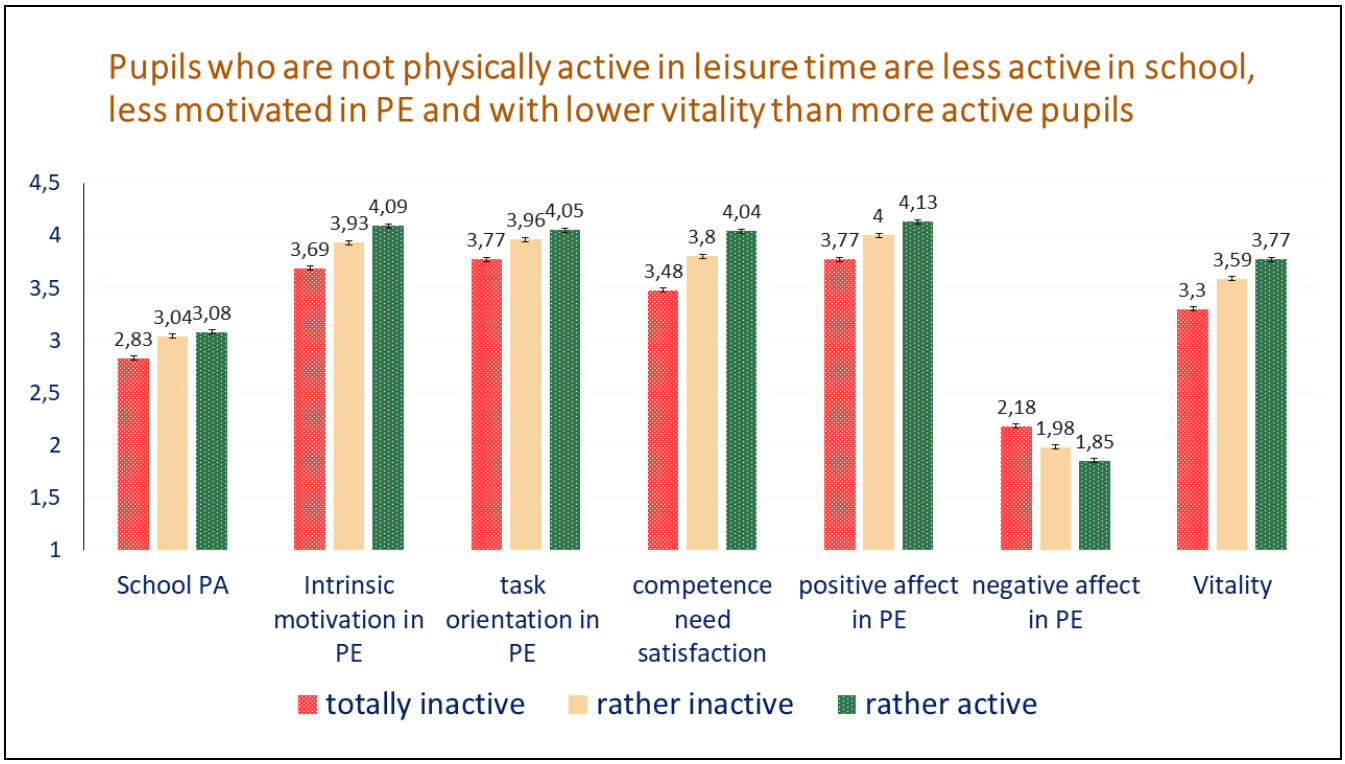


Figure 4.9. Significant differences in PA in school, motivational variables in PE, and vitality among more and less inactive pupils in out-of-school sport and PA settings (after adjustment for gender and age differences)

The group of totally inactive pupils was the most disadvantaged one. In comparison to other groups, totally inactive pupils, i.e. those who mostly need school PA, reported substantially lower (i) PA in school, (ii) motivation in PE and (ii) well-being in life. It should be noted that PE and PA in school settings are consisted mainly of sport activities requiring advanced sport skills and high physical competences for pupil success. In this environment, pupils with no sport and physical activity experiences feel disempowered. As shown in Figure 4.9, these pupils are much less likely to feel that their need for competence is satisfied, compared to their schoolmates who have more experiences from out-of-school sport and physical activity settings.

Importance of Mastery Climate in PE to promote pupils' motivation in PE, school PA, self-monitoring, intentions for out-of-school PA, out-of-school PA

This project focused on mastery-oriented climate in PE, which is considered an important determinant of pupils' motivation in PE and proximal determinants of out-of-school PA (e.g., Papaioannou et al., 2004).

We examined if different levels of European teacher-initiated mastery climate are associated with European pupils' PA levels during school, their motivation in PE, their emotions in PE and their well-being. Based on pupils' answers on the teacher-initiated motivational climate questionnaire (6 items; Papaioannou et al., 2007), we divided the sample into three (3) groups: 1) Low mastery/ learning climate: ≤ 3.67 (n = 4339), 2) Moderate mastery/ learning climate: 3.68 to 4.17 (n = 3456), and 3) High mastery/ learning climate: ≥ 4.18 (n = 3471).

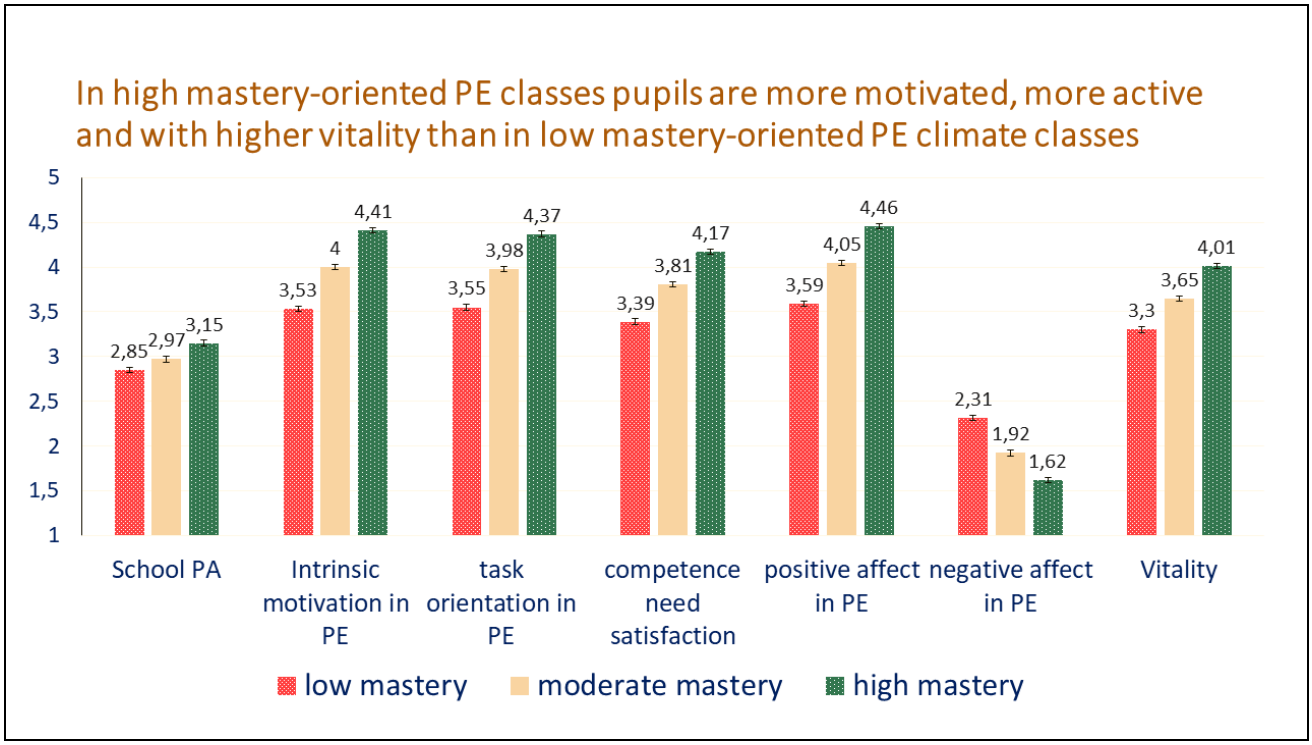


Figure 4.10. Significant differences on pupils' motivational variables in PE, PA in school and vitality among pupils perceiving different levels of teacher-initiated mastery climate in PE.

After adjusted for age and gender, results showed that the more pupils perceive that the PE teacher emphasizes learning / improving:

- the more physically active are during school ($F_{2, 7995}$ = 61.1, p < .001) (Figure 4.10),
- the more task oriented are in PE ($F_{2, 10539}$ = 1275.4, p < .001),
- the stronger their intrinsic motivation in PE ($F_{2, 10674}$ = 920.8, p < .001),
- the more positive emotions & enjoyment they have in PE ($F_{2, 10696}$ = 1115.6, p < .001),
- the less negative emotions they have in PE ($F_{2, 10667}$ = 558.2, p < .001),
- the greater their vitality and joy ($F_{2, 10471}$ = 502.7, p < .001) they feel in their life
- the more likely they perceive satisfaction of their need for competence (($F_{2, 10471}$ = 929, p < .001)

Similarly, we explored if the different levels of teacher-initiated mastery climate are linked with pupils' out-of-school PA, intention, perceived behavioral control, attitudes towards PA and self-regulation strategies to be physically active.

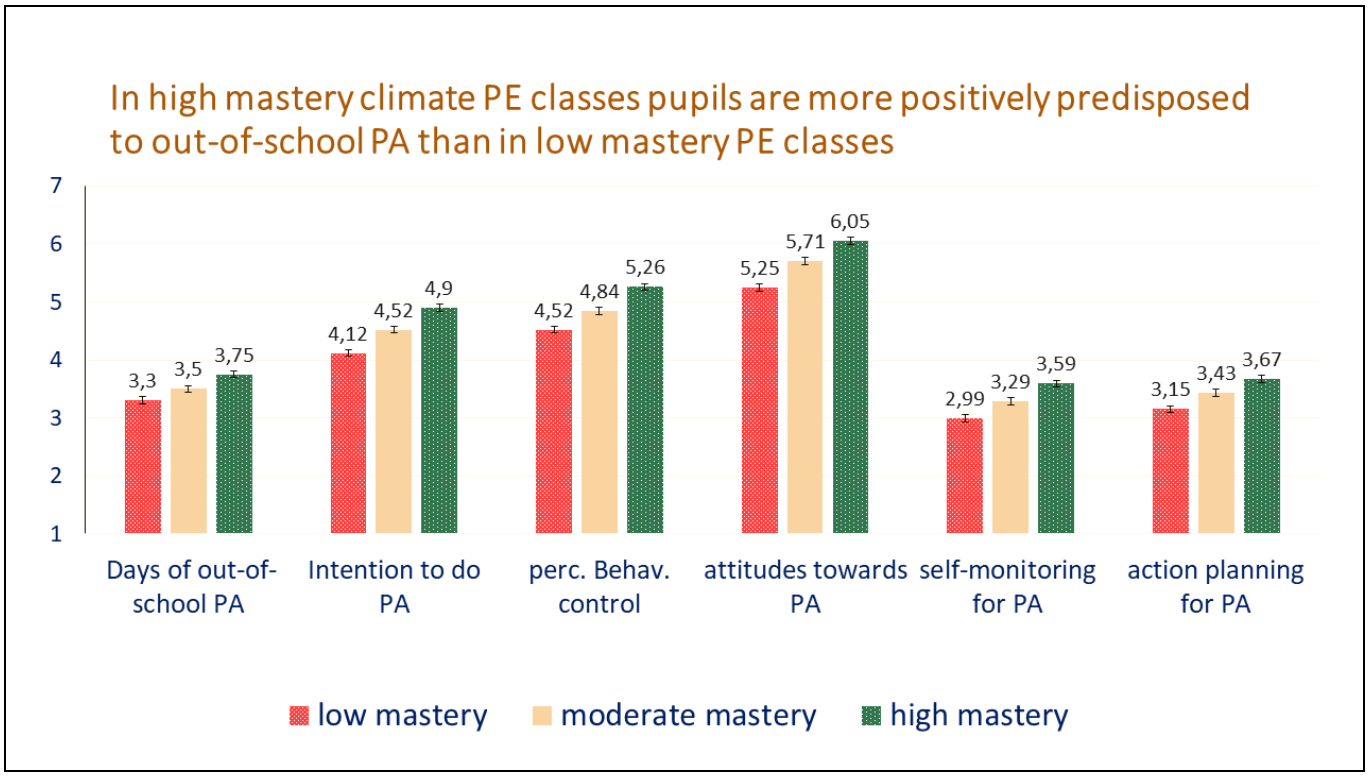


Figure 4.11. Significant differences in predictors of out-of-school PA among pupils perceiving different levels of teacher-initiated mastery climate

After adjusted for age and gender, results showed that the higher the pupils' perception of their PE teacher emphasizing mastery/learning / improving:

- the higher their levels of physical activity ($F_{2, 10878} = 38.051$, $p < .001$),
- the stronger their intention to do out of school PA ($F_{2, 10207} = 129.650$, $p < .001$),
- the more they are encouraged and believe that they CAN/ IT'S UP TO THEM to be physically active out of school ($F_{2, 10228} = 156.558$, $p < .001$),
- the more positive their attitudes towards PA ($F_{2, 10465} = 261.178$, $p < .001$),
- the more often they monitor themselves how often they do out-of-school PA ($F_{2, 10418} = 205.937$, $p < .001$),
- the more likely they are to develop specific plans (when/where/with who/how/how often) to do out-of-school physical activity ($F_{2, 10438} = 165.820$, $p < .001$; Figure 4.11).

Importance of Pupils' Basic Needs Satisfaction in PE to promote pupils' motivation in PE, PA in school, self-monitoring, intentions for out-of-school PA, out-of-school PA

With regard to interventions in the PE environment, this project also focused on the increase of pupils' basic needs satisfaction. We delivered measures of students' basic needs satisfaction because we assumed that PE teachers satisfying their pupils' needs for autonomy, competence and relatedness have more motivated pupils in PA settings both inside and outside school (Ryan & Deci, 2017).

Firstly, we checked if the different levels of satisfaction of the three basic psychological needs are associated with pupils' PA levels in school, their motivation in PE, their emotions in PE and their well-being. Based on pupils' answers on measures of need satisfaction, the mean scores of the three basic psychological needs (autonomy, competence, relatedness) were computed. Then we divided the sample into three (3) groups: 1) Low satisfaction of the three basic needs: ≤ 3.22 (n = 3498), 2) Moderate satisfaction of the three basic needs: 3.23 to 3.82 (n = 3479), and 3) High satisfaction of the three basic needs: ≥ 3.83 (n = 3551).

After adjusted for age and gender, results showed that the higher the pupils' perception that their three basic psychosocial needs are satisfied in PE:

- the more physically active they are in school ($F_{2, 7572}$ = 187.424, p < .001),
- the more task oriented they are in PE ($F_{2, 10012}$ = 1568.674, p < .001),
- the stronger their intrinsic motivation in PE ($F_{2, 10110}$ = 2509.599, p < .001),
- the more positive emotions & enjoyment they have in PE ($F_{2, 10101}$ = 1951.083, p < .001),
- the less negative emotions they have in PE ($F_{2, 10083}$ = 697.135, p < .001), and
- the greater vitality and joy ($F_{2, 9908}$ = 886.272, p < .001) they feel in their life (Figure 4.12).

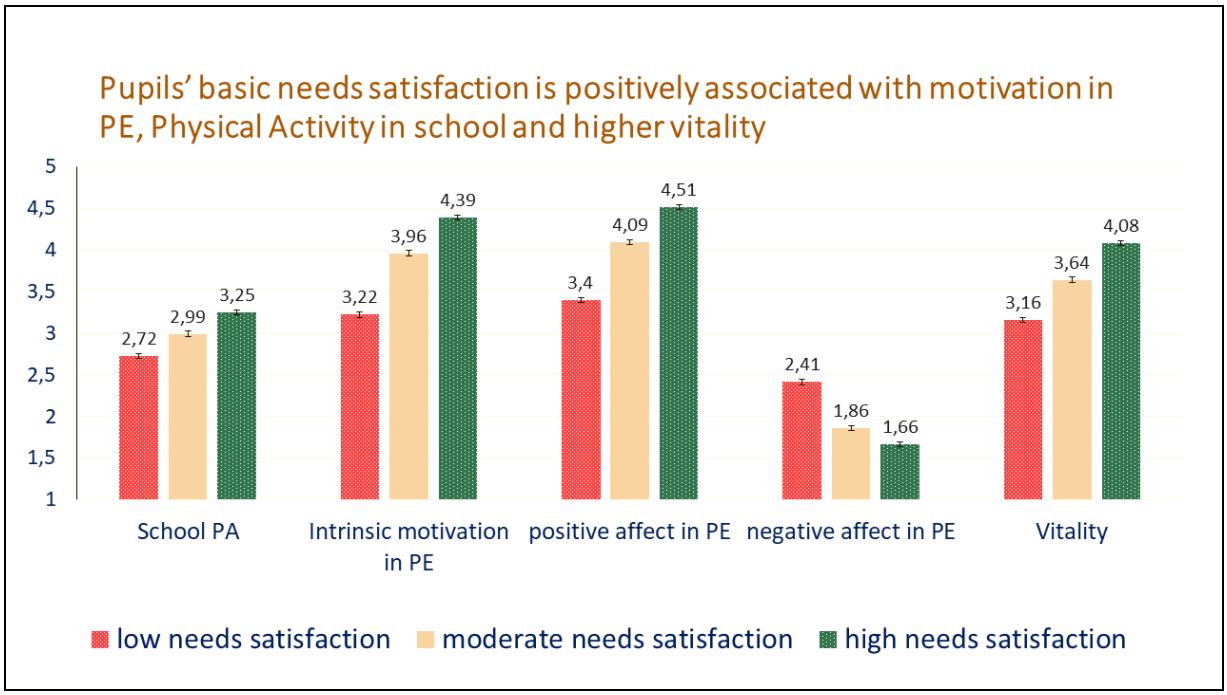


Figure 4.12. Significant differences in pupils' motivational variables in PE, in school PA and in vitality among pupils perceiving different levels of Basic Needs Satisfaction in PE (low, moderate, high)

Results from additional MANCOVAs adjusting for age and gender differences revealed that the more pupils perceive that their three basic psychosocial needs are satisfied:

- the higher their level of out-of-school PA ($F_{2, 10194} = 202.945$, $p < .001$) (Figure 4.13),
- the stronger their intention to do out of school PA ($F_{2, 9643} = 202.755$, $p < .001$),
- the more they believe that they CAN/ IT'S UP TO THEM to be physically active out of school ($F_{2, 9663} = 248.631$, $p < .001$),
- the more positive their attitudes towards PA ($F_{2, 9876} = 273.112$, $p < .001$),
- the more likely they are to monitor themselves how often they do out-of-school PA ($F_{2, 9852} = 477.026$, $p < .001$), and
- the more likely they are to develop specific plans (when/where/with who/how/how often) to do out-of-school physical activity ($F_{2, 9878} = 380.832$, $p < .001$).

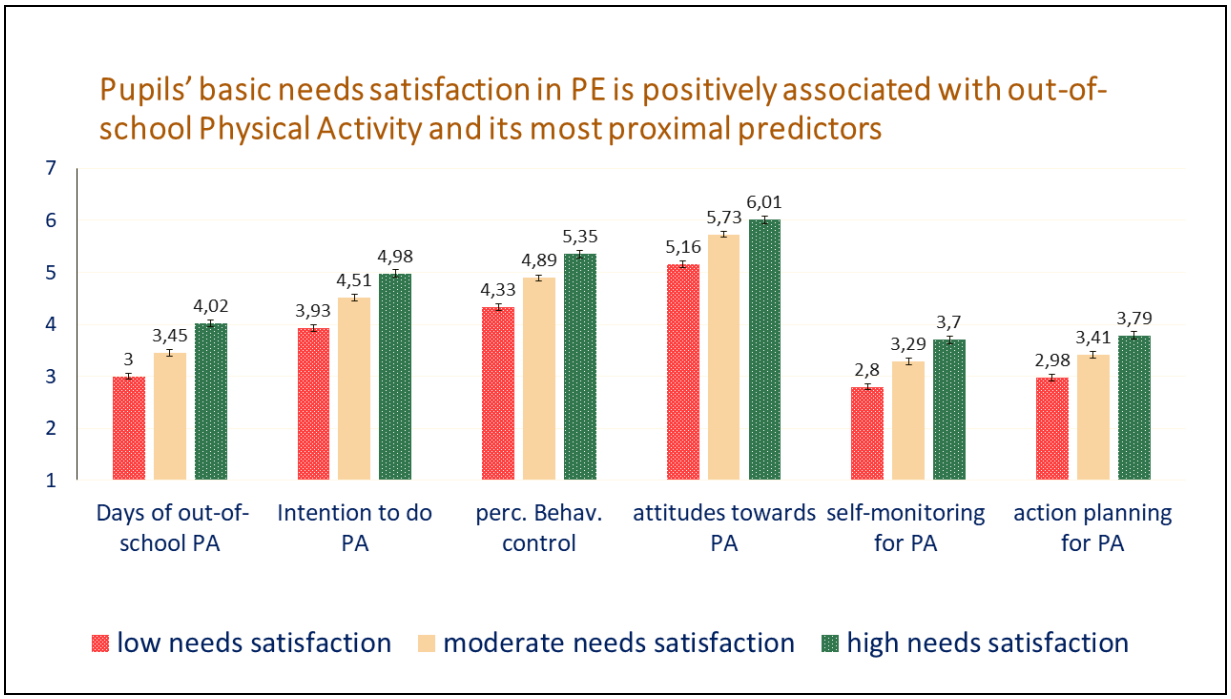


Figure 4.13. Significant differences in PA and proximal predictors of out-of-school PA among pupils perceiving different levels of Basic Needs' Satisfaction in PE (low, moderate, high)

Importance of Developing Self-Regulatory Skills for PA: Self-Monitoring and Action Planning

At the center of this project was self-monitoring and goal-setting for participation in PA. Accordingly, we investigated physical activity among pupils using more or less often self-monitoring strategies. We divided the sample into three (3) groups based on their answers on self-monitoring of their PA (Low self-monitoring: 0 to 2.75; Moderate self-monitoring: 2.76 to 4.00; High self-monitoring: 4.01 to 5.0).

Table 4.7. Number of pupils at different level of self-monitoring

Age	Low	Moderate	High	TOTAL
10	85	139	120	344
11	257	558	461	1276
12	235	359	252	846
13	313	367	227	907
14	479	520	316	1315
15	457	539	298	1294
16	364	349	191	904
17	234	215	128	577
18	94	74	48	216
Total	**2518**	**3120**	**2041**	**7679**

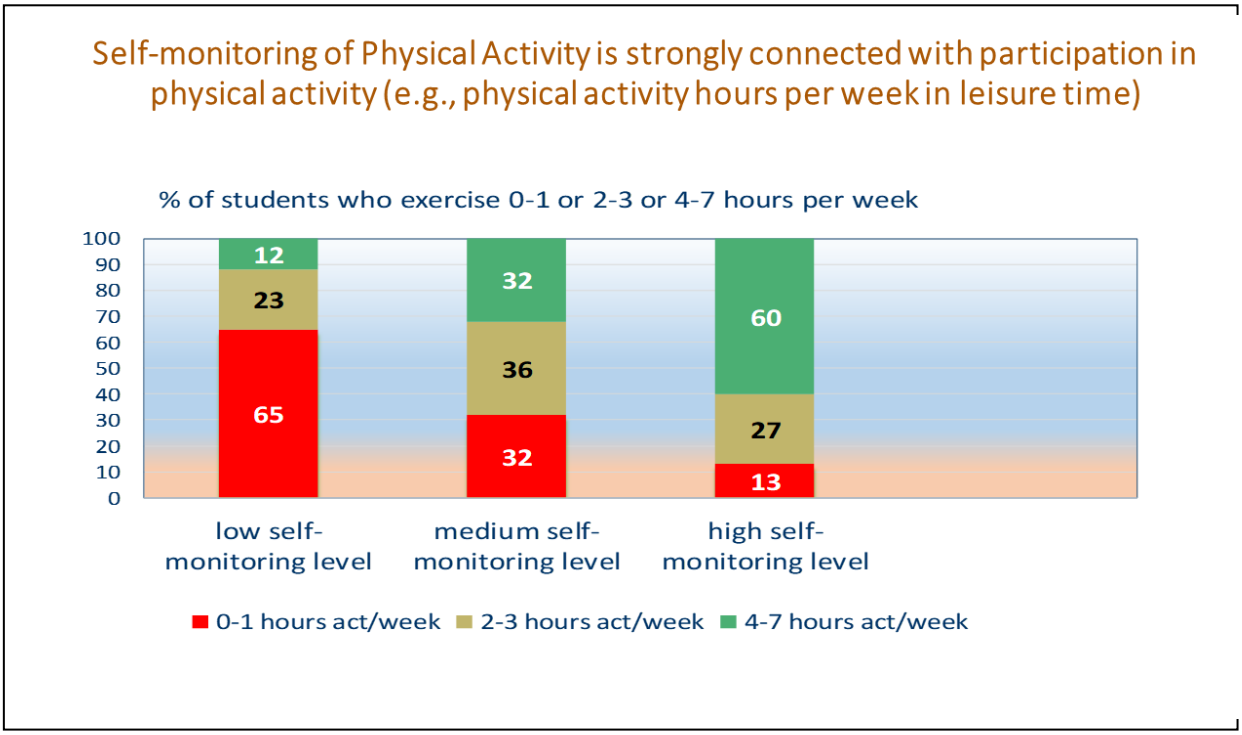


Figure 4.14. Percentages of pupils who are relatively active [4-7 hours of Moderate Vigorous Physical Activities (MVPA) per Week], rather inactive (2-3 hours of MVPA/week) or totally inactive (0-1 hours of MVPA/week) among pupils differing in self-monitoring

As shown in Figure 4.14, there were large differences in Moderate Vigorous Physical Activity in leisure time among pupils adopting different levels of self-monitoring. The majority (60%) of pupils adopting high levels of self-monitoring were physically active or rather active. On the contrary, the majority (65%) of pupils adopting low levels of self-monitoring were totally inactive. Pupils adopting moderate levels of self-monitoring were almost equally distributed across inactive, rather inactive and active/rather active groups.

Summary

- The majority of the pupils in the six European countries (FR, GR, IT, SP, TR, UK) are physically inactive, with one of every three pupils being almost totally inactive.
- Boys and younger age/primary school pupils were more physically active compared to girls, older age, secondary or high school pupils.
- Number of days of Physical Education (PE) per week was positively related to out-of-school PA, underscoring the importance of PE for pupils' PA and health.
- Lack of time and increased homework for school has been reported as the most important barriers for Physical Activity (PA) in most European countries but not so much in UK.
- Adjusting for country and age-group differences, large between-school differences in PA emerged, underscoring the importance of the IMPACT monitoring tool to policy makers who can use it to find out schools with high levels of inactivity and support them with specific policies.
- Family support and Socio-Economic Status (SES) emerged as important determinants of pupils' PA.
- Pupils' participation in out-of-school PA emerged as determinant of their PA in school and motivation in Physical Education (PE), underlining the need of schools and PE teachers to focus even further on physically inactive pupils and on the promotion of their PA.
- Boys and younger age/primary school pupils were also more motivated in PE classes, underlining the need to adapt the European PE curricular for girls and to start interventions for PA promotion in younger ages.
- The strongest correlates of extra-curricular PA were pupil's intentions for extra-curricular PA, perceived behavioral control, self-monitoring and action planning. The role of self-monitoring in the promotion of PA emerged as particularly important.
- PE teachers can directly affect pupils' intentions, perceived behavioral control, self-monitoring and action planning through implementation of goal-setting programs for PA promotion that also facilitate the development of pupils' self-regulation skills such as self-monitoring and action planning.
- Still, pupils' adoption of goal-setting programs for out-of-school PA is less likely to sustain if pupils are not intrinsically motivated in PA and do not enjoy PA. The implementation of these goal-setting programs should take place within a positive motivational climate in PE.
- Indeed, a positive motivational climate in PE consisted of high mastery climate in PE and satisfaction of pupils' basic needs for autonomy, competence and relatedness emerged as very important for the cultivation of intentions for extra-curricular PA, perceived behavioral control, self-monitoring and action planning and PA.
- Mastery climate in PE and satisfaction of pupils' basic needs also explained large amount of variance of pupils' PA, well-being and motivation in PE, e.g., intrinsic motivation in PE, positive and negative affect in PE and vitality, while they also emerged as distal predictors of extra-curricular PA.
- These findings reinforce the importance of PE teachers' training with regard to how to increase mastery climate and satisfy pupils' basic needs alongside their training to adopt goal-setting programs for out-of-school PA.

CHAPTER 5. THE ROLE OF PHYSICAL EDUCATION IN PROMOTION OF PHYSICAL ACTIVITY: A GOOD CASE EXAMPLE

The IMPACT Intervention

To investigate whether the IMPACT model is effective to promote youth PA through PE, IMPACT researchers developed **educational material and webinars**. The aim was to train and help PE teachers to increase their effectiveness with regard to promotion of students' motivation and physical activity, especially for those who need it mostly. The webinars were developed in English, French, Greek, Italian and Turkish and were delivered to PE teachers of four countries: France, Greece, Italy and Turkey.

The educational material content was developed based on the various theories that were used to develop the IMPACT project model. Specifically, we used trans-contextual models for PA promotion through PE (Standage et al., 2003; Hagger et al., 2003; Papaioannou et al., 2004) that incorporated primarily Achievement Goals Theory (AGT) (Ames, 1992; Nicholls, 1989) and Self-Determination Theory (SDT) (Ryan & Deci, 2017) to increase pupils' motivation in PE and PA settings (Duda, 2013; Papaioannou 1995), and social cognitive models including Theory of Planned Behavior (TPB) (Ajzen, 1991) and self-regulation models and behavior change techniques (Abraham, & Michie, 2008; Lock & Latham, 2006) aimed at the increase of PA (Carraro & Gaudreau, 2013; McEwan et al., 2016; Olander et al., 2013).

In total, **five webinars** were developed and delivered to PE teachers. Researchers also included a **sixth webinar** between webinars 4 and 5 in order to discuss with PE teachers various issues related to the application of the IMPACT project in schools. The webinars were delivered through the Big Blue Button platform that enables participants' interaction. The development of the educational material was an arduous and long process and lasted one year. Researchers adopted the following strategies in order to ensure that webinars' content will respond to PE teachers' needs and abilities: a) Visiting to schools and having formal conversations with PE teachers in the four countries took place (i.e. Greece, Turkey, Italy, and France) b) Literature review and adoption of effective intervention strategies that previous studies reported, and c) Organizing a significant number of online and in-person meetings where researchers based on the information gathered from the previous stages, the theoretical background used for the development of the program and the suggestion of the representatives of PE teachers' associations (e.g., EUPEA, CAPDI) and Ministries (i.e. Greek Ministry of Education and Turkish Ministry of Education) was discussed and decided on the structure and content of each of the five webinars.

All webinars had the following structure: a) Introduction (a brief introduction to the topic or problem), b) Explanation of the theory (fundamental principles without extending to theory analysis), c) Presentation of ideas how the theory can be converted into practice, d) Examples of best practices (included PE teachers' ideas and suggestions), and e) Discussion with PE teachers (recommendations, questions, etc.) and guidelines for the activities that teachers should follow during the implementation of the program.

Researchers developed the Webinars by allocating limited time for lecturing. On the contrary, (a) they included videos in which pupils demonstrate examples of applied theory to practice (e.g. a video with an example that students set goals by using S.M.A.R.T. acronym), (b) they prompted PE teachers to make suggestions for a topic or exchange opinions about a specific topic by forming groups in chat rooms, and (c) they included multiple-choice questions (quiz or gallop, etc.) that PE teachers should answer.

The content of the five webinars

Webinar 1 included information about the purpose and the structure of the IMPACT. Additionally, participants were informed of the importance of daily physical activity and the role of physical education in the promotion of students' physical activity. The main aim of this webinar was to raise PE teachers' awareness of the limited time students spent in physical activities. An additional goal was to provide PE teachers with useful information that they would use in order to increase pupils' awareness of the benefits of

physical activity to their health and the recommendations of the World Health Organization about at least one hour of vigorous-moderate intensity PA daily.

Webinar 2 included useful information that would help PE teachers to increase students' enjoyment and motivation in PE. Additionally, PE teachers were informed about the key-concepts of achievement goals theory and self-determination theory. Finally, they have become key stakeholders in strategies that promoting positive motivational climate and increase students' motivation in PE.

Webinar 3 included useful information for promoting students' motivation to participate in out of school physical activities by implementing self-regulated strategies (e.g. goal setting, self-monitoring, self-assessment). An emphasis was given to apply these strategies in an autonomous-oriented way.

Webinar 4 included the "Athlos" or "Team Pentathlon" program. This program was adopted in order to urge students to participate in out of school physical activity. The program lasted for nine weeks. PE teachers were asked to act as facilitators by helping students to apply during the implementation of the "Athlos"/"Team Pentathlon" program the information and strategies related to motivation and self-regulation that they had previously been taught. Students had to form teams and then to set personal and team goals for increasing physical activity by using strategies such as planning, evaluation, recording, and evaluation.

The aim of **webinar 5** was to promote teachers' self-reflection concerning the application of the IMPACT intervention through information about the findings of the IMPACT project. Additionally, PE teachers were informed about the ESTIMATE network. Furthermore, strategies and procedures regarding the establishment of the ESTIMATE Coordinating Committee and the development and sustainability of this network were discussed among participants. Finally, PE teachers were invited to express their experiences with the program, their suggestion, and the evaluation of the program.

Between webinars 4 and 5 a **sixth webinar** with the PE teachers was also delivered to allow discussion between researchers and PE teachers concerning the application of the Athlos/Pentathlon program and to clarify issues that emerged during the implementation of the Athlos/Pentathlon program.

IMPACT project forum

An online forum was developed in the IMPACT website to facilitate discussion between PE teachers and exchange ideas.

Trained PE teachers and delivery of webinars

The webinars were delivered to **189 in-service PE teachers** in four countries (France, *n* = 27; Greece, *n* = 68; Italy, *n* = 31; and Turkey, *n* = 63). The duration of each of the five webinars was approximately 120 minutes. Members of the research team delivered the webinars in each of the four countries. The webinars in each country were recorded through the BigBlueButton platform and the material is available at IMPACT project's website.

The IMPACT webinars, teacher educational material and forum can be found at the IMPACT Project website (www.impactpe.eu/site/index.php/en/about/webinars).

Pupils participating in IMPACT project intervention

Participants in Time 2 (T2) measurement (May 2019) were 4169 pupils, aged 10 to 18 years old (*M*age: 13.55 ± 1.99 years old) from 4 European countries (FR, GR, IT, TR; Table 37) where the IMPACT intervention program was implemented. These pupils had also participated in Time 1 (T1; October 2018) measurement (matched cases). Regarding their gender, 1933 were boys and 2201 were girls (one pupil reported "other" and 31 did not report their gender). Pupils' sample was randomly divided into two intervention groups: 1) the

experimental group consisted of pupils (***n* = 2688**) whose PE teachers took part at the 5 online webinars in the academic year 2018-2019 and tried to implement the principles of IMPACT project during this period of 5 months and b) the **control group** consisted of pupils (*n* = 1481) whose PE teachers did not receive any training in the academic year 2018-2019 and continued to implement their regular teaching program. The cross-tabulations between pupils' gender and educational level with intervention groups are presented below in Tables 5.1, 5.2 and 5.3 respectively.

Research Ethics

All PE teachers participating in the control group received the IMPACT project training one year after the training of PE teachers in the experimental group, i.e., in the academic year 2019-2020.

All measurements and the application of the impact project were conducted following approval of the methodology from ethics committees of all implicating educational authorities, schools and universities. All pupils and parents provided written consent for their participation in the project. Several PE teachers who attended the webinars in the academic year 2018-2019 did not provide written consent from parents for Time 2 measurement and therefore their pupils did not reply to Time 2 measurements. The majority of the French pupils did not deliver this consent, thus reducing considerably the sample size from France.

Table 5.1. Cross-tabulation between country and intervention groups in T2 measure

	Experimental group		Control group		Total	
	Teachers	**Pupils**	**Teachers**	**Pupils**	**Teachers**	**Pupils**
France	14	149	9	112	23	261
Greece	56	1290	23	598	79	1888
Italy	23	517	21	487	44	1004
Turkey	24	732	12	284	36	1016
Total	117	2688	65	1481	182	4169

Table 5.2. Cross-tabulation between pupils' gender and intervention groups in T2 measure

	Intervention groups		
	Experimental group	**Control group**	**Total**
Boys	1253	680	1933
Girls	1416	785	2201
Other	2	2	4
Total	2671	1467	4138

Notes. Thirty-one (*n* = 31) did not report their gender

Table 5.3. Cross-tabulation between pupils' age/educational level and condition in T2 measure

	Experimental group	**Control group**	**Total**
Primary school (age 11-12)	491	360	851
Secondary school (age 13-15)	1152	440	1592
High school (age 16-17)	1038	672	1710
Total	2681	1472	4153

Notes. Sixteen pupils (*n* = 16) did not report their educational level

Intervention Effects: Preliminary findings

Results from 2x2 repeated measures analyses of variance revealed that **experimental group pupils** (whose PE teachers had been trained through online IMPACT project webinars) **increased from T1 (October 2018) to T2 (May 2019) their out-of-school PA** compared to control group pupils (whose PE teachers had not received any training) (Figure 5.1). Regarding the pre-intervention measure (T1), there were no significant differences in out of school PA, e.g., in the PACE+ measure between experimental and control group pupils: $F_{1,3980} = 2.365$, $p = .124$; on the other hand, there were significant differences in pupils' out of school PA between experimental and control group only at the post-intervention measure, e.g., in the PACE+ measure T2; $F_{1,3980} = 52.497$, $p = .001$.

Experimental group pupils reported higher levels of PA after IMPACT intervention compared to control group pupils. Findings shown in Figure 5.1 imply that the average days of PA in the total intervention group increased by approximately 0.3 days per week, while there was no increase in PA in control group.

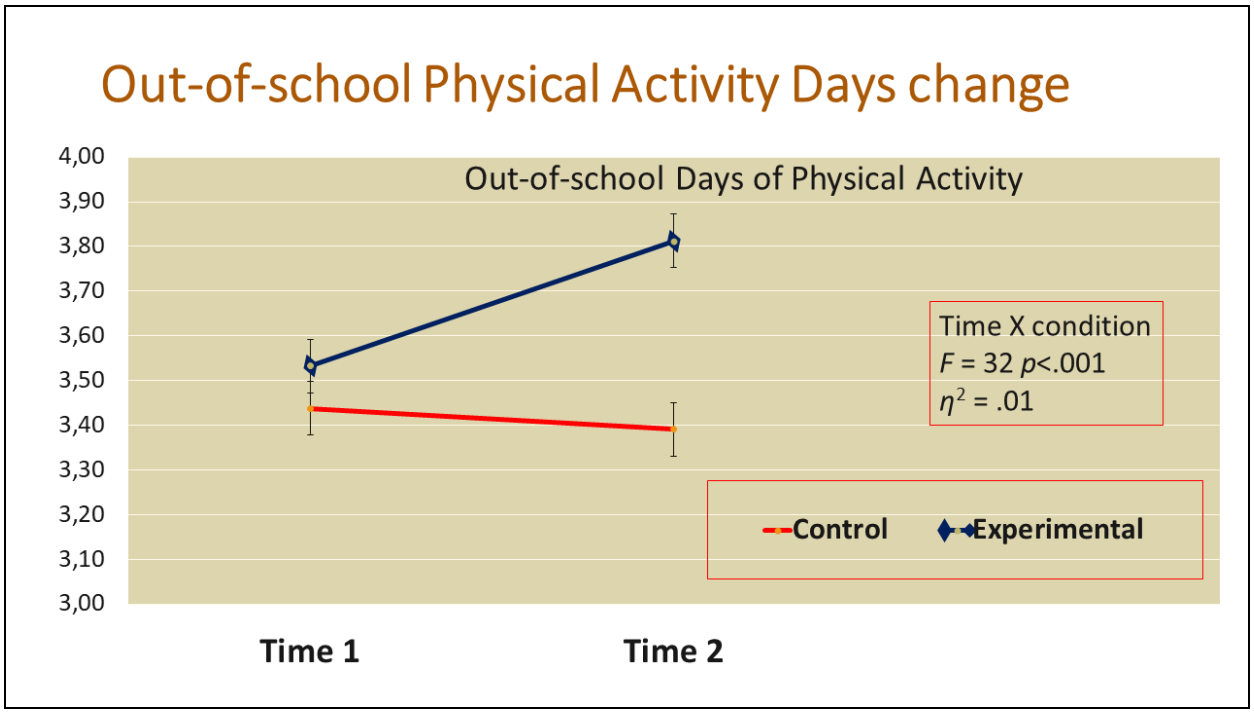


Figure 5.1. Effects of IMPACT project intervention on days of physical activity per week (PACE+ measure)

Intervention effects for students participating in goal-setting program or not

A key-feature of the IMPACT project program was promotion of self-monitoring and goal-setting for out-of-school PA. We did not expect that all PE teachers in intervention groups would implement the goal-setting program to promote out-of-school PA, because this is relatively new strategy for most teachers who had not been previously trained to adopt health-related PE curricula and might face several personal or external barriers to adopt rapid changes in their teaching. Without goal-setting pupils miss the opportunity to use both goal-setting and self-monitoring of their PA. Even if pupils apply self-monitoring, it is useless when it is not accompanied by deliberate goal-setting to improve levels of PA.

To capture the effects of goal-setting adoption on physical activity and its motivational determinants, in Time 2 pupils had indicated in T2 measure how often they participated in classes adopting self-monitoring which is requirement for goal-setting, and in classes requiring to set measurable goals to increase PA. Accordingly, they replied to the following items: "During the last 2 months, how many times has your PE

teacher asked you to observe and record how often you did physical activity outside of school?", and "Over the past 2 months, how many times has your PE teacher asked you to set measurable goals to improve your physical activity outside of school?". Responses were given on 5-point scales (1= never; 2 = 1-2 times; 3 = 3-4 times; 4 = 5-6 times; 5 = 7 or more than 7 times). Based on pupils' answers, we divided the sample in the four groups shown in Table 5.4. That is, we classified students in groups including students who participated at least 1-2 times in self-monitoring and goal-setting programs (Mean score to the above items >= 2) and groups of students who did not (Mean score to the above items < 2). Missing cases either in reports of PA, or in the aforementioned scales precluded classification of 269 pupils from the total sample.

About 27% of students (N = 690) in experimental groups reported that their PE teacher had not applied goal-setting program to promote PA in their classes. Interestingly, about 46% of the students in control groups (N = 633) reported that their PE teacher implemented goal-setting programs to promote PA, suggesting that goal-setting to promote PA is a known strategy to several PE teachers who teach their pupils to adopt it. Good for the present intervention is the finding that among the four groups shown in Table 5.4, the largest one is **the experimental and goal-setting group comprising 47% of adolescents of the total sample (N = 1832),** implying that the majority of PE teachers who received the IMPACT project training applied the goal-setting program in their classes.

Then we conducted 2 (time) x 2 (condition-group) repeated measures Analyses of Variance using physical activity and its determinants as dependent variables.

Table 5.4. Classification of pupils into four groups according to their participation in goal-setting program to promote Physical Activity

	Mean score in goal-setting & self-monitoring items	Condition - 4 groups				Total
		Control NO monitoring/ goal-setting	Control YES monitoring/ goal-setting	Experimental NO monitoring/ goal-setting	Experimental YES monitoring/ goal-setting	
Frequency of participation in goal-setting program	1.00	566	0	427	0	993
	1.50	179	0	263	0	442
	2.00	0	271	0	417	688
	2.50	0	95	0	206	301
	3.00	0	136	0	358	494
	3.50	0	44	0	179	223
	4.00	0	31	0	236	267
	4.50	0	15	0	98	113
	5.00	0	41	0	338	349
Total		**745**	**633**	**690**	**1832**	**3900**

Effects of intervention on physical activity

- Adolescents in **Experimental and goal-setting groups** reported **higher increase from T1 to T2** in reported **days of Physical Activity**, in comparison to other groups (Figures 5.2 & 5.3). These findings imply that **the IMPACT project and the content of webinars were effective in terms of promoting European adolescents' physical activity**.
- Adolescents in the **control group** whose teachers implemented **goal-setting** had **no significant change** in physical activity from T1 to T2, indicating that goal-setting is necessary but not enough if it is not accompanied by strategies to increase pupils' motivation.

- Physical activity of adolescents in **control and no-goal setting** program **decreased from T1 to T2**, due to developmental effects when no particular intervention takes place.
- **No increase but neither decrease** in physical activity emerged for **experimental group** pupils whose teachers **did not apply goal-setting** programs, implying that strategies to increase pupils' motivation might act as a buffer for the decrease of adolescents' physical activity, but they are not enough if they are not accompanied by goal-setting programs to promote out of school physical activity.
- Regarding **physically active days per week in out of school PA**: in the **experimental and goal setting group** the percentage of **relatively active pupils increased by 7%,** while the percentage of **very inactive pupils decreased by 11%** (Figure 5.3).
- Regarding **hours per week in out of school PA**, in the **experimental and goal setting group,** the percentage of **very active pupils increased by 7.5%** while the percentage of **inactive pupils decreased by 7.3%** (Figure 5.4).
- On the other hand, in the control/no goal-setting group there was a 5% increase of very inactive pupils (days/ week).

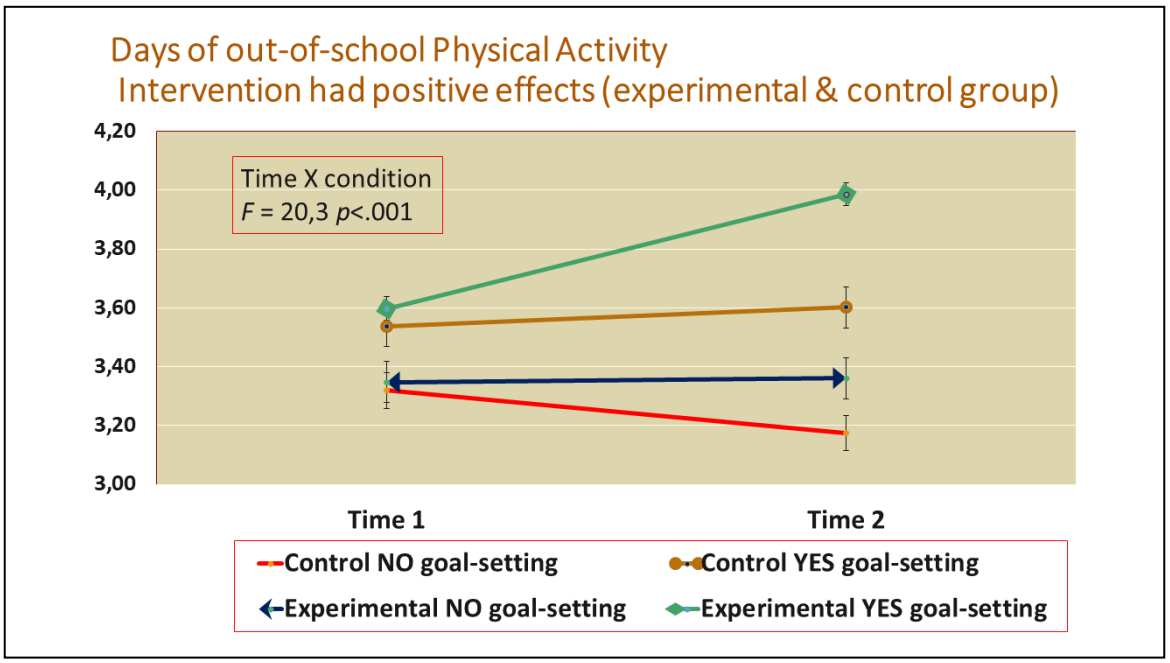


Figure 5.2. Effects of IMPACT project intervention on days of out-of-school Physical Activity per week. Vertical lines indicate Standard Errors at 95% levels of confidence.

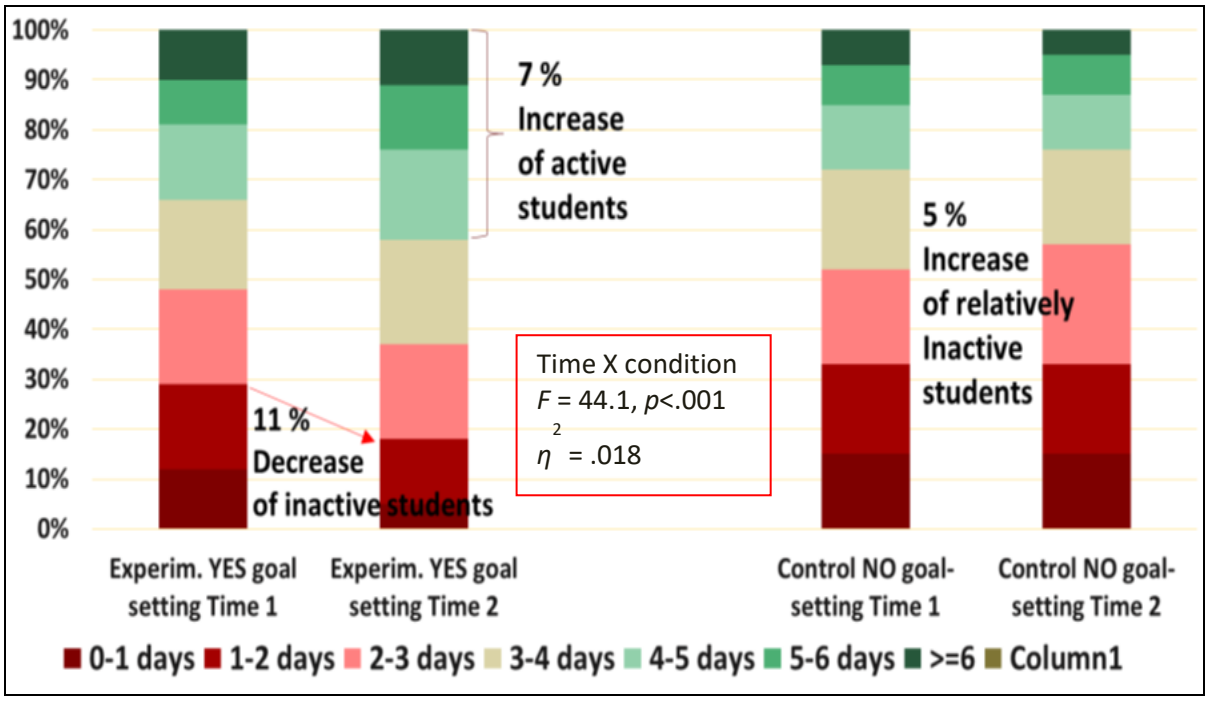


Figure 5.3. Effects of IMPACT project intervention on days of out-of-school Physical Activity per week

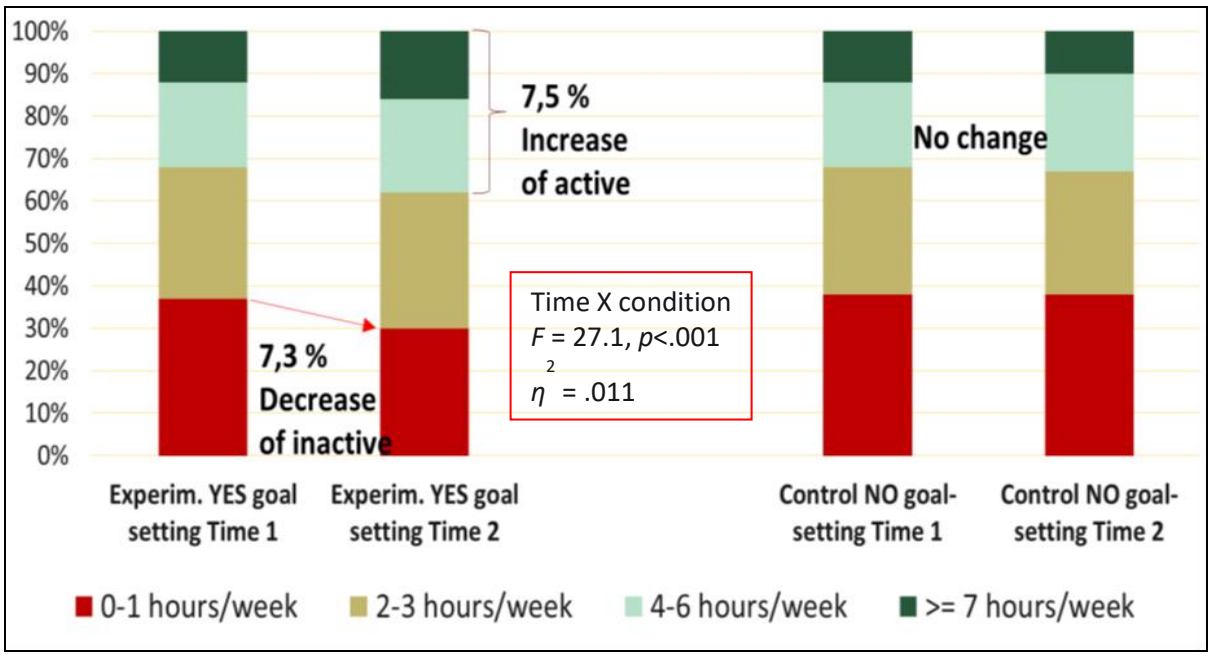


Figure 5.4. Effects of IMPACT project intervention on hours of out-of-school Physical Activity per week

Effects of intervention on self-monitoring and action planning

Results reported in main study imply (Chapter 4) that it is important to teach adolescents to use self-monitoring and goal-setting/planning for PA. Findings from IMPACT project intervention imply that **only experimental and goal-setting group pupils increased substantially the adoption of self-monitoring strategies from T1 to T2** (Figure 5.5). Pupils who reported that their PE teachers did not apply goal-setting programs, either in experimental or goal control groups, slightly decreased self-monitoring from T1 to T2, indicating that the use of goal-setting programs is necessary to promote the adoption of self-monitoring strategies from adolescents. Pupils in control and goal-setting groups slightly increased their self-monitoring strategies from T1 to T2, but less likely than pupils in experimental and goal-setting groups. This finding implies that the emphasis on personal progress, mastery climate and all motivational strategies adopted in the IMPACT project are also necessary to boost adolescents' self-monitoring.

Similar results emerged with regard to the adoption of action planning strategies. Again the adoption of goal-setting programs had significant positive effects on action planning for students either in experimental or control groups, but the positive effects were significant and more pronounced in experimental groups (Figure 5.6). This also underlines that goal-setting programs are not enough to promote self-regulatory skills such as self-monitoring and action planning, if they are not accompanied by strategies emphasizing personal progress within a positive motivational climate supporting and motivating all pupils to progress.

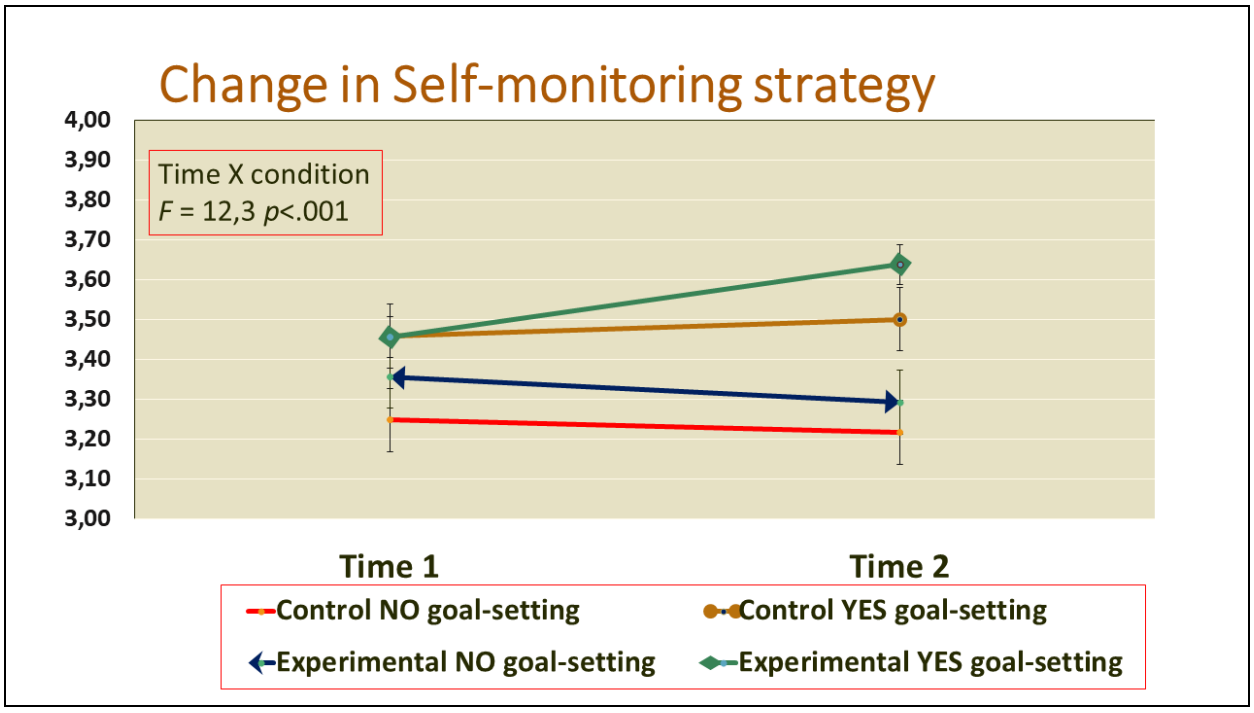


Figure 5.5. Effects of IMPACT intervention on Self-monitoring strategy. Vertical lines indicate Standard Errors at 95% levels of confidence.

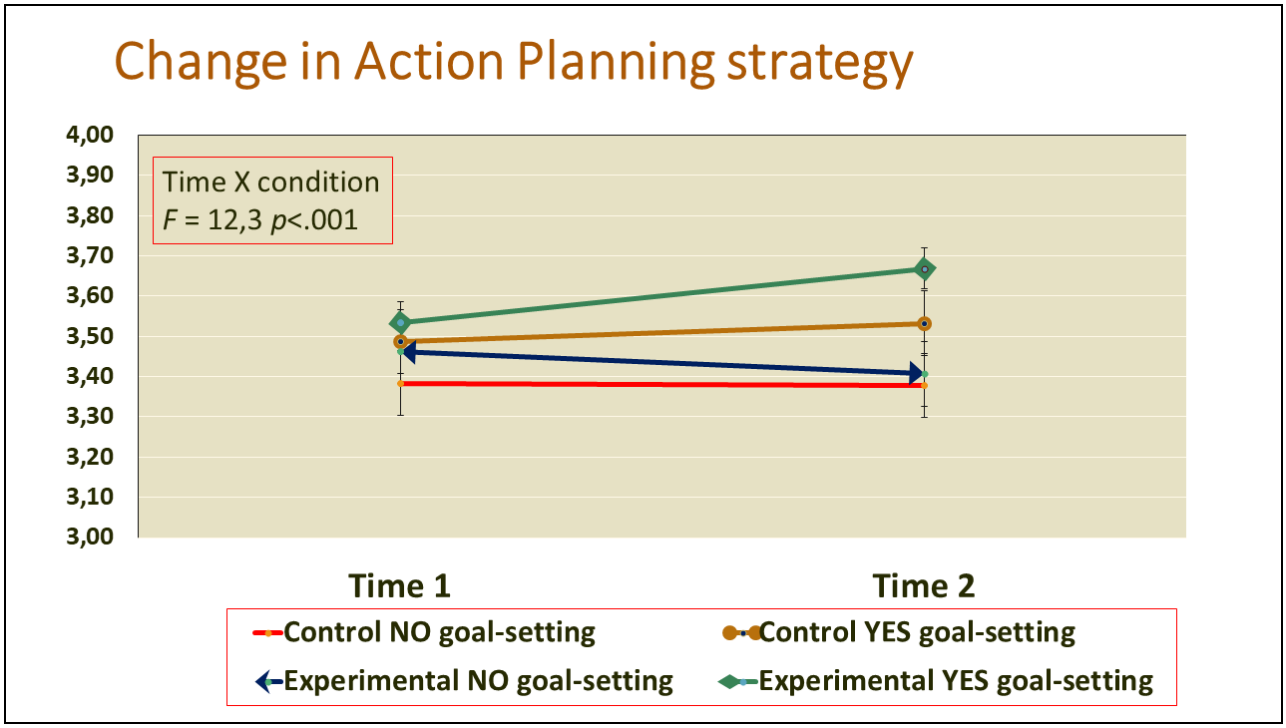


Figure 5.6. Effects of IMPACT intervention on Action Planning strategy

Effects of intervention on mastery climate and needs satisfaction

The results shown in Figure 5.7 imply that the IMPACT project intervention and goal-setting programs in particular acted as a buffer to inhibit the decrease of mastery climate that emerged in groups where no goal-setting program was applied. The adoption of goal-setting programs helps pupils to monitor their progress and reinforce their belief that through effort and adoption of measurable challenging goals they can become more physically active, which is important to their health. On the other hand, not adoption of goal-setting programs in PE decrease pupils' perception that PE is mastery-oriented and participation in this kind of PE classes does not help them to progress.

As shown in Figure 5.8, from T1 to T2 pupils in goal-setting programs also increased their scores on perceived autonomy need satisfaction. When pupils are allowed to set their own goals, they perceive that they have autonomy is supported. Interestingly, while there was also a slight increase of autonomy support in experimental and no goal-setting group, perception of autonomy support slightly decreased in control and no goal setting group. Taking into consideration that the higher increase from T1 to T2 in autonomy support emerged in experimental and goal-setting group, these findings imply that PE teachers receiving the webinars managed to implement some strategies focused on support of pupils' autonomy.

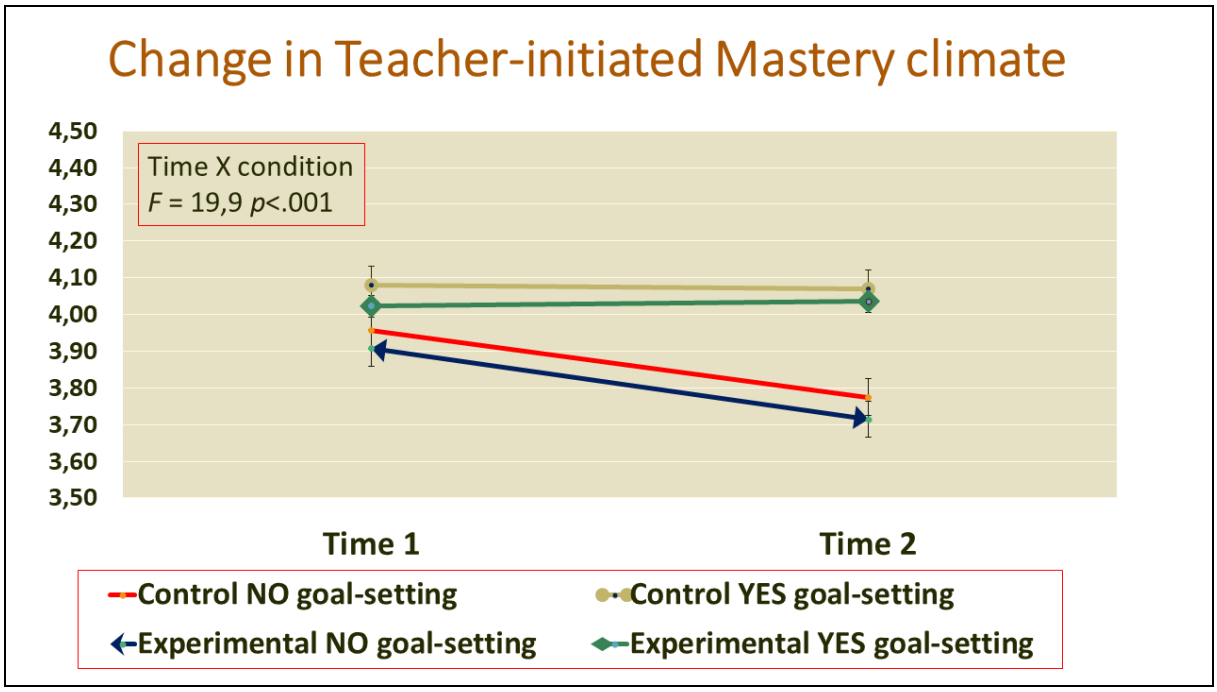


Figure 5.7. Effects of IMPACT intervention on Teacher-initiated Mastery Climate

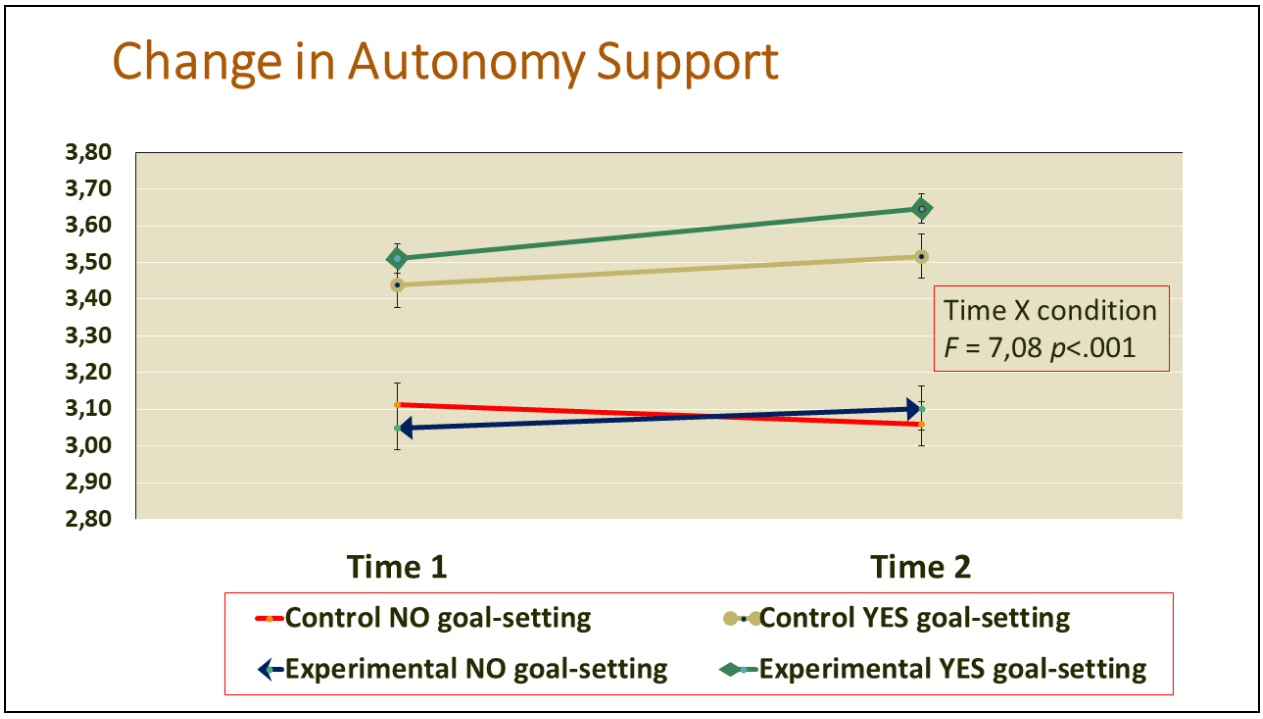


Figure 5.8. Effects of IMPACT intervention on Autonomy support

Summary

Educational material for five 120-minute webinars was developed and delivered concurrently online across four European countries, training **189 PE teachers** who applied the IMPACT project guidelines to their adolescent pupils. Matched responses to Time 1 and Time 2 measurements from 4169 pupils (*n* = 2688 experimental, *n* = 1481 control) revealed that:

- T**he IMPACT project training was effective in terms of promoting European adolescents' Physical Activity (PA)**.
- The effects of the IMPACT project intervention on adolescents' PA were evident when the trained PE teachers applied the goal-setting program for PA promotion.
- The application of goal-setting programs from PE teachers who were not trained to apply IMPACT project motivational principles, did not promote PA. Goal-setting alone is not enough to promote PA if it is not accompanied by the application of motivational principles.
- The IMPACT project intervention was particularly effective for physically inactive pupils, i.e., those who mostly need PA.
- The IMPACT project intervention was particularly effective for the promotion of self-monitoring and action planning, but also for the maintenance of a positive motivational climate in PE.

CHAPTER 6. OBJECTIVE MEASUREMENT OF PHYSICAL ACTIVITY

Measurement of Pupils' Physical Activity levels with Accelerometers: Aims and Method

To complement Physical Activity (PA) findings stemming from self-reports with objective measures of PA, across three countries, from the larger sample of pupils participating in T1 and T2 measurements of the main study, a random sample of pupils was selected to assess their PA through accelerometers. The aim was to investigate:

- Overall levels of youth physical activity assessed through objective measures
- Age and gender differences in objective measures of physical activity
- Possible differences between experimental and control group pupils due to the implementation of the IMPACT Project Intervention.

Two measures were conducted in 3 European countries (France, Greece, and Italy). Time 1 (T1) accelerometer measure took place between October-November 2018, while the T2 accelerometer measure was conducted between March-April 2019.

Table 6.1. Participants in each Country at T1 and T2 Accelerometer Measures

	T1 Measure		T2 Measure	
Countries	***N***	**%**	***N***	**%**
France	60	31.9	37	28.5
Greece	75	39.9	56	43.1
Italy	53	28.2	37	28.5
Total	**188**	**100**	**130**	**100**

Table 6.2. Male and female pupils at T1 and T2 Accelerometer Measures

	T1 Measure		T2 Measure	
Countries	***N***	**%**	***N***	**%**
Boys	74	39.4	51	39.2
Girls	114	60.6	79	60.8
Total	**188**	**100**	**130**	**100**

Table 6.3. Participants' school grades at T1 and T2 Accelerometer Measures

	T1 Measure		T2 Measure	
Countries	***N***	**%**	***N***	**%**
Primary school	37	19.7	30	23.1
Secondary school	82	43.6	52	40
High school/ College	69	36.7	48	36.9
Total	**188**	**100**	**130**	**100**

Participants wore an accelerometer for seven consecutive days (GT3X+ Actigraph) at their waist. A 15-second epoch, Evenson equation to calculate pupils' PA cut-points (Sedentary Time: <100 counts per minute (cpm); Light PA: 100 - 2295 cpm; Moderate PA: 2296 - 4011 cpm; Vigorous PA: ≥ 4012 cpm and MVPA: ≥ 2296 cpm), and a minimum of three valid days with 8 hours of wear time per day were used to accurately monitor PA intensities (e.g., Evenson et al., 2008; Fenton et al., 2016; Kim et al., 2012; Trost et al., 2011). Participants were excluded from subsequent analyses for failing to meet the above wearing time criteria. Pupils'

anthropometric characteristics (height and weight) were also measured to the nearest point (0.1 cm and 0.1 kg respectively) using a balance and a portable stadiometer.

During anthropometric measures, participants wore light clothes and no shoes. Body Mass Index (BMI) was calculated using the equation of weight (kg) / height $(m)^2$. Pupils were classified as normal BMI, overweight or obese based on the International Obesity Task Force (IOTF) cut-off points for BMI (Cole et al., 2000). Accelerometer data were analyzed using the Actilife Software (versions 5 or 6; Actigraph, Pensacola, FL). All statistical analyses were conducted with PASW Software version 18.0. The *p*-value was set at .05. Means and standard deviations of pupils' objectively measured PA levels are presented in Table 32.

Pupils' objective Physical Activity: Results

The majority of pupils (87.2%) in the three countries did not fulfill daily step-recommendations (Tudor-Locke et al., 2011; Figure 6.1).

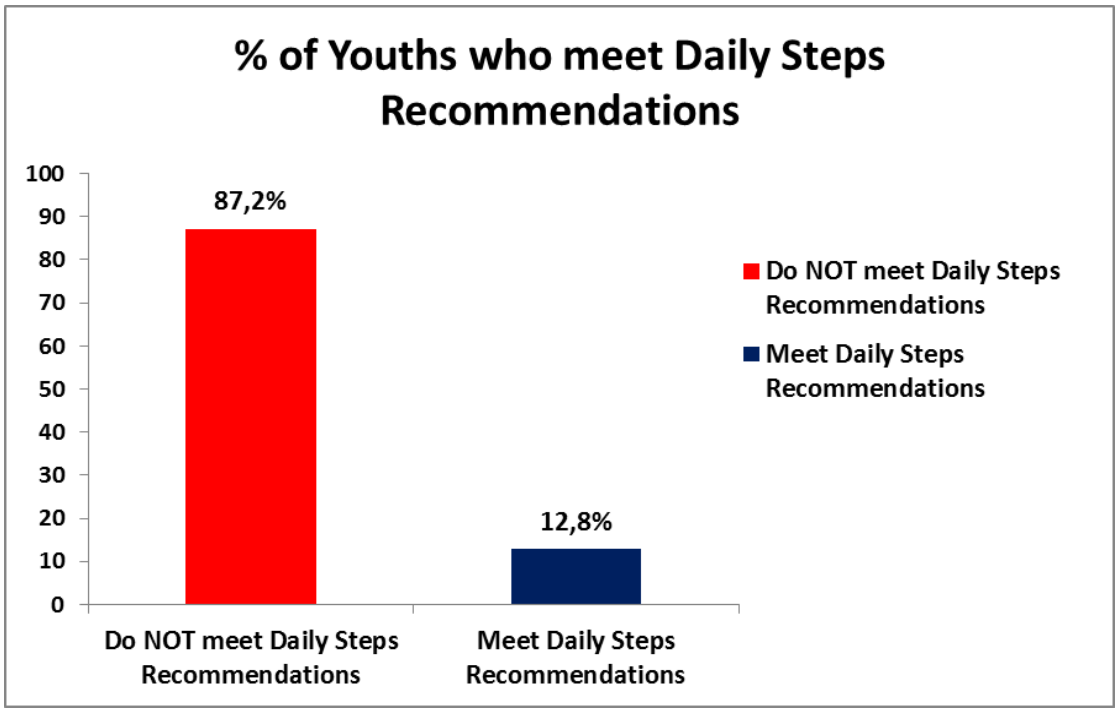


Figure 6.1. Percentage (%) of youths who meet daily steps recommendations

When findings were examined in relation to World Health Organization's (WHO) guidelines, the results revealed that only one boy (0.5%) met the 2010 WHO's recommendation for 60 minutes of moderate to vigorous PA (MVPA) daily. Unfortunately, 26.1% of the pupils never exceeded the threshold of 60 minutes of daily PA while more than half of the pupils (54.3%) were very inactive, that is, they were doing 0-1 days of at least 60 minutes MVPA per week; Figure 6.2). Just 14.9% of pupils were doing 4-6 days MVPA above the 60 minutes threshold in a specific day. Thus, these findings also confirm that the majority of adolescents from these European countries do not meet the minimum amount of MVPA recommended by WHO and other health authorities.

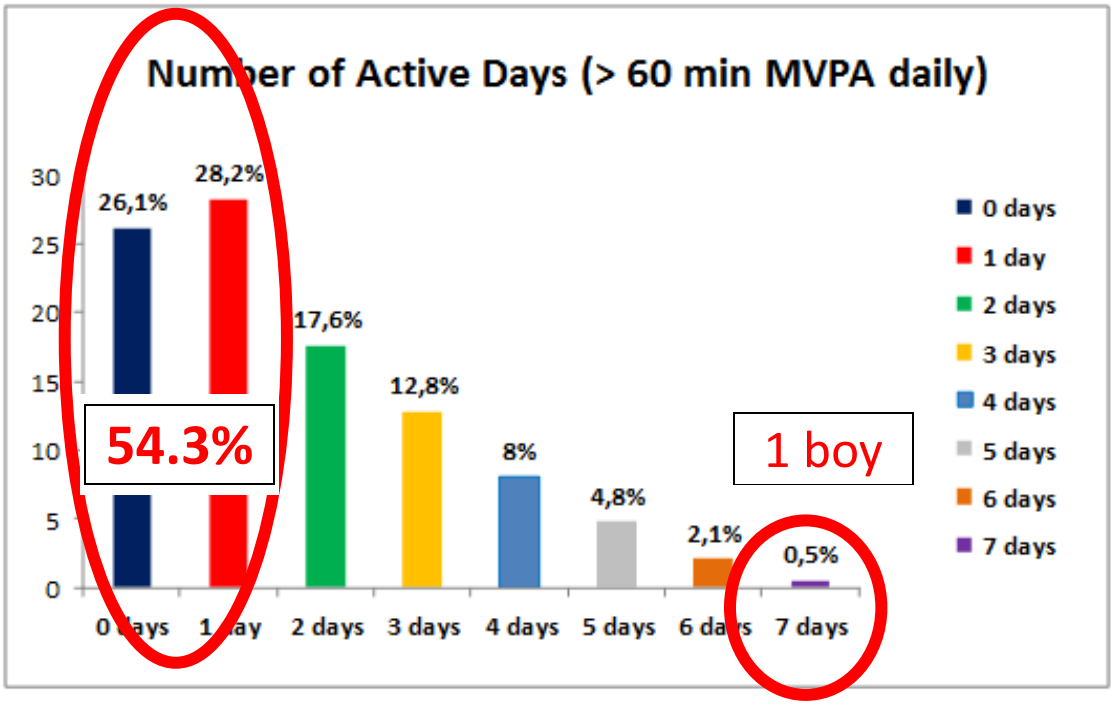


Figure 6.2. Percentage (%) of pupils who meet PA recommendations for 60 minutes of Moderate to Vigorous PA (MVPA) per day

Moreover, 17.6% of pupils were classified as overweight or obese (Figure 6.3).

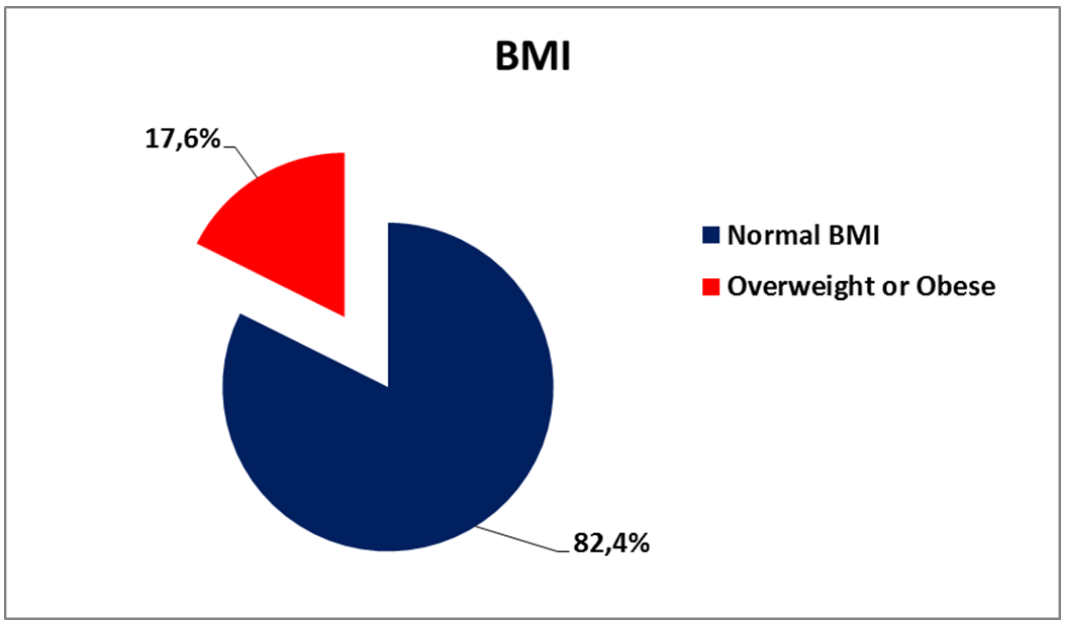


Figure 6.3. Participants Body Mass Index (BMI)

Gender differences in objective measures of Physical Activity

Results showed that boys (M = 55.54 ± 19.53) had higher levels of Moderate to Vigorous PA (MVPA) compared to girls (M = 42.03 ± 16.54) (t_{186} = 5.092, p < .001; Figure 6.4).

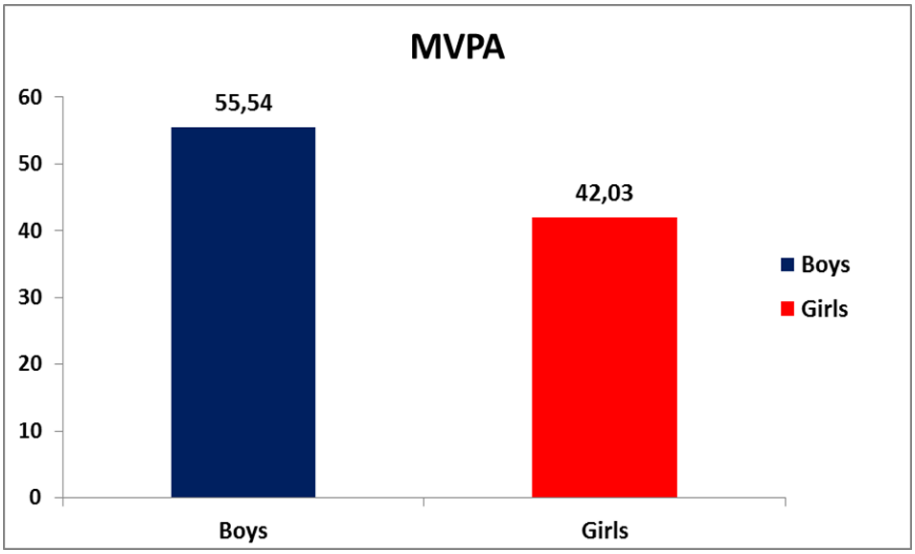


Figure 6.4. Differences in MVPA between boys and girls

Age differences in objective measures of Physical Activity

Primary school pupils (children; M = 59.22 ± 22.41) had higher levels of MVPA compared to secondary (M = 42.24 ± 17.05) and high school pupils (adolescents; M = 47.05 ± 16.25) ($F_{2,186}$ = 11,435, p < .001; Figure 6.5). The findings of the present study are in line with previous research in the area of youths' PA assessment (e.g., Van Hecke et al., 2016).

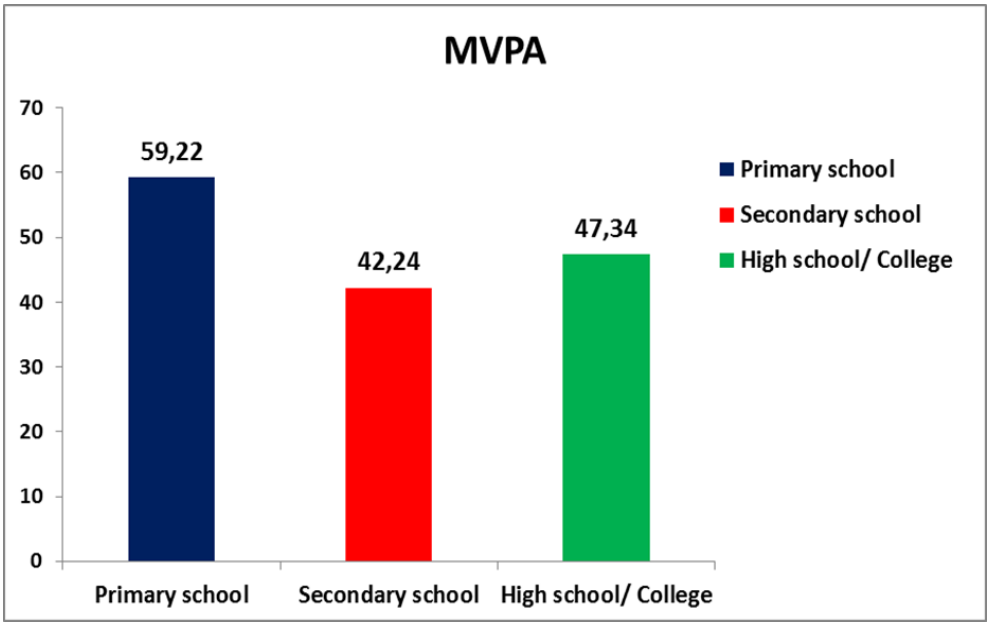


Figure 6.5. Differences in MVPA between school grades

Differences in objective measures of PA between countries

In this sample, Greek pupils (M = 57.35 ± 19.62) had higher levels of MVPA compared to French (M = 38.03 ± 14.61) and Italian pupils (M = 43.73 ± 15.47) after adjusting for gender & age ($F_{2,183}$ = 23.592, p < .001; Figure 6.6).

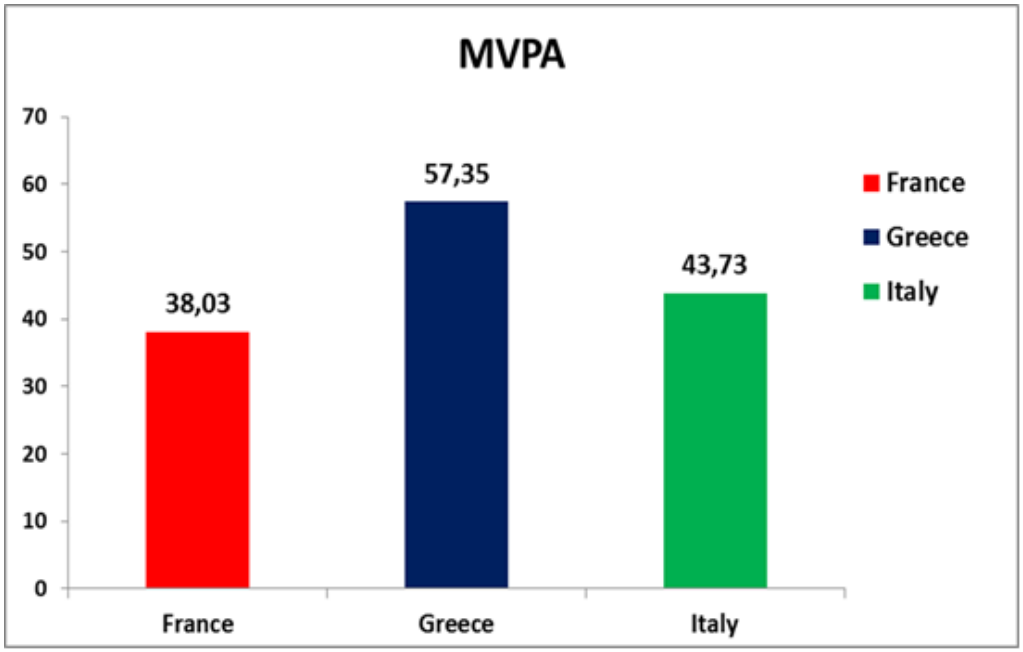


Figure 6.6. Differences in MVPA between the three countries

Days of Physical Education (PE) per week and objective Physical Activity (PA)

To investigate the relationship of days of PE per week with objective measure Moderate Vigorous PA (MVPA) a sample of pupils who wore the accelerometers in T1 (before intervention) for at least 6 days per week was selected. Moreover, to control for age effects on MVPA, from this sample only pupils aged 14-17 years old were selected, because in this subsample no age differences in MVPA emerged.

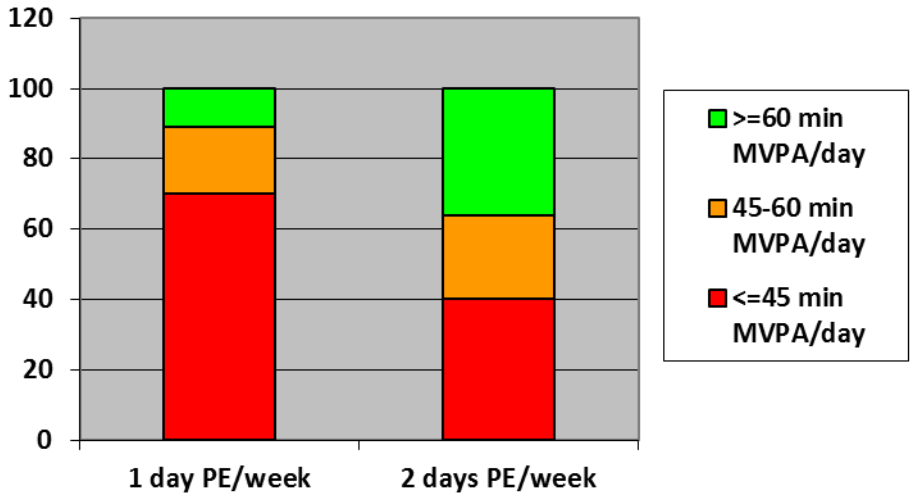


Figure 6.7. Relationship of days of PE/week with Moderate Vigorous PA for a sample of pupils 14-17 years old who wore the accelerometers for 6-8 days/week.

The resulting sample consisted of 62 pupils (n_1 = 37 pupils with one hour PE/week; n_2 = 25 pupils with two hours PE/week). As shown in Figure 6.7, in n_1 group of pupils (1 hour PE per week) there was larger percentage (70%) of quite inactive pupils (<= 45 minutes MVPA average per day) than the corresponding percentage (40%) of quite inactive pupils in n_2 group (2 hours PE per week) ($p < .02$). On the other hand, the percentage of physically active pupils (>=60 minutes MVPA average per day) was higher (36%) in n_2 group (2 hours PE per week) than the corresponding percentage (11%) of physically active pupils in n_1 group. This finding alongside the corresponding results concerning the relationship of days of PE per week and self-reports of PA (main Study in Chapter 4), underscore the importance of PE for adolescents' PA.

Differences between intervention and experimental group pupils in objective Physical Activity

Pupils were divided into two groups: experimental (*n* = 78) and control group (*n* = 52) based on whether their PE teacher took part on the online webinars and the implementation of the IMPACT project tasks or not respectively. Separate two-way analyses of variance with repeated measures, having as covariance pupils' age and gender, revealed no significant differences in all examined variables of PA (Sedentary time, LPA, MPA, VPA, MVPA, steps) due to time (pre, post), condition (experimental, control) or interaction between time and condition. Descriptive statistics (mean and standard deviation) of T1 and T2 accelerometer variables are presented in Table 6.4.

Table 6.4. Descriptive statistics between T1 and T2 accelerometer variables

	T1 Measure (Pre)		T2 Measure (Post)	
Variables (values per day)	**Experimental Group**	**Control Group**	**Experimental Group**	**Control Group**
MVPA	50.42 ± 19.03	44.95 ± 21.06	45.26 ± 20.46	41.06 ± 18.34
Steps	8432.51 ± 2605.70	7644.77 ± 2754.39	7956.42 ± 2828.54	7427.80 ± 2440.03

Notes. MVPA: Moderate to Vigorous Physical Activity

Seventy seven (n = 77) of those pupils who wore accelerometers both in Time 1 and 2 had also responded on Time 2 measure and the two items asking them whether their PE teachers implemented goal-setting programs in their classes (description is provided in Chapter 5). Based on their responses to these items we classified these pupils in four groups:

(1) Experimental and goal-setting (n = 20)
(2) Experimental and no goal-setting (n = 20)
(3) Control and goal-setting (n = 19)
(4) Control and no goal-setting (n = 17).

Repeated measures analyses of variance revealed that pupils in experimental and goal-setting PE classes slightly increased their vigorous PA in Time 2 while pupils' vigorous PA decreased in Time 2 in all other groups (Figure 6.8), but due to small sample size this difference is marginally significant $F(3, 13) = 2.17$, $p < .10$. No other significant differences emerged among the four groups.

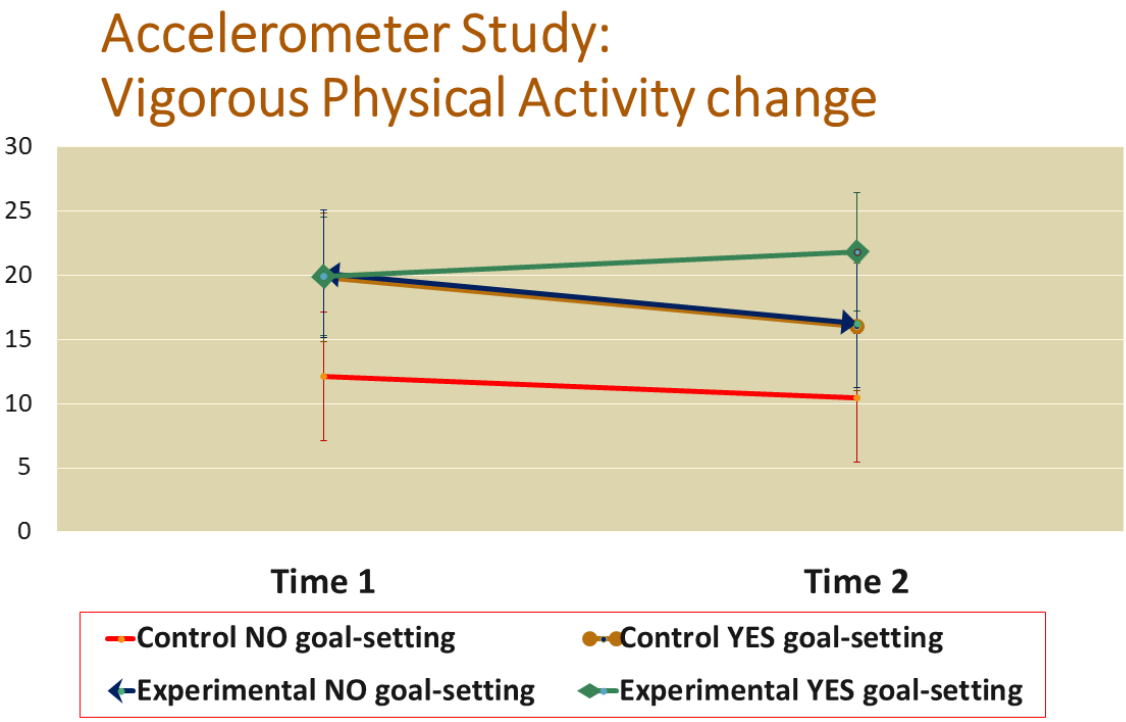


Figure 6.8. Average minutes per day of Vigorous Physical Activity in Time 1 and Time 2 across four groups differing on experimental condition and adoption of goal-setting program

Summary

The findings of the accelerometer study also revealed a disappointing picture about adolescents' physical activity in these three European countries.

- The percentage of pupils who almost never (0-1 days per week) reached the 60 minutes of daily MVPA was 54.3%.
- The percentage of pupils who did 60 minutes of daily MVPA for a minimum of three days in a week was just 28.2%.
- The trends in the accelerometer study were the same as in the preliminary study and in the main study involving much larger numbers of participants who reported PA on self-reports.
- Girls were even more inactive than boys.
- Older adolescents were even more inactive than pre-adolescents, whatever measure of physical activity was used, either objective or subjective.
- Days of PE per week was positively linked with objective measures of MVPA.
- There is some evidence that PE teachers in experimental groups who implemented the goal-setting program had more positive effects on adolescents' objective vigorous PA than PE teachers who did not implement goal-setting programs and PE teachers in control groups.

CHAPTER 7: COMPLEMENTARY STUDIES

Few additional smaller studies were conducted to complement the findings of the main intervention study described in chapter 5.

Observation Study

Purpose

This study was conducted only in Greece and its purpose was to examine possible differences in PE teachers' behaviors in PE settings between Time 1 and Time 2 measurements described in chapter 5 (pre vs post IMPACT intervention) and groups (experimental vs control). Systematic observation of teachers' behaviors was employed using a new observation instrument that relied on the adopted motivational theories in the IMPACT project, i.e., Achievement goals (AGT; Ames, 1992; Nicholls, 1984) and Self-Determination (SDT; Deci & Ryan, 2000).

Participants

Sixteen Greek PE teachers from the larger group of PE teachers who were involved in the main study described in chapter 5, volunteered to participate in this study. Nine teachers were males and seven females; M_{age} = 52.25 ± 3.77 years; teaching experience: M = 23.58 ± 4.28 years. Teaching in one PE class from each of these teachers was filmed twice, the first filming (Time 1; T1) before the delivery of the IMPACT project webinars (October 2018) and the second filming Time (T2) at the end of the IMPACT project intervention (April 2019).

After the T1 measure, PE teachers were divided into two groups: (1) the experimental group (n = 10) that attended the five online webinars and implemented the IMPACT principles and (2) the control group (n = 6) that did not receive any training and followed their regular teaching program. They taught a total of 299 pupils, seven of them in elementary schools (fifth and sixth grades), five of them in secondary junior schools and four of them in senior high schools. These schools were spread across all over Greece, including north, central and south Greece and both urban and sub-urban areas.

Procedure

The study was conducted with the permission of the Ministry of Education, the approval of the Ethics Committee from the University of Thessaly and the agreement of the coordinators, schools' headmasters, PE teachers, and pupils' parents. The PE teachers and the parents, who allowed their children to take part in the filmed PE lessons, were informed about the research procedure and both filled in a consent form.

Following ethics approval, the leading researcher contacted the headmasters of the schools and the PE teachers. The researcher explained the process in general terms. The given information was that the study would occur in a PE lesson, without changing the schools' daily program and the typical teaching in this class. No reference was made to the PE teachers concerning the motivational climate they create.

Following the researcher visited the schools and filmed teaching in one PE class. To capture the PE teachers' behaviors, a digital camera and a microphone was used, which teachers carried it with them during the PE lessons. The camera was focused exclusively on the PE teachers and not on pupils.

Observational tool

The observational instrument was a modified version of the Multidimensional Motivational Climate Observation System (MMCOS; Smith et al., 2015; Tessier et al., 2013) that had been developed for use in sports contexts. The new instrument was adapted in PE settings to detect the PE teachers' behaviors for the specific lesson (MMCOS-PE).

The adapted MMCOS-PE has a similar hierarchical structure of MMCOS. It consisted of 7 lower-order factors (autonomy support, controlling, task-involving, ego-involving, relatedness support, relatedness thwarting and structure), 2 higher-order factors (empowering and disempowering) and 32 items or

"*behavioral strategies*". Autonomy support, task-involving, relatedness support, and structure were lower-order factors loading to *empowering* while controlling, ego-involving and thwarting relations were lower-order factors loading to the *disempowering* higher-order factor.

For example, observers rated that a PE teacher was giving emphasis on autonomy support by "*providing space for initiatives*"; being controlling by "*using fear*"; being task-involving by "*supporting teamwork collaboration for learning*"; being ego-involving by "*emphasizing on competition between pupils*"; being relatedness supportive by "*adopting interest and care for all*"; being relatedness thwarting by "*showing negative communication for the pupils*" and finally giving emphasis on structure by "*providing expectations for learning*". Before the observers completed their ratings, they were asked to estimate to what extent the above factors were observed during the PE teachers' lesson and finally, to what extent the PE teacher used empowering or empowering behaviors. Each of the factors and the overall score (empowering or disempowering) were rated using a scale ranging from 0 (none) to 3 (much emphasize).

Inter-Observer Agreement

The reliability of the instrument requires a high degree of agreement among the raters, which ensures that the coding procedure implements a consistent and reliable approach. Prior to data collection, four volunteers' researchers, in two teams, were selected and trained on the theories of AGT and SDT, and onto the concepts of the observation instrument and its structure (MMCOS-PE). Each researcher had about 10 hours of intensive courses comprised of presentations, discussions, cooperation, and training with videos. To facilitate researchers' ratings, the leader researcher provided them with a list of behavioral instructions based on the principles of the theories (e.g., explanations on how to estimate the dimensions). Throughout the courses, to accomplish a high level of agreement, the in-charge researcher trained the observers initially by asking them to rate what they watched in videos (according to behavioral instructions) and then compared each other answers. The procedure was repeated until a high symphony among the raters.

When the trained researchers adopted the features of the behaviors and reached a high level of agreement, then they were asked to rate independently. Each rater-observer had 48 videos to analyze and evaluate. The procedure they had to follow was to split the 30 minutes video into three sections of 10 minutes of teaching (3x10min). Each 10-minute segment was observed and rated by the researchers and gave results for the PE teachers' behaviors and teaching. Eventually, a database was created consisted of the mean scores in the three 10 minute segments, including the observers' coding for each dimension of MMCOS-PE.

Results

In both measures, the Kolmogorov-Smirnov test showed that all data followed a normal distribution ($p > .05$). Differences between experimental and control group PE teachers in the observed variables at T2 (post intervention), separate one way analyses of covariance (ANCOVAs) were contacted using as covariate the results in T1 measure (pre intervention). After adjusting for T1 measurement, results revealed no significant differences between experimental and control groups in any of the observed variables at T2 [empowering ($F_{1,13} = .831$, $p = .379$), disempowering ($F_{1,13} = .516$, $p = .485$), autonomy support ($F_{1,13} = .292$, $p = .598$), controlling ($F_{1,13} = 1.032$, $p = .328$), task-involving ($F_{1,13} = .025$, $p = .876$), ego-involving ($F_{1,13} = .036$, $p = .852$), relatedness support ($F_{1,13} = .014$, $p = .909$), relatedness thwarting ($F_{1,13} = .076$, $p = .787$) and structure ($F_{1,13} = .65$, $p = .802$).

It is important to mention here that in line with instructions provided at the webinars, experimental group PE teachers increased their rates on autonomy support, task-involving, relatedness support, structure, empowering behaviors and decreased their rates on controlling, ego-involving and disempowering behaviors at T2 measure (post-intervention; Table 7.1), but these changes were not statistically significant ($p > .05$). Given the small number of teachers in experimental groups, a deviation to the opposite direction from just one or two of these teachers result to nonsignificant findings. This is expectable because as was shown in Chapter 5 not all teachers followed the instructions provided in the webinars.

Table 7.1. Descriptive statistics between T1 and T2 observed PE teachers' behaviors

	T1 Measure (Pre)		T2 Measure (Post)	
Observed Variables	Experimental Group (*n* =10)	Control Group (*n* = 6)	Experimental Group (*n* =10)	Control Group (*n* = 6)
Empowering	1.61 ± .46	1.75 ± .32	1.81 ± .31	1.71 ± .37
Disempowering	.18 ± .24	.50 ± .32	.13 ± .21	.46 ± .33
Autonomy support	1.28 ± .29	1.52 ± .31	1.29 ± .36	1.48 ± .28
Controlling	.53 ± .45	.44 ± .41	.46 ± .58	.23 ± .24
Task-involving	1.78 ± .32	1.68 ± .27	1.88 ± .41	1.80 ± .32
Ego-involving	.13 ± .18	.17 ± .19	.12 ± .11	.15 ± .14
Relatedness support	1.63 ± .34	1.58 ± .25	1.70 ± .33	1.68 ± .26
Relatedness thwarting	.21 ± .30	.14 ± .20	.19 ± .30	.13 ± .19
Structure	2.05 ± .16	2.01 ± .29	2.11 ± .20	2.06 ± .29

Note. Mean scores of the three 10 minute observed segments.

Studies focused on the online Instrument

Purpose

An innovative website supporting both the implementation and dissemination activities of the IMPACT project was developed. It was used for online measurement including innovative functions providing automatic feedback to PE teachers and students, for online teacher education (webinars) and for dissemination in the remaining part of the project. Following its development, four small studies were conducted investigating (a) the intentions of PE teachers to use Information Technology (IT) to promote their pupils' PA levels, and (b) the utility and the effectiveness of the website/ web-measure with regard to the aims of this project.

Teachers' intentions to use online surveys

More specifically, in Greece, we examined the **intention** of PE teachers at the experimental group to ask their pupils to **use online surveys** in order to monitor their PA levels. An online survey was delivered to them (*n* = 40 participants) with two items during the implementation of the IMPACT intervention (e.g., I INTENT/ I am DETERMINED to ask my pupils to use online surveys to monitor their PA levels). Responses were given on a 7-point Likert scale from 1 (Very unlikely) to 7 (Very likely). Results showed that PE teachers had strong positive intentions to ask their pupils to use online surveys to monitor their PA levels with 87.5% of them reporting that they intent to use this tool in the future (Figure 7.1.).

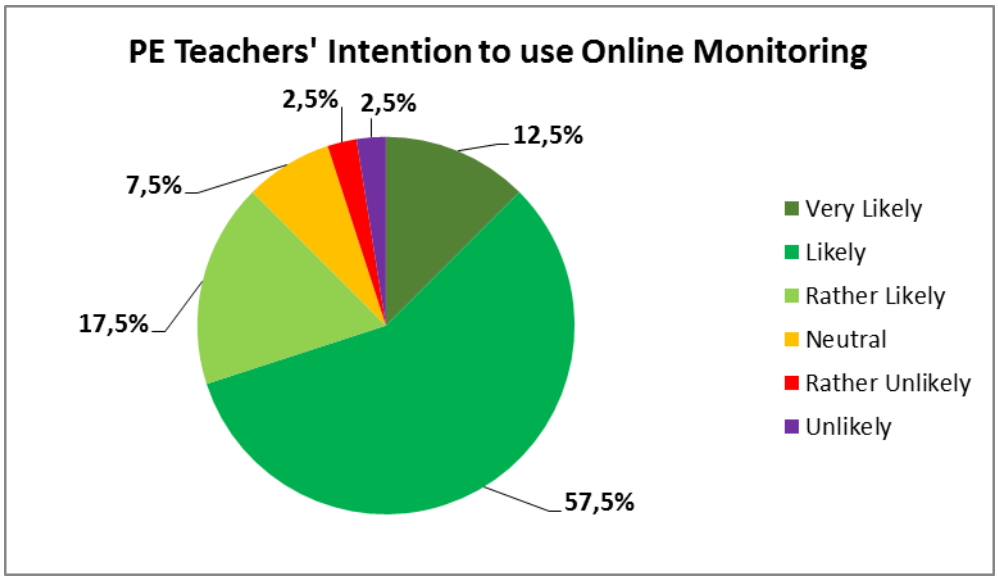


Figure 7.1. PE teachers' intention to ask their pupils to monitor their PA levels through online surveys

Teachers' attitudes towards the online Feedback tool

Using a sample of Greek PE teachers from the experimental group (*n* = 45; 22 males and 23 females), we tried to explore if they used the online **FEEDBACK tool** to monitor their pupils' PA levels and to set goals to be more physically active during the implementation of IMPACT intervention, how easy/ important/ useful they found it and if they intend to use it next year. An online survey was delivered to them with six items during the implementation of the IMPACT intervention (e.g., Did you use FEEDBACK tool to monitor your pupils' PA levels; How many times did you use FEEDBACK tool to monitor your pupils' PA levels; How easy/ important/ useful did you find FEEDBACK tool; Next school year, do you intend to use FEEDBACK tool to monitor your pupils' PA levels). Responses were given in a 2-point scale (YES/ NO), in a 3-point scale (1 time, 2 times, more than 2 times) and in 7-point Likert scales from 1 (Very Difficult/ Not Important at All/ Very Useful) to 7 (Very Easy/ Very Important/ Very Useful). Thirty-one PE teachers reported that they used the FEEDBACK tool to monitor their pupils' PA levels at least once (Figure 7.2.), while 14 responded that they did not use it at all.

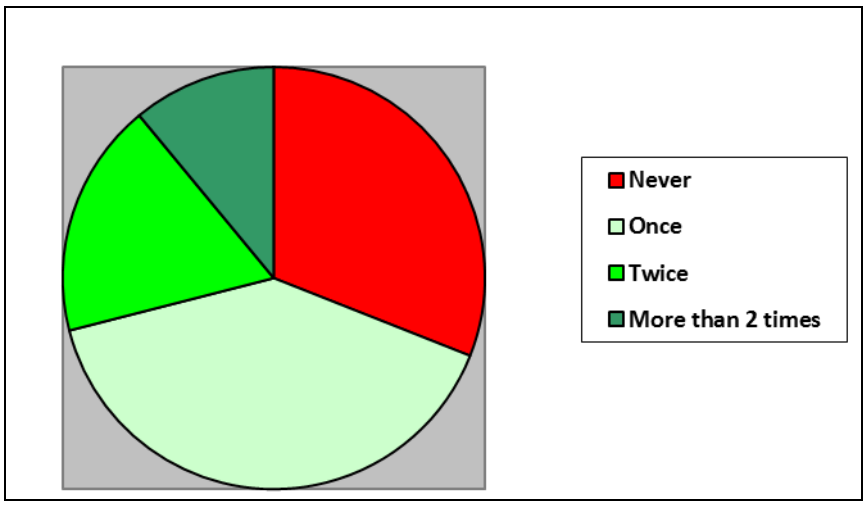


Figure 7.2. Use of FEEDBACK tool by PE teachers

More specifically, 74.2% of the PE teachers found the FEEDBACK tool rather easy, easy or very easy to use (Table 7.2), 83.9% found it rather important, important or very important (Table 7.3) and 87.1% found it quite useful, useful or very useful to increase their pupils' PA levels (Table 7.4). They also reported that they intended to use it again at the next school year (93.6%; Table 7.4).

Table 7.2. How easy did PE teachers find FEEDBACK tool

	Frequency	Percent
Neutral	8	25.8
Rather Easy	13	41.9
Easy	8	25.8
Very Easy	2	6.5
Total	31	100

Table 7.3. How important did PE teachers find FEEDBACK tool

	Frequency	Valid Percent
Neutral	5	16.1
Rather Important	12	38.7
Important	11	35.5
Very Important	3	9.7
Total	31	100

Table 7.4. How useful did PE teachers find FEEDBACK tool

	Frequency	Valid Percent
Neutral	4	12.9
Rather Useful	12	38.7
Useful	12	38.7
Very Useful	3	9.7
Total	31	100

Table 7.5. PE teachers' Intention to use FEEDBACK tool

	Frequency	Valid Percent
Unlikely	1	3.2
Rather Unlikely	1	3.2
Neutral	2	6.5
Rather Likely	11	35.5
Likely	11	35.5
Very Likely	5	16.1
Total	31	100

Teachers' attitudes towards use of IT to promote pupils' PA

Participants were one hundred sixty two PE teachers (n = 162) from the 4 countries who received training through the IMPACT webinars (FR: 28; GR = 51; IT = 46; TR = 37). They completed an online questionnaire measuring their **intention** (3 items; e.g., I intend to use Information Technology - IT in order to promote my pupils' PA levels), their **perceived behavioral control** (3 items; e.g., How confident are you to use Information Technology - IT in order promote your pupils' PA levels) and their **attitudes to use IT to promote their pupils' PA levels** (4 items; e.g., For me, to use Information Technology - IT in order to promote my pupils' PA levels is good/ pleasant/ interesting/ useful). All responses were given in 7-point Likert scales from 1 (e.g., Very Unlikely or Totally Disagree or Very bad/ Very unpleasant / Very boring/ Very useless) to 7 (e.g., Very likely or Totally agree or Very good/ Very pleasant/ Very interesting/ Very useful respectively). Means, standard deviations, reliabilities and correlations between the examined variables are presented below in Table 7.6.

Table 7.6. PE teachers' Intention, Perceived Behavioral Control and Attitudes to use IT

	M ± SD	α	1	2	3
1. Intention	5.04 ± 1.36	.76	-		
2. PBC	4.79 ± 1.26	.80	.34**	-	
3. Attitudes	5.41 ± 1.35	.96	.44**	.62**	-

Notes. PBC: Perceived Behavioral Control; *M* = Mean; *SD* = Standard Deviation; α = reliability; ** $p < .01$

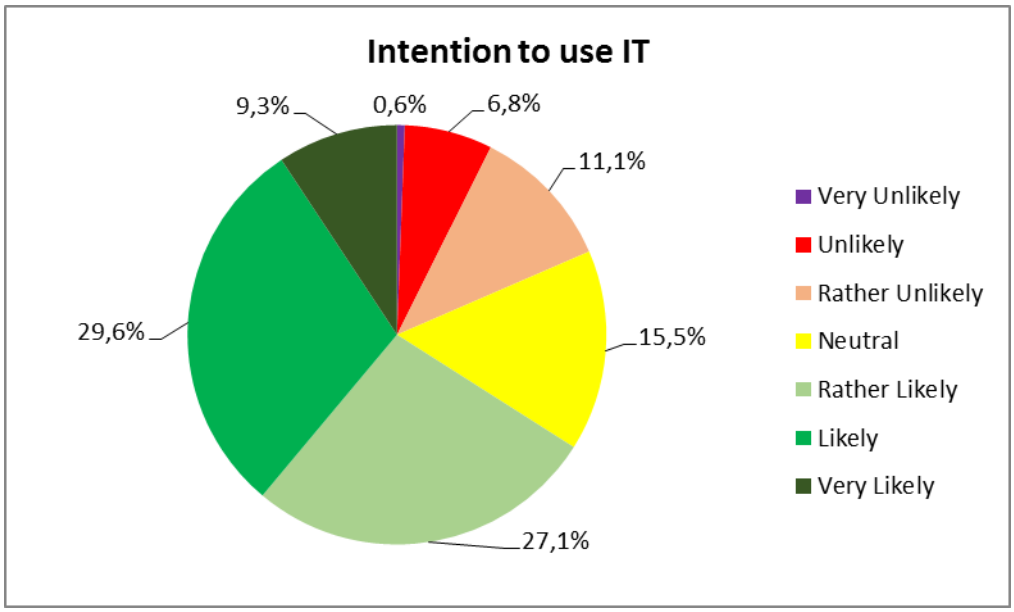


Figure 7.3. PE teachers' Intention to use IT to promote their pupils' PA levels

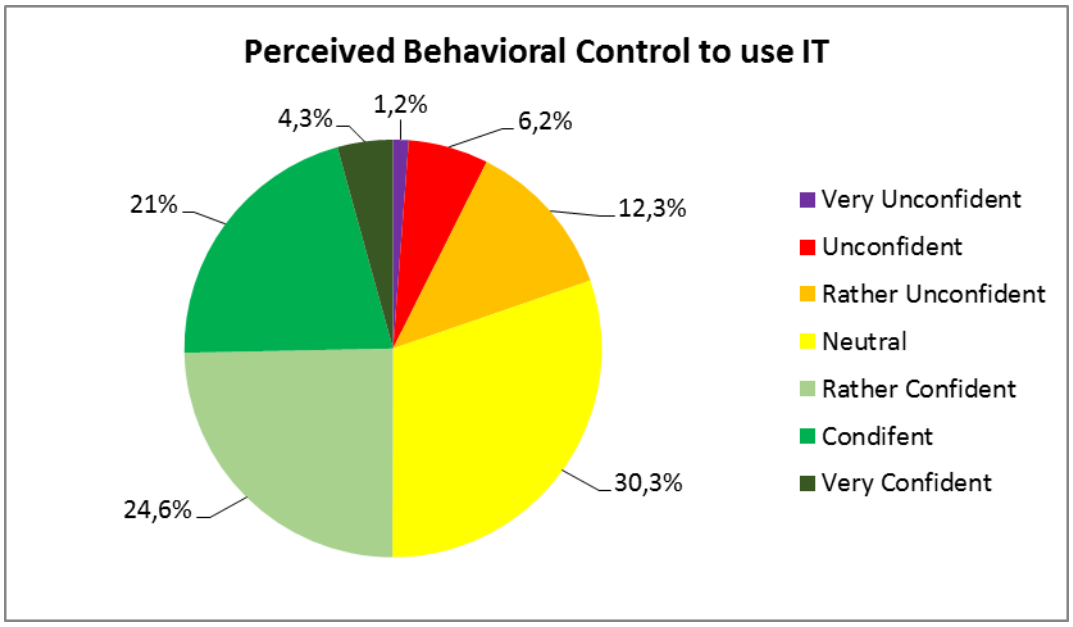


Figure 7.4. PE teachers' Perceived Behavioral Control to use IT to promote their pupils' PA levels

The majority of the PE teachers (63%) reported that they intended to use IT to promote their pupils' PA levels (Figure 7.3) and half of them (50%) reported that they were confident to use IT in the future to promote pupils' PA (Figure 7.3).

Regarding their attitudes towards IT, the majority (74.1%) reported that it is good or very good to use IT to promote their pupils' PA levels (Table 7.7). Similarly, 72,2% reported that they found it pleasant or very pleasant to use IT to promote their pupils' PA levels (Table 7.8).

Table 7.7. How well did PE teachers find the use of IT to promote their pupils' PA levels

	Frequency	Percent
Very Bad	2	1.2
Bad	3	1.9
Rather Bad	10	6.2
Neutral	27	16.7
Rather Good	33	20.4
Good	42	25.9
Very Good	45	27.8
Total	162	100.0

Table 7.8. How pleasant did PE teachers find the use of IT to promote their pupils' PA levels

	Frequency	Percent
Very Unpleasant	5	3.1
Unpleasant	4	2.5
Rather Unpleasant	9	5.6
Neutral	27	16.6
Rather Pleasant	30	18.5
Pleasant	51	31.5
Very Pleasant	36	22.2
Total	162	100.0

Also, more than half of them (55.5%) reported that they found it interesting or very interesting to use IT to promote their pupils' PA levels (Table 7.9). Finally, 43.2% of the PE teachers reported that it is useful or very useful to use IT to promote their pupils' PA levels (Table 51).

Table 7.9. How interesting did PE teachers find the use of IT to promote their pupils' PA levels

	Frequency	Percent
Very Boring	3	1.9
Boring	3	1.9
Rather Boring	10	6.2
Neutral	25	15.4
Rather Interesting	31	19.1
Interesting	42	25.9
Very Interesting	48	29.6
Total	162	100.0

Table 7.10. How useful did PE teachers find the use of IT to promote their pupils' PA levels

	Frequency	Percent
Very Useless	1	0.6
Useless	5	3.1
Rather Useless	5	3.1
Neutral	30	18.5
Rather Useful	35	21.6
Useful	35	21.6
Very Useful	51	31.5
Total	162	100.0

Pupils' preferences for online surveys

Finally, in the T2 measure, 4129 pupils from the four countries (FR, GR, IT, TU) responded to an item asking them to clarify the **way they prefer to complete the IMPACT questionnaire** (online or traditionally with pencil and paper). The vast majority of them (80.6%) answered they would prefer to complete the online questionnaire (*n* = 3329), while only 19.4% of them (*n* = 800) responded that they preferred the traditional way of completing the questionnaire (pencil and paper).

PE teachers' knowledge about WHO Recommendations for adolescents' PA

A **knowledge test** was delivered online twice (at the beginning and at the end of the project) to PE teachers that participated in the IMPACT project. The test included three questions related to health-related concepts, 4 questions related to goal setting theory and 13 questions related to positive motivational climate. The findings suggested that the majority of PE teachers were not aware of these concepts. More specifically, 57.8% of the participants were not aware of the WHO's recommendations, while 42.7% were familiar with this knowledge (see Figure 39).

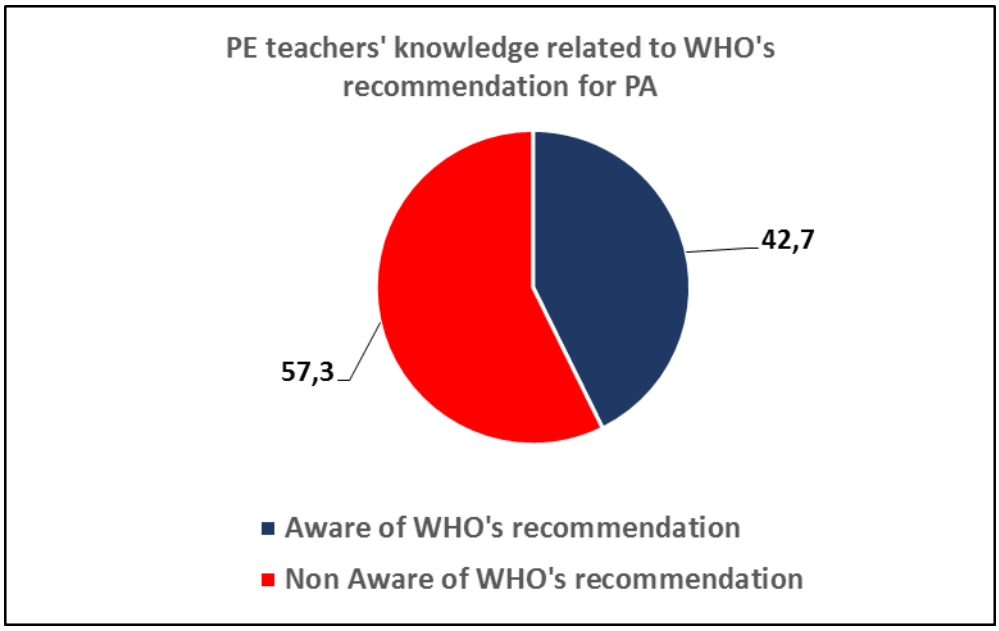


Figure 7.5. PE teachers' awareness of WHO's recommendations for PA

Qualitative Studies focused on teachers' views about PE and PA promotion

Findings from the aforementioned activities described in previous Chapters were coupled with qualitative data reflecting **PE teachers' views** about the role of PE on PA promotion. Two qualitative studies were conducted reported below

Qualitative study 1: Aim and method

During the partner meetings across four countries (FR, GR, IT, TU), partners visited some schools and **interviewed PE teachers**. The aim was to discuss with local PE teachers about their strategies to promote PA, the challenges that they face, the opportunities that they have, their needs in terms of training and support, etc. Following this discussion, partners hold a group discussion presenting their opinions about their impressions from their discussions with PE teachers, plus suggestions stemming from their experiences and knowledge from other examples of good practice. Interviews of PE teachers in Greece, Italy and France were recorded but the interview in Turkey was not allowed to be recorded. Then these recordings then were transcribed.

Qualitative study 1: Findings

Based on PE teachers' reports it can be concluded that the time allocated to PE in the four countries is limited to an average of two hours (maximum three) per week.

Additionally, PE teachers' reports revealed that the curriculum of the participating countries is focused on teaching specific skills in order to be competent to participate in sports-based activities. Arguably, PE teachers prioritize similar goals. For example, a French PE teacher stated, "*most of the time they focus on technique, skills, ability, and pleasant time in PE because they have no time to do more*". However, according to studies and experts' views, the implementation of this type of PE curriculum may lead pupils who are less-skillful in sports to be inactive during PE lessons.

Furthermore, PE teachers reported that they are aware of their pupils' participation in out of school PA but in most cases, they based this awareness on their pupils' participation in PE lessons or on their pupils' reports about the time they spent in out of school PA. For example, a Greek PE teacher stated, "*I can identify*

which pupil participates in a sport at the beginning of the academic year by asking them one by one if they are an athlete or not and in which sport they participate in". Only the French teachers reported that they use a questionnaire in order to explore to what extent their pupils participate in after school PA. More specifically, they stated, "*At the beginning of the year, pupils fill in some questionnaires… and in this way, PE teachers discover the children who want to go to the sports clubs and the pupils who they don't want to go to the sports*". PE teachers reported that the pupils who participate in after school sports are also more physically active during PE classes. This assumption is aligned with the findings of the IMPACT project.

PE teachers also reported that there is no provision for pupils in Greece and Turkey to participate in extra-curricular PA for pupils who do not participate in sport clubs. On the contrary, Italian and French PE teachers stated, "*we do also do school sport in the afternoon… we create teams and training our pupils to participate in school competitions. This is an after-school program that some schools can do some sports or activities with the PE teacher, in the afternoon*". Arguably, it can be also inferred that the purpose of these activities is to promote school sports rather than helping students who are rarely involved in PA. Finally, PE teachers in the participating countries reported that they organize activities to promote inactive or obese pupils' participation in PA. For example, a Greek PE teacher stated "*… they do some theory classes to promote health. In particular, at the beginning of the school year or when the weather is not so good, we introduce pupils to health-related issues such as healthy eating behaviors or teach them alternative ways of exercise that pupils can practice in their spare time*".

Following these interviews, the researchers concluded that the PE teachers wanted to promote PA for pupils who need PA, however they do not have the appropriate training to do it.

Qualitative Study 2: Aim and method

Researchers from three countries organized interviews at the end of the project (2019) with the PE teachers that delivered the IMPACT project. The aim was to explore how these teachers perceived the IMPACT project training, what they found useful and what it can be further improved. Accordingly, 17 PE teachers (France = 5, Greece = 5, and Turkey = 7) randomly selected from these countries were interviewed. The interviews were recorded and transcribed.

Qualitative Study 2: Findings

The data analysis revealed that the majority of PE teachers in these three countries had randomly used the goal-setting theory and none of them used it in order to promote his/her pupils' PA. However, they reported that they used this strategy during the delivery of the project and thus they intend to use it in the future.

Interestingly, many of PE teachers said that the duration of the IMPACT project program is not enough to change their pupils' attitudes towards PA. For example, a Turkish PE teacher reported, "*I liked this theory very much; I was not using it before. But I do not believe that it will settle with a one-time use. I think that if I apply this for 1 year, 2 years, maybe 3 years, it will have an important contribution to the child's life. Setting goals is perhaps one of the most important points of our job*".

Additionally, PE teachers' reports indicated that there is no central policy or directive to guide them on how to identify students who are rarely involved in PA. For example, a Greek PE teacher stated, "*I did not use systematically a specific strategy in order to identify which of my pupils participate in after school PA. Only, in some cases I tried to discuss with my pupils to what if they participated in extracurricular activities, and /or they participated in sports clubs*". Similarly, a French PE teacher reported, "*I had to do the class with him (an inactive student). Running with him or he wouldn't do it. I don't leave them alone facing their difficulty. I value them, I try to find things that could please them, where they feel well. I try regrouping them in groups to motivate them*".

Most of the PE teachers reported that due to the program they adopted strategies that may urge pupils to participate in PA. More specifically, a Turkish PE teacher reported, "*... however, after involving this project I*

understand that every student can experience success and achievement. So it is not the right strategy to leave them alone sitting on the corner of the gym inactive. IMPACT also showed me the importance of the peer effect on motivation and learning". Similarly, a Greek PE teacher underlined that "*Of course (due to the IMPACT) it changed the strategy and lesson's structure. Before, I just urged my pupils to participate in after school PA. However, due to the program, we were in daily contact with the kids and they recorded the time they spent in PA. The most important was the recording*". While another Greek PE teacher said "*Due to the program an overweight schoolgirl, who does not participate in any organized PA, after the program presentation said to me I want to contribute to the good of the team, but I can participate in intense exercise. Then I told her "you will start by walking in the beginning and that is a contribution to the group". The child was initially worried, but after that, I am very pleased with her effort and the fact that she is very active now and satisfied with the PE lesson.*"

Furthermore, all of the PE teachers reported that they would like to participate in similar seminars in the future. For example, a Turkish PE teacher stated, "*I would definitely like to take part in the project that will support my own development*". Additionally, a French PE teacher reported "*Yes! There are no training courses on how to promote after school PA*". Finally, a Greek PE teacher reported, "*Certainly yes it was my honor to join this project because it makes me even better as a PE teacher and as a person*".

Based on the aforementioned it can be concluded that these PE teachers were focused on promoting their student skills in order to participate in sports. Additionally, they provided activities for promoting inactive pupils' participation in PA, using self-regulation strategies (e.g., goal setting self-monitoring, self-recording) that effectively promoted participation in PA. Interestingly, a significant number of PE teachers had a lack of knowledge for significant concepts such as WHO's recommendation for PA, goal setting theory and positive motivational climate that could effectively help them to promote pupils' participation in after school PA. Thus, it can be concluded that before their training the aim of their teaching did not support effectively the promotion of pupils' PA. However, the IMPACT project helped them to adopt strategies that may effectively motivate pupils to participate in after school PA.

Summary

These complementary studies offered useful insight on specific issues of the IMPACT project and provided further boost to the importance of the aims, methodology and outcomes of this project. PE teachers and pupils found the online tools useful and they expressed their willingness to use them in the future for measurement, training and monitoring of PA. Although all PE teachers recognized the importance of promoting pupils' PA, almost all of them were several years in service but had not received contemporary training on how to motivate pupils and how to promote out-of-school PA. Most of the PE teachers did not have accurate knowledge concerning the recommendations of the World Health Organization for children's and adolescents' PA. Many of them reported that they had never received guidelines to identify inactive pupils and promote their PA. They all found the IMPACT monitoring tool and the goal-setting program very important to promote pupils' PA. In total, they found very useful the aims, content and methodology of the IMPACT project.

CHAPTER 8: IMPACT PROJECT EVALUATION AND DISSEMINATION

Further to the qualitative findings reported in Chapter 7, two online anonymous surveys and one focus group interview were conducted to evaluate the quality of outcomes and activities of the IMPACT project.

PE teachers' evaluation of the IMPACT project

In late June 2018, after completion of all webinars and measurements, fifty-three Greek PE teachers responded to an anonymous survey including two items.

- As shown in Figure 8.1, almost all PE teachers (96.2%) found the IMPACT project good or very good, only 3.8% were uncertain and none was negative.
- Importantly, 73.6% of the teachers found the IMPACT project **very good**.
- As shown in Figure 8.2, the large majority of the PE teachers (85%) expressed their willingness to participate in the IMPACT project webinars again in the next academic year (2019-2020), i.e., in the training delivered to PE teachers who participated in the control group in 2018-2019.
- Indeed, when the same PE teachers had participated in the final IMPACT project webinar in June 2019, they had replied in the same way to a similar item: 76% of them replied YES when they were asked if they wanted to participate in next year's IMPACT project webinars (Photo 8.1). The only one PE teacher who replied no, she immediately explained that she wanted to do it but she would be unable because she would move to an administrative position. The discussion between researcher and PE teachers related to Photo 8.1 can be found in the 6th Greek webinar (June 5, 2019): www.impactpe.eu/site/index.php/en/about/webinars

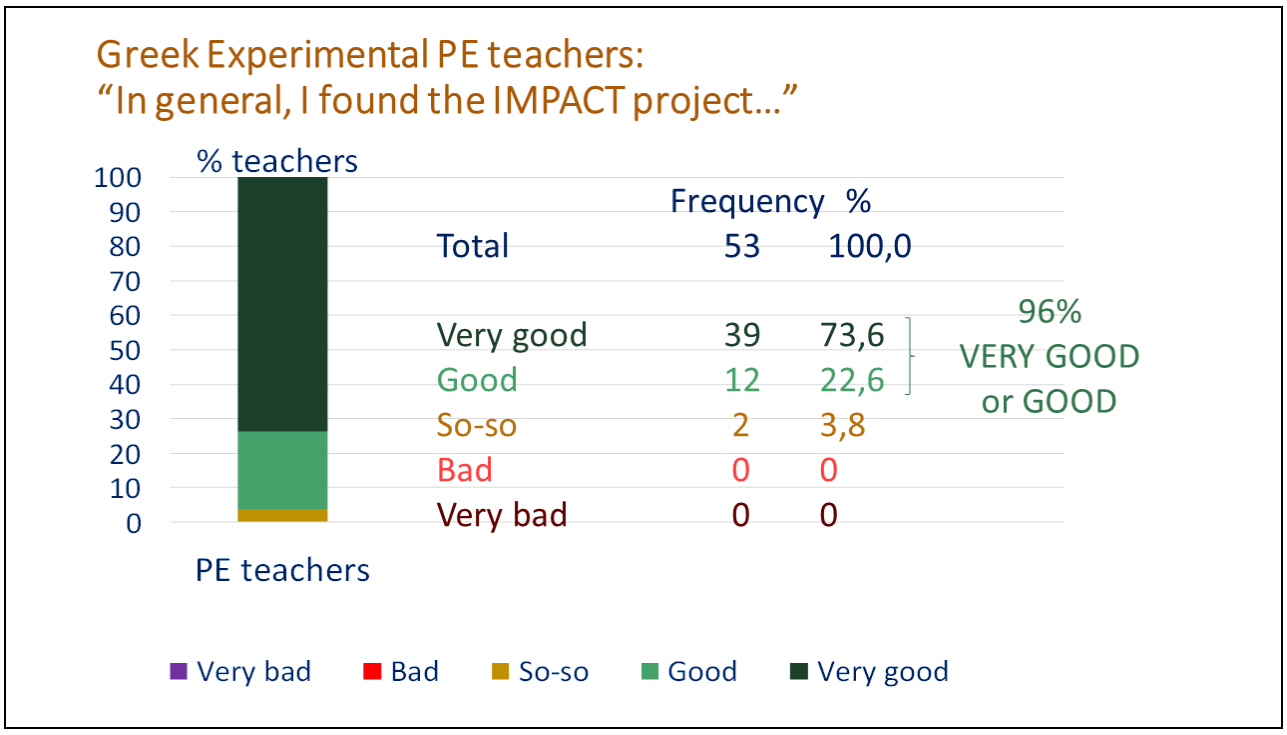


Figure 8.1. PE teachers' evaluation of the IMPACT project

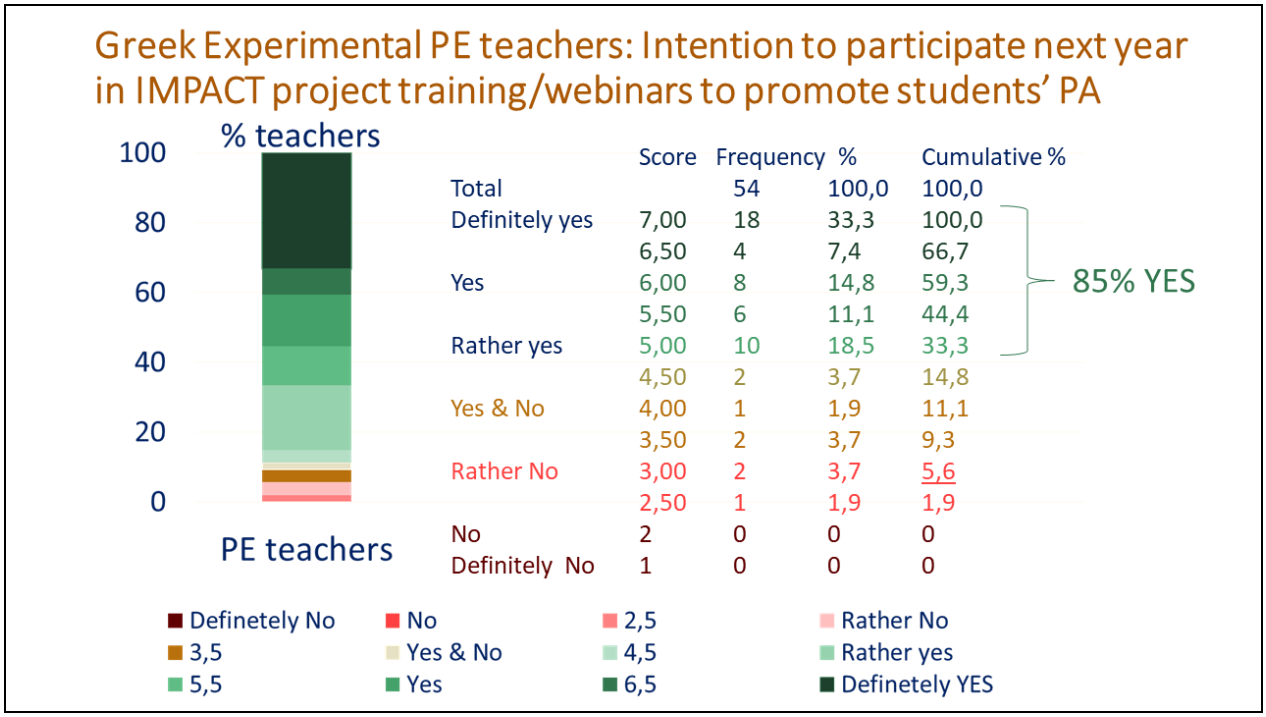


Figure 8.2. PE teachers' intention to participate in next year's IMPACT project webinars.

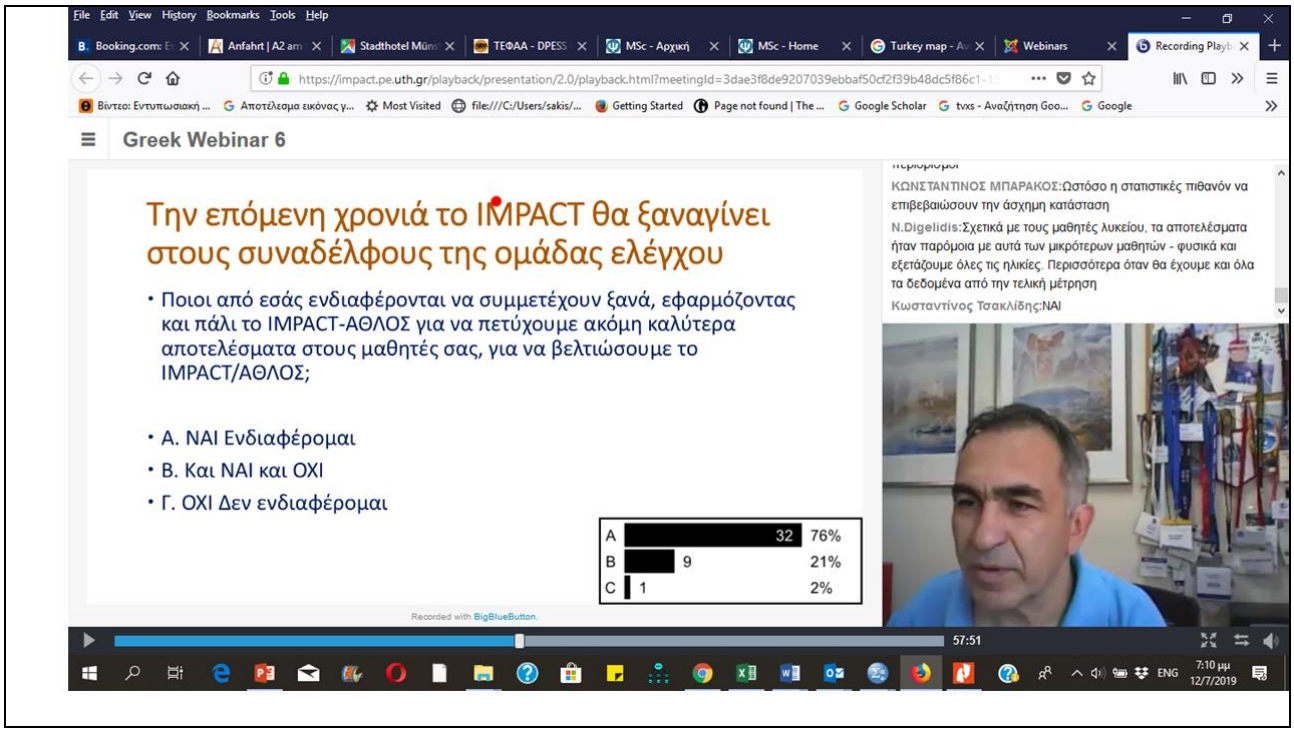


Photo 8.1. Greek PE teachers' answers in the 5th webinar concerning their intention to participate in next year's IMPACT project webinars.

Partners' evaluation of the IMPACT project

In November - December 2019, a final study was conducted through an online measure in order to evaluate the whole IMPACT Project. Twenty partners (*n* = 20; 11 males and 9 females) from 6 countries (DE, FR, GR, IT, SP, TR), 6 universities (University of Thessaly, University of Grenoble-Alpes, University of Padova, Free University of Bozen, Autonomous University of Barcelona and Hacettepe University), 3 Ministries of Education (Ankara MEM, Greek Ministry of Education and Religion Affairs, Greek Institute of Educational Policy) and 3 PE associations (DSLV, CAPDI LSM, EUPEA) took part (Table 53).

Table 53. IMPACT partners' country and Institution

	Partner's Country						
Partners	**FR**	**GE**	**GR**	**IT**	**SP**	**TU**	**TOTAL**
CAPDI & LSM				2			2
DSLV		1					1
EUPEA	1						1
Ankara Provincial Directorate of National Education						2	2
Greek Institute of Educational Policy			1				1
Greek Ministry of Education & Religion Affairs			1				1
University of Padova				1			1
Free University of Bozen				1			1
Hacettepe University						3	3
Autonomous University of Barcelona					1		1
University Grenoble-Alpes	2						2
University of Thessaly			4				4
TOTAL	3	1	6	4	1	5	**20**

Note. FR = France; GE = Germany; GR = Greece; IT = Italy; SP = Spain; TU = Turkey

The online questionnaire consisted of 15 items evaluating the following IMPACT activities: 1) Outputs as a whole, 2) Quality of developed measures, 3) Quantity of collected data, 4) Quality of webinars, 5) Website, 6) Importance of the IMPACT Project to promote PA, 7) The potential of the ESTIMATE network, 8) Quality of the discussion during the 6 IMPACT Meetings, 9) Quality of the outputs related to the 6 IMPACT Meetings, 10) Quality of the discussion during the many informal/ online Meetings, 11) Quality of the outputs related to the many informal/ online IMPACT Meetings, 12) Quality of the 2 IMPACT Symposia (AIESEP 2018, Edinburgh, UK; FEPSAC 2019, Muenster, Germany), 13) Satisfaction of the consortium's work as a whole, 14) Satisfaction of the IMPACT Project coordination and 15) Satisfaction of the IMPACT partners in general or specifically. All answers were given in 5-point Likert scales from 1 (Not at All or Very Low or Very Bad) to 5 (A Lot or Very High or Very Good, respectively).

More specifically, regarding **IMPACT outputs as a whole** (Table 8.1), the vast majority reported that they were good or very good (95%).

Table 8.1. Evaluation of the IMPACT Outputs as a whole

	Frequency	Percent	Cumulative Percent
Moderate	1	5.0	5.0
Good	7	35.0	40.0
Very Good	12	60.0	100.0
Total	20	100.0	

Regarding the **quality of the developed measures** (Table 8.2), the vast majority reported that they were good or very good (90%).

Table 8.2. Evaluation of the quality of the IMPACT developed measures

	Frequency	Percent	Cumulative Percent
Moderate	2	10.0	10.0
Good	8	40.0	50.0
Very Good	10	50.0	100.0
Total	20	100.0	

Regarding the **quantity of the collected data**, the vast majority reported that they were high or very high (90%).

Table 8.3. Evaluation of the quantity of the IMPACT collected data

	Frequency	Percent	Cumulative Percent
High	12	60.0	60.0
Very High	8	40.0	100.0
Total	20	100.0	

Regarding the **quality of the webinars**, the vast majority reported that they were high or very high (90%).

Table 8.4. Evaluation of the quality of the IMPACT webinars

	Frequency	Percent	Cumulative Percent
Fair	2	10.0	10.0
High	8	40.0	50.0
Very High	10	50.0	100.0
Total	20	100.0	

Regarding the **IMPACT website**, the vast majority reported that was good or very good (95%).

Table 8.5. Evaluation of the IMPACT website

	Frequency	Percent	Cumulative Percent
Moderate	1	5.0	5.0
Good	8	40.0	45.0
Very Good	11	55.0	100.0
Total	20	100.0	

Regarding the **importance of the IMPACT Project to promote PA**, the vast majority again reported that was good or very good (90%).

Table 8.6. Evaluation of the importance of the IMPACT Project to promote PA

	Frequency	Percent	Cumulative Percent
Low	1	5.0	5.0
Moderate	1	5.0	10.0
Good	7	35.0	45.0
Very Good	11	55.0	100.0
Total	20	100.0	

Regarding the **potential of the ESTIMATE network** developed through the IMPACT project, the vast majority reported that it was high or very high (65%).

Table 8.7. Evaluation of the potential of the ESTIMATE network

	Frequency	Percent	Cumulative Percent
Fair	7	35.0	35.0
High	7	35.0	70.0
Very High	6	30.0	100.0
Total	20	100.0	

Regarding the **quality of discussions during the 6 IMPACT Meetings**, the vast majority of the participants reported that it was high or very high (85%).

Table 8.8. Evaluation of the quality of discussions during the 6 IMPACT Meetings

	Frequency	Percent	Cumulative Percent
Fair	3	15.0	15.0
High	7	35.0	50.0
Very High	10	50.0	100.0
Total	20	100.0	

Regarding the **quality of the outputs related to the 6 IMPACT Meetings**, the vast majority reported that it was high or very high (75%).

Table 8.9. Evaluation of the quality of the outputs related to the 6 IMPACT Meetings

	Frequency	Percent	Cumulative Percent
Fair	5	25.0	25.0
High	5	25.0	50.0
Very High	10	50.0	100.0
Total	20	100.0	

Regarding the **discussions' quality during the many informal/online IMPACT Meetings**, the vast majority of the participants reported that was high or very high (80%).

Table 8.10. Evaluation of the discussions' quality during the many informal/ online Meetings

	Frequency	Percent	Cumulative Percent
Fair	4	20.0	20.0
High	8	40.0	60.0
Very High	8	40.0	100.0
Total	20	100.0	

Regarding the **outputs' quality related to the many informal/online IMPACT Meetings** (Table 64), the vast majority of the participants reported that was high or very high (80%).

Table 8.11. Evaluation of the outputs' quality related to the many informal/ online IMPACT Meetings

	Frequency	Percent	Cumulative Percent
Low	1	5.0	5.0
Fair	3	15.0	20.0
High	7	35.0	55.0
Very High	9	45.0	100.0
Total	20	100.0	

Regarding the **quality of the 2 IMPACT Symposia involving all partners**, the vast majority again reported that it was high or very high (90%).

Table 8.12. Evaluation of the quality of the 2 IMPACT Symposia (AIESEP 2018; FEPSAC 2019)

	Frequency	Percent	Cumulative Percent
Fair	2	10.0	10.0
High	9	45.0	55.0
Very High	9	45.0	100.0
Total	20	100.0	

Regarding the **satisfaction of the consortium's work as a whole** (Table 66), the vast majority reported that was quite or very satisfied with the group work (85%).

Table 8.13. Evaluation of the consortium's work as a whole

	Frequency	Percent	Cumulative Percent
Somewhat	3	15.0	15.0
Quite	5	25.0	40.0
A Lot	12	60.0	100.0
Total	20	100.0	

Regarding their **satisfaction with the IMPACT Project coordination** (Table 67), the vast majority reported that it was quite or very satisfied (90%).

Table 8.14. Evaluation of the IMPACT Project coordination

	Frequency	Percent	Cumulative Percent
Rather no	1	5.0	5.0
Somewhat	1	5.0	10.0
Quite	6	30.0	40.0
A Lot	12	60.0	100.0
Total	20	100.0	

Finally, regarding their **satisfaction with the IMPACT partners in general or specifically** (Table 68), the vast majority reported that it was quite or very satisfied (85%).

Table 8.15. Evaluation of the IMPACT partners

	Frequency	Percent	Cumulative Percent
Somewhat	3	15.0	15.0
Quite	7	35.0	50.0
A Lot	10	50.0	100.0
Total	20	100.0	

Qualitative findings from *IMPACT Partners' Views concerning the Effectiveness of the Project*

During the final meeting (28-29 of November 2019) in Athens, the coordinator of the IMPACT Project organized a semi-structured, focus group interviews with open-ended questions in order to evaluate the effectiveness of the IMPACT Project (e.g., online questionnaires, educational material, website, webinars). The interview lasted around 20 minutes. Participants were 13 partners from the Universities implementing the IMPACT Project in their countries (University of Thessaly, Greece; University of Grenoble-Alpes, France;

University of Padova & Free University of Bozen, Italy; Hacettepe University, Turkey; Autonomous University of Barcelona, Spain), 2 partners from Educational Institutes (Institute of Educational Policy in Greece, ANKARA MEM) and 2 partners from PE Associations (EUPEA, DSLV). Below are some major points stemming from this focus group interview and related discussion.

Question: "*Did the IMPACT tools helped PE teachers' training and pupils to increase their out of school PA?*" All consortium members agreed that they are helpful, e.g., one partner representing a European PE teacher Association said "*IMPACT added value; we created educational material that is applicable to PE teachers*". Several partners mentioned that further improvement is needed, e.g., a European academic said that "*I agree that the tools we developed are helpful to PE teachers but we need to improve several things, e.g. to improve-extent the content of the webinars*". There was agreement that the content should be further improved and become appropriate for different developmental stages of pupils.

Question: "A*re the IMPACT measures useful and how they can help PE teachers?*" Partners agreed that they are useful. A European researcher said that "*All measures are useful in order to identify and monitor students' PA levels and the psychosocial variables that affect their PA levels*. *But we still need to develop a monitoring tool that will monitor more effectively the where, when, how and with whom a pupil is planning to participate in out of school PA*". Another European researcher said that "*the measures are useful, but we need to examine more factors that influence pupils' PA, for example, we need to add more variables related to family or neighborhood (environmental factors)*". However, another European researcher added that "*the IMPACT survey is too long & we need to connect it more with the PE teachers training*".

Question "*Who can primarily benefit from IMPACT tools & outputs?*" Partners mentioned PE teachers, e.g., a European academic said "*PE teachers and pupils can benefit from IMPACT measures and findings. Pre-service PE students can also benefit from our measures and findings if we train them*". A partner representing European PE teachers added "*we need to focus more on the policy-makers*".

Question "Did *PE teachers or parents directly benefit from IMPACT measures or findings?*" There was also agreement on this point. For example, A European researcher said "*parents or PE teachers can benefit from our measures because they can monitor - evaluate their children/pupils' PA levels*". A colleague representing PE teachers added that "*our measures might help parents understand that they have a significant role to increase their children PA*". It was agreed that we need to involve and train also parents in order to increase their children's PA levels.

Question "*Were the webinars delivered and received well in all 4 countries?*" A colleague said, "*yes regarding France*". Also, a partner from Italy responded "*yes*". He also mentioned that "*in Italy, they sent an e-mail to PE teachers participating in these webinars asking them free comments about the educational material. He said that only positive comments they received*". A colleague from Turkey also responded "*yes*" about Turkish webinars. The aforementioned positive evaluation from Greek PE teachers was also mentioned.

Question "*Can the 5-6 webinars be helpful in the future and can we use them for in-service training?*" They all agreed that they will be helpful, e.g., one said, "*yes they are helpful and easily deliverable*", a colleague from a country other than the four where the webinars were delivered added *that "they are helpful*". Another added that "*we need to connect them with the Dissemination. We need to keep them online (open access), to translate them in other languages, to use them for asynchronous training*". Another added that "*PE teachers need more practical examples, the content was great, it was ok, but we need to add some more practical things. The webinars are ok for pre-service PE teachers, but for in-service teachers, we need to add more applicable examples*". A colleague from a European educational authority said: "*we need to connect them with PE teachers' certification*".

Question "*Is the IMPACT website useful and can we use it for further training?*" All partners agreed that it is useful for PE teachers' training. A partner from a PE teacher Association also said that "*it is useful and it is important that we have it free - open access*".

IMPACT project dissemination

Several actions were organized to disseminate the outcomes of the project.

- Two symposia were organized within the regular programme of two European/International Congresses of Sport Pedagogy and Sport Psychology respectively, where all IMPACT project partners participated:
  - 2018 AIESEP Congress in Edinburgh, Scotland.
  - 2019 FEPSAC in Muenster, Germany.
- The IMPACT project final event, which was also delivered streamlined (French Institute, 29 November 2019, Athens, Greece). All IMPACT project partners were involved.
- A presentation of the IMPACT Project at the 13th FIEP 2018 World & European Congress with the title: (Istanbul, Turkey; 29th of September 2018; Presenter: Prof. Papaioannou, project coordinator).
- A presentation of the IMPACT project at the EUPEA meeting in Crete, 11-13 October 2019, delivered by staff of EUPEA and university of Thessaly.
- Three workshops were also contacted in Greek National Conferences of PE teachers:
  - EGVE Congress, 22 of April 2019, Northern Greece Association of Physical Educators.
  - Π.ΕΝ.Ε.Λ.Φ.Α. Congress, Crete, 12 of October 2019 (ΠΑΝΕΛΛΗΝΙΑ ΕΝΩΣΗ ΕΚΠΑΙΔΕΥΤΙΚΩΝ ΛΕΙΤΟΥΡΓΩΝ ΦΥΣΙΚΗΣ ΑΓΩΓΗΣ - Hellenic Society of Physical Educators).
  - ΠΕΠΦΑ Seminar on 22 of November 2019, Larisa, Greece (Association of Physical Educators in Larisa).
- A presentation of the IMPACT Project at the 18th Congress of Association des Chercheurs en Activités Physiques et Sportives (ACAPS; Paris, France, 29-31 of October 2019).
- An oral communication about the IMPACT project was presented at the Spanish Conference of Sport and Exercise Psychology (Zaragoza, 13th to 16th March 2019)
- Dissemination of the IMPACT Project through local newspapers, national news agencies, and partners' websites.

More details about IMPACT Project Dissemination can be found on the IMPACT project website (www.impactpe.eu/site/index.php/en/about/dissemination).

Summary

Both the PE teachers who were trained through the IMPACT project webinars and the IMPACT project personnel who implemented the project found all project outcomes useful and of high quality. Several recommendations for project tools' improvement, extension and adaptation were made. A summary of these suggestions appear in the recommendations chapter.

CHAPTER 9: IMPACT PROJECT RECOMMENDATIONS

The IMPACT project was successful in terms of promoting European pupils' Physical Activity (PA) through an intervention in European Physical Education (PE). Through the IMPACT project activities a number of tools were developed, several research outputs emerged and many experiences were collected. These can be useful to European institutions and policy makers focused on the promotion of pupils who mostly need PA.

Pupils' PA is determined by multiple individual and environmental factors, including pupils' physical literacy, the competences and resources of pupils' parents, educators and trainers with regard to youth PA, and the institutions that provide resources, training and opportunities for youth PA. Hence, effective interventions to promote European youth PA should target PA at different levels of generality: pupils, teachers, parents, local authorities, governments, European Institutions.

At the center of the IMPACT project was the systematic and accurate monitoring of youth PA accompanied by knowledge and skills to increase pupils' motivation in PA. These are needed at different levels of generality. As shown in Figure 9.1, the IMPACT project focused on the two lowest levels of generality, on pupils and PE teachers respectively. This work should be continued in order to further improve and adapt these tools for different pupil ages, European languages and populations (e.g., children with special needs, parents, coaches, etc.).

Future interventions should also focus on the higher levels of generality: European institutions, national governments, regional and local authorities. These are needed for two general purposes, (1) to directly implement and possibly extent and adapt the present tools for policy needs and actions, (2) to transfer, multiply and implement these tools across large European populations at lower levels (schools, teachers, pupils).

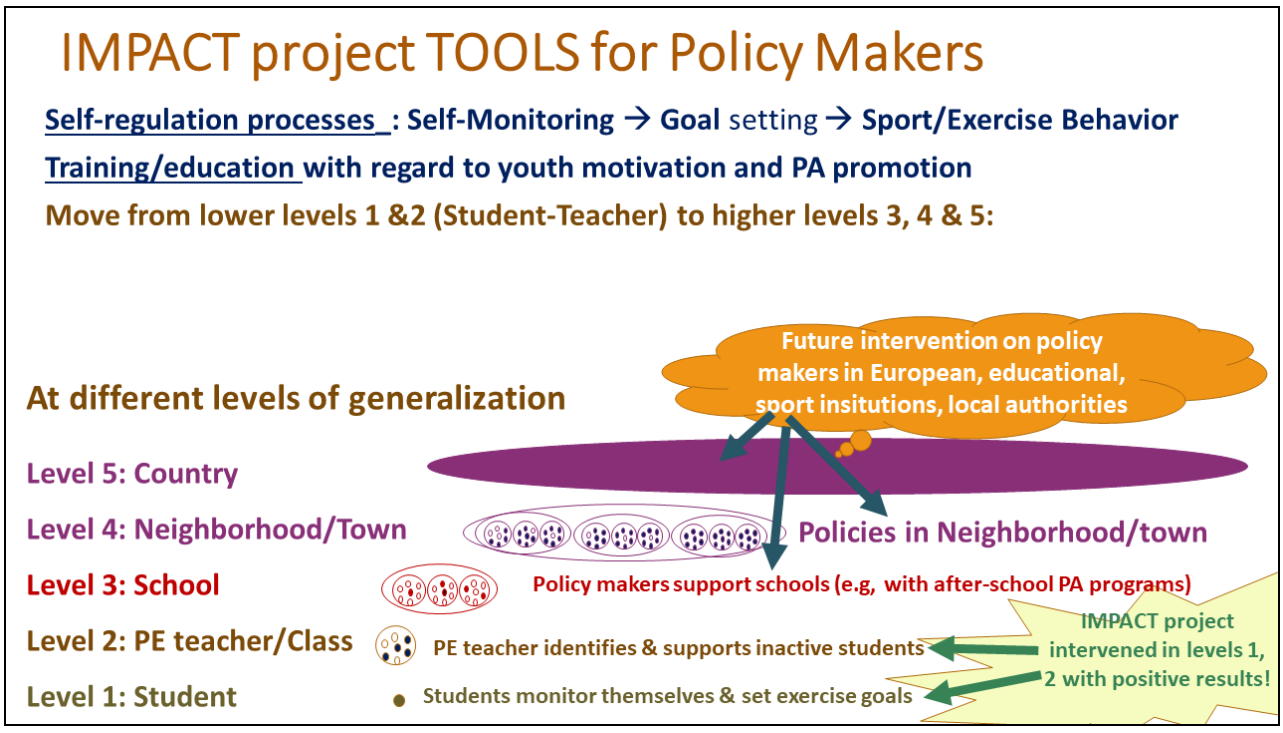


Figure 9.1. Monitoring, goal-setting and knowledge about pupils' motivation in PA

The following recommendations stem directly from the IMPACT project findings. They are addressed to policy makers interested in promoting European youth PA:

1. Adopt the IMPACT tool to monitor PA consistently across all schools at local, regional and country level. Identify schools with low levels of activity and support these schools and their neighborhoods with specific strategies, some of them described below.
2. Open the sport and exercise facilities of schools during afternoons and weekends for extra-curricular physical activity of youth who mostly need PA.
3. Invest on the improvement of sport and exercise facilities and equipment of schools.
4. Promote sports development and sports facilities in neighborhoods and villages located in impoverished areas and close to schools with low levels of PA.
5. Cover the costs of participation in sports for families of low Socio-Economic Status.
6. Increase days of Physical Education (PE) in schools across all Europe. As was reported here, only one additional day of PE per week contributed significantly in pupils' PA both inside and outside of school.
7. All pupils across all ages should have more than one day of PE per week in school. In schools with just one day of PE per week, pupils perceive that PA has low importance in their life.
8. Decrease homework for school preparation in schools and countries where this is too high. Lack of time and homework emerged as the most important barrier for extra-curricular PA.
9. Invest in PE teachers' in-service training with regard to pupils' motivation and PA promotion.
10. Encourage the adoption of the IMPACT project webinars & tools for European PE teachers' training with regard to pupils' motivation and PA promotion across Europe.
11. Collaborate with national and local researchers and PE teachers to adapt the IMPACT project educational material across different grades/ages – make it developmentally based.
12. Encourage pre-service teacher education programs (i.e., universities) focused on extra-curricular physical activity.
13. Promote European students' internships focused on out-of-school physical activity.
14. Adopt campaigns to inform all European parents and school teachers about the recommendations of health organizations for youth physical activity.
15. Invest on parents' training and retraining (from irrational beliefs about sport and PA) concerning youth motivation and PA promotion.
16. Start interventions with PE teachers and parents to promote children's participation in sport before preadolescence and if possible from kindergarten.
17. Review and adaptation of PE curricular and adaptation for girls' needs.
18. Review and adaptation of PE curricular for children with low competences in sport and motor difficulties, making them inclusive for all.

19. Ensure that PE teaching is made by PE specialists across all school grades.
20. Disseminate the use of the IMPACT project website for in-service and pre-service training for physical activity promotion.
21. Promote the use of self-monitoring and goal-setting for out-of-school PA as very important strategies for youth PA promotion.
22. Disseminate the use of the short IMPACT project measure (5-minutes to complete) to facilitate teachers' identification of inactive pupils, goal-setting programs for PA promotion and the development of pupils' self-regulation skills in PA.
23. Disseminate the IMPACT project measures for the training of teachers and parents, to facilitate their understanding of theory of motivation and its application in school physical education.
24. Promote the use of other motivational measures (e.g., enjoyment in physical education) with pupils to understand how their progress and collaboration with others makes them happy.

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