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# Physical Education Classes with different durations, and their contribution to Daily Physical Activity Recommendations of Adolescents in Porto, Portugal

# Clases de Educación Física con diferentes duraciones y su contribución a las Recomendaciones de Actividad Física Diaria de Adolescentes en Porto, Portugal

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**Abstract.** Objective: For many adolescents, physical education classes (PE) provide the most relevant opportunity to be engaged in physical activity (PA). Although the evidence suggested low levels of PA in PE few studies have focused their investigation on the contribution of PA performed during PE to daily PA. So, the purpose of this study was to analyze PA levels of adolescents in Porto, Portugal during daily school hours when they attended PE (PED) with 45 min of duration (PED45), PE with 90 min of duration (PED90), school days without PE (NPED) and weekend days (WD). Methods: This study was conducted in four Portuguese public schools with 441 students (253 girls) volunteers, aged between 10 to 18 years (14.31 ± 2.70). PA was assessed using an Actigraph accelerometer for seven consecutive days. Independent and general linear model repeated measures were used to assess differences between PA according to NPED, PED45, PED90 and WD. A logistic regression was used to investigate the contribution of PE to the compliance of adolescents' daily PA recommendations. Results: PED45 contributed, on average, 16.9% for the daily moderate to vigorous physical activity (MVPA) and PED90 accounted for 32.2%. All students engaged in more MVPA on PED than NPED or WD ($p$<0.05). PE classes were associated with higher odds to accomplished the recommended 60 min of daily MVPA (OR = 2.66, 95% CI = 2.01-3.53). Conclusion: This study suggested that PE increased the daily MVPA levels and played a considerable role in providing PA to accomplish PA guidelines.
**Keywords:** Accelerometer, Physical Activity; Moderate to Vigorous Physical Activity; Physical Education; Adolescents.

**Resumen.** Objetivo: Para muchos adolescentes, las clases de educación física (EF) proporcionan la oportunidad más relevante de participar en actividad física (AF). Aunque las evidencias sugieren niveles bajos de AF en EF, pocos estudios han centrado su investigación en la contribución de la AF realizada durante la EF a la AF diaria. Por lo tanto, el propósito de este estudio fue analizar los niveles de AF de adolescentes en Porto, Portugal durante las horas escolares diarias cuando asistían a EF (PE) con una duración de 45 minutos (PE45), EF con una duración de 90 minutos (PE90), días escolares sin EF (NEF) y días de fin de semana (FD). Métodos: Este estudio se llevó a cabo en cuatro escuelas públicas portuguesas con 441 estudiantes (253 niñas) voluntarios, con edades comprendidas entre 10 y 18 años (14,31 ± 2,70). Se evaluó la AF utilizando un acelerómetro Actigraph durante siete días consecutivos. Se utilizaron modelos lineales generales independientes y de medidas repetidas para evaluar las diferencias entre la AF según NEF, PE45, PE90 y FD. Se utilizó una regresión logística para investigar la contribución de la EF para el cumplimiento de las recomendaciones diarias de AF de los adolescentes. Resultados: PE45 contribuye, en promedio, con el 16,9% de la AF MVPA (actividad física moderada a vigorosa) diaria y PE90 representó el 32,2%. Todos los estudiantes participaron en más MVPA en PE que en NEF o FD ($p$<0,05). Las clases de EF se asociaron con una mayor probabilidad de cumplir con los 60 minutos recomendados de MVPA diaria (OR = 2,66, IC del 95% = 2,01-3,53). Conclusión: Este estudio sugiere que la EF aumentó los niveles de MVPA diaria y desempeñó un papel considerable en proporcionar AF para cumplir con las pautas de AF.
**Palabras clave:** Acelerómetro, Actividad Física; Actividad Física Moderada a Vigorosa; Educación Física; Adolescentes.

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## Introduction

Obesity stands as one of the most pressing public health concerns of our century era, rapidly escalating on a global scale (World Health Organization, 2020). Concurrently, PA among adolescents has witnessed a decline over recent decades (Guthold, 2020), with sedentary behavior increasingly pervading the lives of young individuals (García-Hermoso et al., 2023; López-Gil et al., 2021).

A growing body of evidence underscores the beneficial impact of PA on health (Baumgartner et al., 2020). Considering that children and adolescents spend a substantial portion of their day in educational settings, schools play a pivotal role in both providing and promoting PA (van Sluijs, 2021; Moon et al., 2024). For many adolescents, school represents a primary opportunity for engaging in PA (Demetriou, 2019; van Sluijs, 2021) an aspect particularly crucial for overweight adolescents who generally exhibit lower activity levels compared to their normal-weight peers (Cooper et al. 2015; Costa et al., 2017). However, current statistics reveal that children and adolescents across the WHO European region spend nearly two-thirds of their school time engaged in sedentary behavior and merely five percent in physical activities (Moon et al., 2024; World Health Organization, 2021).

PE programs within schools have been recognized as pivotal for promoting healthy and active lifestyles among youth (Dobbins et al., 2020; Drouka et al., 2023). PE provides meaningful and positive PA experiences that may instill lasting attitudes toward PA into adulthood. Exposure to adequate PE class time, optimized for physical activity, enhances students' energy expenditure, contributing significantly to weight management and fitness maintenance (Martins et al., 2022; Drouka et al., 2023).

Despite the recognized importance of PE, and daily PE in schools have been recommended in Europe (EGHEPA,

2015) these programs encounter various challenges, including widespread physical inactivity among children and families (World Health Organization, 2021), competition with academic priorities (Costa et al., 2017; Quennerstedt, 2019), and budget constraints (McKenzie & Kahan, 2008).

Many schools struggle to meet the recommended frequencies and intensities of PE and PA opportunities (Sallis et al., 2012; Moon et al., 2024). Healthy People 2010, for instance, advocated for increased adolescent participation in daily PE, with at least 50% of class time devoted to physical activity (U.S. Department of Health and Human Services, 2000), with at least 50% of class time devoted to being physically active (Centers for Disease Control and Prevention, 2010). However, research indicates that the majority of schools fall short of these recommendations, failing to provide adequate opportunities for student participation in PA (Kahan & McKenzie, 2016; Martins et al., 2022).

Although PA levels during PE may be suboptimal (Beale et al., 2021; Kobel et al., 2015), with MVPA accounting for only a fraction of total PE time, the contribution of PE remains significant. For many adolescents, PE may represent their primary opportunity for engaging in meaningful MVPA (OECD, 2019). In a Portuguese study, Ferreira et al., (2014) found that the mean time spent in MVPA during PE class was 25.36 ± 15.69 minutes, which corresponds to 28.18% of the total time spent in PE. Similarly, Costa et al., (2017), in a Portuguese sample, found that non-overweight students (NOW) were significantly more engaged in MVPA (36.73%) during PED45 (10.62 min) compared to their overweight (OW) counterparts (28.72%, 7.94 min). This trend persisted in PED90, with NOW students engaged in MVPA for 31.4% of the total time (20.46 min) compared to OW students (26.04%, 17.09 min). Brusseau et al., (2011), in a study conducted with 363 children (8-11 years old) using pedometers seven consecutive days, found that children exhibited higher activity levels on school days compared to weekends, with PED showing increased activity compared to NPED. Gråstén et al., (2015) in a study that analyzed objectively PA participation, with accelerometers, found that the two PE45 classes that students have on their week provide 26.2% and 33.6% of weekly MVPA of girls and boys, respectively.

Given that a significant proportion of adolescents engage in PA solely within the school setting, ensuring adequate time for PA during school hours, particularly within PE classes, is crucial for promoting healthier lifestyles (OECD, 2019). The EU Guidelines on 'Health Enhancing Physical Activity' (EU Working Group 'Sport & Health', 2008) estimated that up to 80% of school-age adolescents engage in PA solely at school. Martins et al., (2020) have shown that only about 20% of adolescents reported participating in daily PE, as many international authorities have been recommending. Additionally, about 20% of adolescents reported never attending PE. In Portugal, only 15.7% of youth engage in at least one hour of physical exercise daily (Guthold, 2020). So, sufficient time devoted to sport and PA at school, especially on PE classes, can make a key contribution to healthier lifestyles.

The Expert Group on Health-enhancing physical activity (2015), recommends increasing PE time during compulsory education to at least five lessons per week, approximately five hours. In Portugal, PE curriculum in basic education allocate a minimum of 135 min per week, distributed across three 45 min sessions, while secondary school curricula allow for 180 min per week, divided into four 45-minute sessions (Direção-Geral da Educação, 2001). However, resource limitations often lead schools to consolidate PE into two weekly blocks (90 + 45 min in basic education and two blocks of 90 min in secondary school), compromising total PE time (Costa et al., 2017; Ferreira et al., 2014).

Therefore, the aim of this study was to evaluate PA during PE classes among adolescents in Porto and assess their contribution to daily and weekly PA. Additionally, we sought to analyze differences in PA among Porto adolescents during school hours on days with PE 45 min of duration (PED45), PE with 90 min of duration (PED90), school days without PE (NPED) and weekend days (WD).

## Material and Methods

### *Participants and data collection*

This was a cross-sectional study conducted in basic and secondary schools developed in Porto area, Portugal, designed as an intervention project to promote physical activity. Ethical approval for this study was obtained from the Faculty of Sports ethics committee, the Portuguese Foundation for the Science and Technology, Portuguese Data Protection Authority (Process 6766/2015) and by the regional section of the Ministry of Education (Process 1402/2015).

Twenty-five public schools in the Porto area, Portugal, were contacted via both mail and email to solicit their participation in the study. Of these, 13 schools declined to participate, six did not respond to the invitation, and six schools agreed to partake in the research. All students from the schools that agreed to participate were invited to be part of the study.

The participants included 603 children and adolescents who consented to participate and obtained written parental consent. Following the exclusion of individuals who did not attend physical education classes or did not wear an accelerometer for at least four consecutive days (comprising three weekdays and one weekend day), the final sample consisted of 441 adolescents (253 girls) aged between 10 and 18 years (mean age: 14.31 ± 2.70).

### *Anthropometric measures*

Body mass and height were assessed following standardized protocols. Weight was measured to the nearest 0.10 kg, with participants wearing light clothing (underwear and a t-shirt), utilizing a portable digital scale (Tanita Inner Scan BC 532, Wembley, UK). Height was measured to the nearest 0.01 m while participants stood barefoot or in stockings

against a SECA 217 portable stadiometer.

Body Mass Index (BMI) was computed using participants' weight and height [weight (Kg)/height$^2$ (m)]. The classification of BMI followed internationally recognized procedures proposed by Cole (2000), which take into account the age and sex of children and adolescents, enabling categorization as normal, overweight, or obese. Accordingly, in our study, children were stratified into non-obese (NOW) and overweight/obese (OW) groups based on specific cut-off points for age and sex (Cole, 2000).

***Physical Activity***

PA was assessed using Actigraph accelerometers, specifically models GTM1 and wGT3X-BT (Pensacola, FL, USA). Although two different models of accelerometers were used, according to a study by Vanhelst et al., (2011), uniaxial and triaxial accelerometers do not differ in their measurement of PA in population studies, and either could be used in such studies. The accelerometers were positioned on the right side of the waist, and participants were instructed to wear them continuously for seven consecutive days. Subsequently, the collected data were downloaded into the Actilife software for processing. Initially, the validity of wear time was confirmed by distinguishing between device usage and non-usage, and differentiating between periods of sleep and PA using the algorithm developed by Choi et al., (2011). A minimum recording of 480 minutes per day was established to consider the data valid for daily physical activity assessment, and at least four days of valid usage within the seven-day period were required for inclusion in the analysis. A minimum of four measurement days has been recommended to achieve sufficient reliability, typically quantified by an intraclass correlation coefficient (ICC) of 0.8 among days (Trost et al., 2000).

To evaluate physical activity performed during physical education (PE) classes, the data were filtered based on the schedule of attended PE classes.

Data analysis employed specific cut-off points (in counts per minute) developed by Evenson et al., (2008). These cut-off points delineated various intensity levels of physical activity: Sedentary behavior (0 to 100 counts per minute), Light activity (101 to 2295 counts per minute), Moderate activity (2296 to 4011 counts per minute), and Vigorous activity (more than 4012 counts per minute). For the purposes of this study, TPA was calculated by summing all intensity levels of physical activity and MVPA was defined as activity exceeding 2295 counts per minute.

***Physical Education Classes***

The PE classes observed are an integral component of the standard school curriculum defined by the Ministry of Education and Science and are conducted twice weekly by specialized physical education teachers. In order to evaluate "normal" non-intervened PE, no specific instructions were provided to the teachers, regarding the content of these lessons. However, the content of each class was meticulously recorded, as it is recognized that it can significantly influence the intensity of PA.

A total of 119 PE classes were observed, representing the two weekly sessions per student. Subsequently, the mean percentage of PA engaged during these classes was calculated. Each session of 45PE had a duration ranging from 20 to 49 minutes (mean: 31.68±6.48), while the 90PE ranged from 42 to 84 minutes (mean: 66.20±7.23). The time duration of each PE class was recorded when at least 51% of the students were present, and the class observation was concluded when at least 51% of the students had left the PE setting. This recorded time was utilized to calculate the duration of each class.

The outcome measure, expressed as the mean proportion of class time spent in PA, was derived by dividing the mean class time spent in each level of PA by the mean total duration of the classes. To calculate the proportion of MVPA from PE classes to daily MVPA, the MVPA time in PE classes was divided by the total MVPA time for the day and multiplied by 100.

***Statistical Analysis***

A descriptive analysis, including means and standard deviations, was conducted to characterize the demographic features of the participants. All data were analyzed using the statistical software SPSS® 20.0, with a significance level set at 5%.

To investigate patterns of PA participation, data recorded from the school time were categorized into four groups: NPED, PED45, PED90 and WD. Sex, age and BMI differences across different PA intensities throughout the week, as well as the contribution of 45 and 90 minutes PE classes to daily MVPA were assessed using One-way repeated measures ANOVA. Post-hoc pairwise comparisons were conducted using the Bonferroni correction for multiple comparisons to identify significant differences in PA levels and days of the week.

Regression analysis models were employed to explore the association between compliance with the recommended daily 60 minutes of MVPA and participation in PE classes. Established potential confounding factors for MVPA among adolescents, including sex, age, and BMI, were included in the analyses to identify the model that best explains the observed data.

## Results

The characteristics of participants and their physical activity (PA) patterns across the week are outlined in Table 1.

There were no statistically significant differences observed for sex, age or BMI. On average, participants recorded 6.2±1.0 days of valid accelerometer data, including 1.6±0.5 weekend days and 1.7±0.4 days with PE. 45PE had an average duration of 32±6 minutes, while those lasting 90PE had an average of 66±7 minutes.

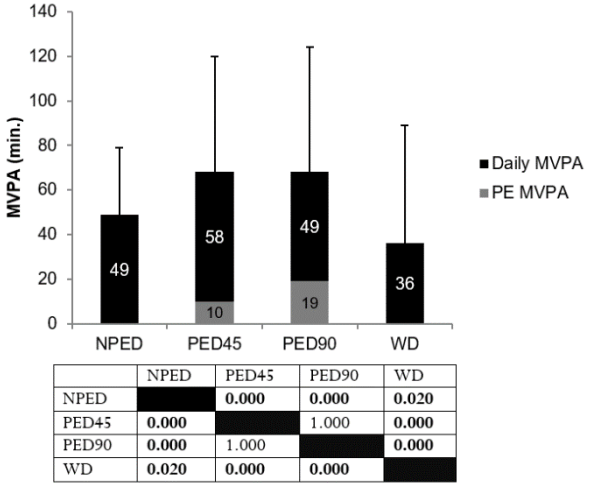
Table 1.
Participants' characteristics

| | All (n = 441) |
|---|---|
| Age (years) | 14.31±2.70 |
| BMI (Kg/m2) | 22.04±3.96 |
| TPA | |
| PED45 (min/d) | 857.30±126.33 |
| PED90 (min/d) | 861.63±153.29 |
| NPED (min/d) | 831.03±117.85 |
| WD (min/ d) | 752.14±142.38 |
| SB | |
| PED45 (min/d) | 460.38±121.55 |
| PED90 (min/d) | 480.42±146.93 |
| NPED (min/d) | 495.42±110.74 |
| WD (min/ d) | 414.57±129.00 |
| LPA | |
| PED45 (min/d) | 328.64±89.63 |
| PED90 (min/d) | 321.20±87.90 |
| NPED (min/d) | 287.03±68.65 |
| WD (min/ d) | 301.60±96.03 |
| *MVPA* | |
| PED45 (min/d) | 68.28±58.38[a] |
| PED90 (min/d) | 69.33±67.88[a] |
| NPED (min/d) | 48.57±30.41[a] |

Data are expressed as means and standard deviations.
BMI: Body mass index; TPA: total physical activity; SB: sedentary behavior; LPA: light physical activity; MVPA: moderate to vigorous physical activity; PED45: 45 minutes physical education class days; PED90: 90 minutes physical education class days; NPED: days without physical education classes; WD: weekend days. a Values adjusted for sex, age and IMC. Bold text indicates significant P values (p<0.05).

Using One-way repeated measures ANOVA, we identified statistically significant differences in the amount of MVPA performed across the week ($p$<0.05). Mauchly's test indicated a violation of the assumption of the sphericity $\chi2(5) = 18.75$ $p = 0.002$, thus the degrees of freedom were adjusted using Huynh-Feldt estimates of sphericity ($\varepsilon = 0.95$). The results revealed a significant effect of each type day of the week on MVPA levels, F(2.84) = 2.98, $p = 0.034$. Specifically, both PED90 and PED 45 exhibited significantly higher mean MVPA compared to NPED [M diff = 20.76 (95%CI = 7.27 to 34.26) and M diff = 19.71 (95%CI = 9.09 to 30.33), $p < 0.05$], as well as WD [M diff = 33.36 (95%CI = 22.06 to 44.67) and M diff = 32.32 (95%CI = 21.57 to 43.07), $p < 0.05$]. However, no significant differences were observed between PED45 and PED90 [M diff = 1.05 (95%CI = -8.75 to 10.85), $p < 0.05$].

No statistical differences were observed in Total Physical Activity (TPA), Sedentary Behavior (SB), and Light Physical Activity (LPA) levels across the week among PED45, PED90, NPED and WD [F (2.56) = 0.33, $p = 0.768$; F (2.22) = 1.41, p = 0.247; F (2.91) = 0.31, p = 0.815, respectively]. Additionally, SB was higher on NPED compared to PED90 [M diff = 15.01 (95%CI = -13.30 to 43.31), $p < 0.05$], PED45 [M diff = 35.05 (95%CI = 11.94 to 58.15), $p < 0.05$] and WD [M diff= 80.85 (95%CI = 41.12 to 120.58), $p < 0.05$]. In terms of LPA, on average, PED45 exhibited a higher amount of time compared to NPED [M diff = 41.61 (95%CI = 20.93 to 62.29), $p < 0.05$] and WD [M diff = 27.04 (95%CI = 0.43 to 53.65), $p < 0.05$]. Although not statistically significant, LPA during PED45 was higher than in PED90 [M diff = 7.44 (95%CI = -15.49 to 30.36), $p > 0.05$].




| | NPED | PED45 | PED90 | WD |
|---|---|---|---|---|
| NPED | | **0.000** | **0.000** | **0.020** |
| PED45 | **0.000** | | 1.000 | **0.000** |
| PED90 | **0.000** | 1.000 | | **0.000** |
| WD | **0.020** | **0.000** | **0.000** | |

Figure 1. Minutes spent in MVPA on NPED, PED45, PED90 and WD adjusted for sex, age and BMI and PE classes' contribution for MVPA in the PED. Significant differences (P < 0.05) between days of the week.

Table 2.
Logistic regressions showing the association between compliance of the 60 minutes daily of MVPA recommended and have PE

| | OR | (95% CI) | *P* |
|---|---|---|---|
| PED45 | 3.18 | (2.03-4.98) | 0.000 |
| PED90 | 2.90 | (2.14-3.92) | 0.000 |
| Sex | 3.69 | (2.78-4.88) | 0.000 |
| Age | 1.07 | (1.01-1.13) | 0.016 |
| BMI | 0.83 | (0.62-1.12) | 0.233 |

PED45: 45 minutes physical education class days; PED90: 90 minutes physical education class days; BMI: body mass index. Bold text indicates significant P values (p<0.05).

On average, we observed differences in the contribution of PE with varying durations to daily MVPA, F (1) = 71.73, $p = 0.000$. Specifically, PE classes contribute 16.8% for MVPA in PED45 and 34.7% of MVPA in PED90, equivalent to 9 min and 19 min of MVPA, respectively (figure 1).

Our findings suggest that a higher proportion of adolescents meet the recommended 60 minutes of daily MVPA during PED45 and PED90 (47.8% and 50.2%, respectively), compared to NPED and WD where compliance rates are much lower (27.7% and 12.7%, respectively). A logistic regression was conducted to assess the impact of participating in PE classes, adjusted for sex, age and BMI, on compliance of the recommended 60 minutes of daily MVPA (Table 2). The logistic regression model yielded a statistically significant result $\chi2(5) = 144.516$ $p = 0.000$. The model accounted for 18.6% (Nagelkerke $R^2$) of the variance in the MVPA recommendation compliance and accurately classified 69.0% of cases. Participants engaged in PED45 and PED90 had 3.18 and 2.90 times higher odds, respectively, of complying with international MVPA recommendations. Boys exhibited 3.69 times more odds of compliance compared to girls, while older participants were 1.07 times more likely to meet the recommendations than their younger counterparts. No significant differences were observed for BMI.

## Discussion

This research presents findings regarding PA engagement, comparing PED, NPED and WD, and analyzes the contribution of PE to daily MVPA. Our results indicate that PE effectively increases daily MVPA levels, with adolescents spending significantly more time engaged in MVPA on PED compared to all other days of the week ($p < 0.05$) (refer to figure 1). This represents an enhanced MVPA participation of 16.9% in PED45 and 32.2% in PED90. Furthermore, PE significantly contributes to overall daily PA. On PED45, participants engaged in 26 min more of TPA compared to NPED, and on PED90 they accumulated 30 min more, with PED45 contributing 10 min to daily MVPA and PED90 contributing 19 min.

Few studies have focused on the contribution of PE to meeting health-related daily PA recommendations, and such data are valuable for designing interventions to increase PA, as well as for prescribing individual exercise for specific groups (Martins et al., 2022; Moon et al., 2024). Guidelines for children and adolescents suggest 60 minutes of daily MVPA to confer health benefits (OECD, 2019; World Health Organization, 2020). This is particularly relevant nowadays, considering that inactivity and low levels of PA are significant contributing factors to adolescent obesity (Hadianfard et al., 2021), and recent data has shown high levels of obesity at earlier ages (Brambilla et al., 2022; Frade et al., 2021). Therefore, PE can play an important role in promotion PA and contributing to public health (Moon et al., 2024; Smith et al., 2015; van Sluijs, 2021).

Studies conducted to analyze MVPA during PE classes have indicated low levels of students engagement. Fairclough and Stratton (2006) reviewed 44 articles to estimate the PA levels during PE classes and concluded that, on average, children and adolescents spend 37% of their PE time engaged in MVPA. Recent studies suggest even lower levels of MVPA during PE (Beale et al., 2021; Hall-López, 2020).

Despite this, PE offers a valuable opportunity during childhood and adolescence to acquire and practice skills that can promote lifelong fitness and good health (OECD, 2019; van Sluijs, 2021). PE extends beyond is not limited to training in physical skills and has more than just a recreational dimension. Objectives extending beyond sports, such as promoting good health, fostering personal development, and enhancing social inclusion, underscore the importance of PE in school curricula (OECD, 2019; UNESCO, 2015; World Health Organization, 2018). In a recent review study, Silva et al., (2022) found that participation in physical education classes may contribute to students being more physically active and less likely to engage in sedentary behavior.

The World Health Organization (2020), supported by various studies (Martinez-Gomez, 2009; Tremblay et al., 2011; Roberts et al., 2017), emphasize the decline in PA levels among European adolescents, coupled with increased sedentary lifestyles and obesity, posing significant risks for physical, metabolic and mental health during youth and later life. These guidelines estimate that up to 80% of school-age adolescents engage in PA primarily at school (EU Working Group 'Sport & Health', 2008). Therefore, adequate time dedicated to sports and PA during school, particularly in PE classes, can significantly contribute to healthier lifestyles.

An Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents (U.S. Department of Health and Human Services, 2012) reviewed numerous studies linking that increased MVPA is associated with cardiovascular diseases. They found strong evidence indicating that increased MVPA is associated with lower blood pressure, reduced body fat measures, lower BMI, improved fitness, healthier lipid profiles, and decreased insulin resistance during childhood and adolescence. Recent studies enhance these findings (Baumgartner et al., 2020). While specific recommendations for optimal cardiovascular health are limited, interventions involving 20-60 minutes of PA 2 to 5 times per week in children aged 3-17 years, including dynamic and isometric exercises, have been effective in preventing clustering of cardiovascular risk factors. The Panel recommends at least 60 min of MVPA daily for children over 5 years of age, advocating for the promotion of PA in schools. Hence, increasing daily MVPA during PE could substantially contribute to meeting these recommendations and reducing metabolic disease risk. Therefore, increasing daily MVPA from 49 min on NPED to 69 min on PED90 and 68 on PED45 could make a crucial contribution to meeting the recommendations and, consequently, reducing the risk of metabolic diseases. Moreover, we found that on PED45 and PED90, 47.8% and 50.2%, respectively, of adolescents students comply with the recommended 60 minutes of daily MVPA, and PED45 and PED90 have, respectively, 3.18 and 2.90 times higher odds of complying with international MVPA recommendations. In NPED and WD, compliance it is much lower, 27.7% and 12.7%, respectively.

Gråstén et al., (2015) reported that PE45 classes provide a substantial portion of weekly MVPA, 26.2% and 33.6% for girls and boys, respectively. These findings underscore the crucial role of PE in facilitating compliance with MVPA recommendations among adolescents and promoting their health. From a Public Health perspective, PE significantly contributes to TPA and daily MVPA (Meyer, et al. 2013; van Sluijs, 2021). Intervention studies, such as that conducted by Kriemler et al. (2010), have shown that increased daily MVPA participation improves fitness and reduces cardiovascular risk. Thus, expanding PE across more school days may further enhance children's and adolescents' PA during the school week (EGHEPA, 2015; OECD, 2019) . In a study conducted to assess whether increasing the frequency of PA practice per week would yield better outcomes compared to concentrating practice on fewer days but with longer durations (3 sessions of 45 min each versus 1 session of 90 min + 1 session of 45 min per week,

respectively), Kobel et al. (2015) observed that augmenting daily MVPA appears to be more efficacious with increased practice opportunities rather than longer practice durations, particularly if this involves reducing the number of days dedicated to PA practice per week. Our findings align with these results and echo the recommendations outlined by the Expert Group on Health-enhancing Physical Activity (2015) and OECD (2019), which advocate for enhanced PE in schools, early childhood motor skills development, and fostering partnerships with the sports sector, local authorities, and the private sector. They propose that the minimum mandated PE lesson time during compulsory education should be elevated to at least 5 lessons per week, totaling approximately 5 hours. Our study highlight the importance of implementing significant public measures and policies to increase physical education in schools, making it a daily, to enhance physical activity among young people. With more PE classes per week it is probable that more adolescents would meet the PA recommendations. The structure and goals of PE curricula should be adjusted accordingly, defining tangible and flexible outcomes for each developmental stage, and suggesting the inclusion of realistic activities.

Limitations of this study include its focus on adolescents from a single metropolitan area, limiting generalizability, and the cross-sectional design, precluding causal inference. However, the study's use of objective measures with high compliance rates during school hours provides valuable insights into TPA and MVPA levels.

## Conclusion

This study suggests that PE contributes to increased daily TPA and MVPA levels among young, playing a significant role in providing structured PA during these formative years. With more PE classes per week, it is probable that more adolescents would meet the PA recommendations. Prioritizing daily physical education in schools can significantly increase physical activity among young people, addressing important public health concerns. Future research could investigate the impact of different frequencies and durations of PE classes on daily TPA and MVPA, as well as explore the barriers and facilitators for effective implementation of PE programs in diverse student populations.

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