

School-Based Physical Activity Programmes: An Integrative Review of Health-Related Research

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ABSTRACT

A widespread lack of healthy habits is a paramount concern to all, and schools, especially through physical education, can be an important setting to promote physical activity and healthier habits among young people. An integrative review was conducted between 2010 and 2023, exploring physical activity programmes in schools and to discuss strategies to elevate students' physical activity levels and habits for a lifetime of autonomous wellbeing. The results included 42 articles: eight reviews completed on related research, 12 studies focused on school-based physical activity intervention programmes, and 22 dedicated to the relationship between physical activity, physical education and health. Recommendations include prioritizing longitudinal research, enhancing student-teacher relationship and collaboration, increasing the level of interest in physical education and the participation in enjoyable activities, developing young people's knowledge, and addressing contextual factors affecting physical activity.

Keywords: physical education; school; fitness for life; health; young people.

INTRODUCTION

The pervasive absence of healthy habits should be a paramount concern to all. According to the most recent data from the public opinion survey Eurobarometer, an estimated 45% of the European Union adult population never exercises or play sports (European Union, 2022). Since adolescents who adopt healthier habits may be more likely to continue with those habits during adulthood (Neil-Sztramko et al., 2021), it is essential to target this population for intervention. Regardless of the implemented policies such as national sports-for-all or action plans to promote physical activity (PA) (World Health Organization, 2018), the levels of participation have not changed much since 2013 (European Union, 2022). The school system can be an important setting to promote PA and health among children and adolescents (Peralta et al., 2020) and Physical Education (PE) classes should assume a proactive role in fostering healthy lifestyles and providing important benefits to public health (Pate et al., 2011). It is crucial to explore the extent to which schools, particularly through PE, can foster an interest and develop a skillset in young people that enables them to pursue a lifetime of autonomous wellbeing.

The first step is to analyse the possible connections between PE, Health and PA in the school context and consider how integrating these connections can contribute to more physically active lifestyles (McCuaig & Quennerstedt, 2018; Quennerstedt, 2019), a central aim of PE. Salutogenesis represents a paradigm shift in understanding wellbeing and disease prevention, positing that all individuals exist on a health-disease continuum model, where no one is ever entirely healthy, but in some way always healthy (Antonovsky, 1996; McCuaig & Quennerstedt, 2018). This is an important idea in how PA should be conceived and implemented in the PE context. Unlike the pathogenesis perspective, focused on identifying and eliminating risk factors, the salutogenic perspective intends to strengthen students' health resources, enabling them to continuously maintain and develop higher levels of health (Antonovsky, 1996; McCuaig & Quennerstedt, 2018; Quennerstedt, 2019).

According to Eriksson and Lindström (2008), the ultimate goal of health promotion is to create prerequisites for a good life and there are different ways in which people, from different backgrounds and contexts, draw upon different resources to do it (McCuaig & Quennerstedt, 2018). To attain this longitudinal engagement in a healthy lifestyles, certain conceptual domains are required (McConnell, 2010). For example, in the Fitness Education Model, three primary 'roots' are packaged together, stating that students: (1) need opportunities to engage in lifetime PA of sufficient intensity and duration to maximize health benefits, (2) need to learn why it is important to develop and maintain adequate levels of PA and physical fitness (PF) and (3) must develop knowledge and skills to plan and execute their own personal plan throughout their lives.

Although some school-based studies seek to analyse the impact of PE and PA to a health-related behaviour at a specific point in time, few follow individuals or groups throughout life to capture the lifelong effects (Rhodes et al., 2017). Therefore, the purpose of this Integrative Review (IR) is to (1) explore PA programmes in schools, from primary to secondary school with a focus on health-related studies and (2) discuss the possible means to elevate students' PA levels and habits for a lifelong involvement in PA.

METHOD

Identification

IR is the broadest type of research review, with the ability to (1) explore the multiple perspectives of research on a particular topic, (2) include conceptual and empiric studies and (3) incorporate and combine diverse methodologies (Whittemore & Knafl, 2005). This method integrates results and recommendations from a wide range of research designs. It provides a comprehensive view that informs and enhances practical decision-making, regardless of the original study methodologies (Younas et al., 2022), particularly when seeking implications beyond the reported literature.

The data collection for this IR included two databases: B-on Database and SCOPUS. The first was selected for its inclusion of many of the leading publishers of scientific journals and international databases most relevant to PE, PA and health in the school context (e.g. Web of Science, EBSCO Health). The second was chosen for the same reason, noting that it was not included in the first database. The identification of additional related studies was based on literature referenced in the collected articles.

Given the ideas and philosophies on longitudinal engagement for a healthy lifestyle shared with the publication of the Fitness Education Model (McConnell, 2010), this IR included publications available from this year on. The following terms were chosen:

‘Physical Education’

AND (‘Physical Fitness’ OR ‘Physical Activity’ OR Exercise)

AND (Wellbeing OR Well-Being OR ‘Well Being’ OR Salutogenic OR Health)

AND (School OR Schools)

After defining the purpose, keywords and databases, the inclusion/exclusion criteria were defined as follows: (1) published between 2010 and 2023; (2) empirical and review studies; (3) published in peer reviewed journals; (4) open access written in English, Portuguese or Spanish; (5) PA related school programmes, from primary to secondary school, and (6) mixed gender classes / groups (most frequent worldwide). Articles specifically focused on obesity, overweight or specific pathologies (e.g. autism spectrum disorders) were excluded.

Selection

The extraction of the IR results was completed by two reviewers and 33 studies were identified as eligible. Subsequently, nine articles were manually added after they had been identified as relevant from reading the initially identified 33 studies. This resulted in a total of 42 documents being considered for the IR (Figure 1).

The selected articles were examined through an inductive thematic analysis that focused on six steps (Braun & Clarke, 2012). The first step is familiarization with the data by undertaking a pre analysis (e.g. titles, keywords), immersing oneself in the data and preparing the material to inform step two. This second step involves highlighting and taking notes of the context of the studies (e.g. type of programme, purpose of the study). The third step involves searching specifically for broader themes (e.g. salutogenesis, students’ participation). The fourth step reviews the identified themes and synthesizes them to form richer themes that inform and determine the direction that is most

relevant to the area of interest (e.g., benefits of PA). The fifth step is to capture the extent to which each theme is related to the area of interest. The final step is to analyse the defined themes to generate a comprehensive report that addresses how best to enhance students' PA levels and habits for a lifelong involvement in PA.

On completion of the sixth step, two major groupings were identified: (1) studies connected to school-based intervention programmes, focusing on the implementation and results, and (2) studies dedicated to the relationship between PA, PE and health (either as mental health or as health-related quality of life (HRQoL)). According to McCuaig et al. (2013), students need to learn how physiological, psychological, social, cultural, environment and economic resources can contribute to their overall health development.

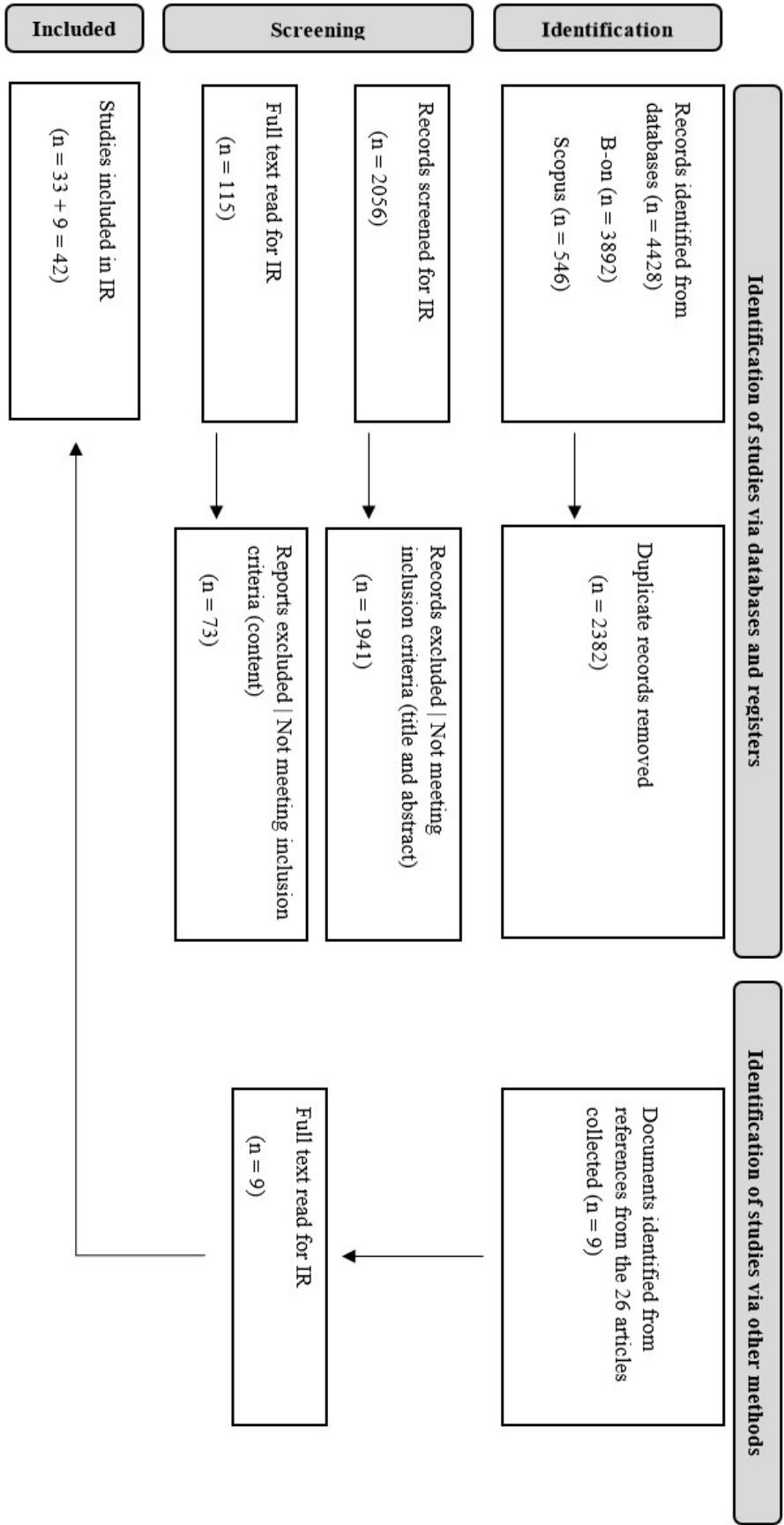


Figure 1. Flow diagram reporting searches of databases and other sources for this IR Adapted from: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: <http://www.prisma-statement.org/> – A short description of all studies is presented in supplemental online material (1, 2 and 3).

RESULTS

Descriptive Overview

From the 42 articles included in this IR, eight were reviews (Ahn & Fedewa, 2011; Alalawi et al., 2023; Andermo et al., 2020; Biddle et al., 2019; Demetriou & Höner, 2012; Ramires et al., 2023; Rodriguez-Ayllon et al., 2019; Solidade et al., 2021). These were analysed separately from the empirical studies, as they did not provide new evidence for the IR presented. The eight reviews are referenced in the discussion.

The remaining 34 studies were empirical, with most contributions from Sindre Dyrstad, Geir Reasland, Erin Kollé and Ruran Solberg. Most were published in 2023 (eight) across the 24 journals. From these 34 articles, two groupings were identified (Figure 2): (1) 12 articles connected to experimental or quasi-experimental school-based intervention programmes; and (2) 22 articles dedicated to the relationship between PA, PE and health.

Given that the goal of this IR goes beyond exploring school-based PA programmes and discuss possible means to elevate students’ PA levels and habits for a lifelong involvement in PA, greater emphasis will be placed on the health approach grouping.

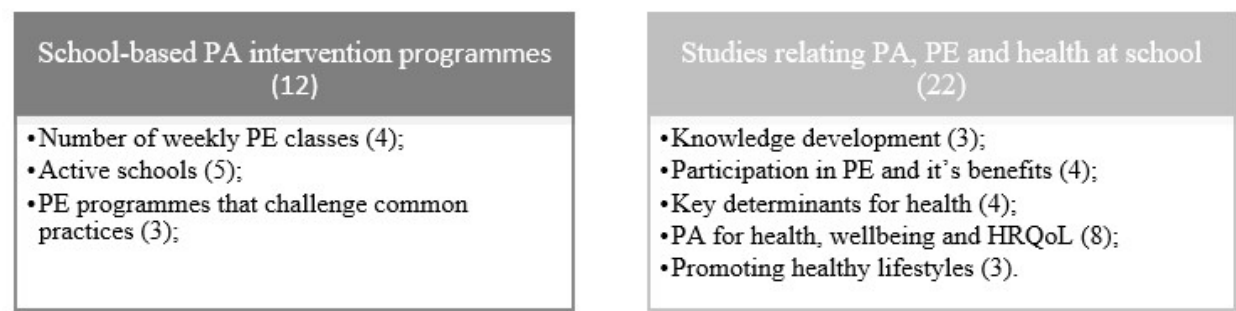


Figure 2. Groupings and number and nature of studies in each

DISCUSSION

The two identified groupings and respective themes were categorized according to positioning in the pathogenic-salutogenic perspective continuum (Figure 3). This process was conducted by a subjective positioning of the authors.

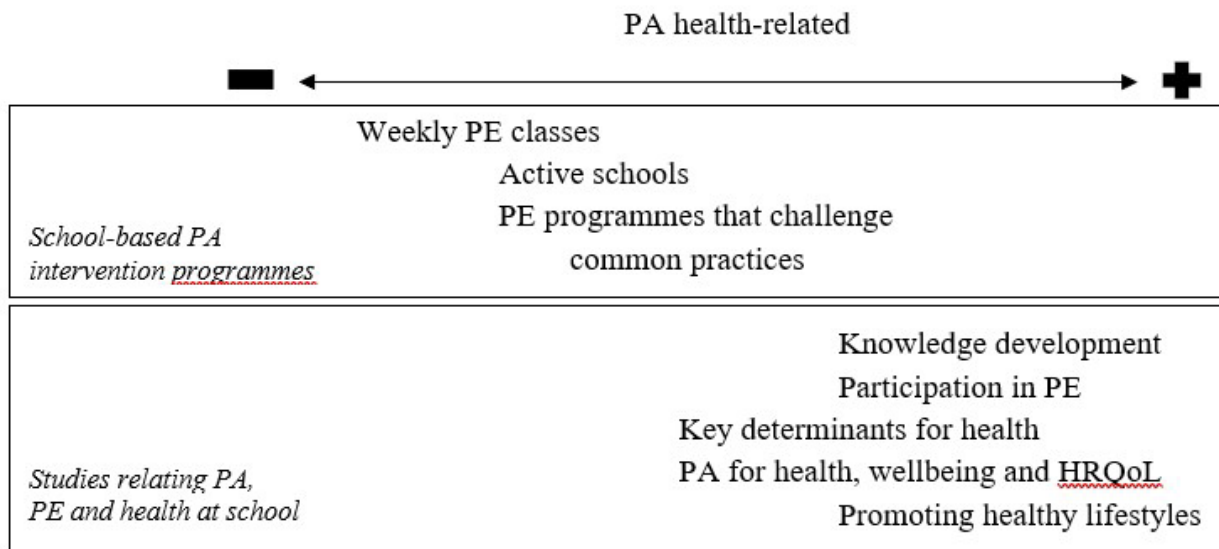


Figure 3. Groupings and related studies in the pathogenic-salutogenic perspective continuum

School-based PA intervention programmes

Twelve studies, divided into three themes, captured distinct approaches towards a PA approach in PE, i.e., (1) weekly PE classes, (2) active schools, and (3) PE programmes that challenge common practices. These articles encompass all school ages and yield diverse results and realities of health-related studies within the school context.

Weekly PE classes

Four studies (Ardoy et al., 2011; Jurak et al., 2013; Lisowski et al., 2022; Ługowska et al., 2023) focus on the effects of increasing weekly PE classes in school-based interventions.

The programme presented by Ardoy et al. (2011) doubled the number of PE classes from two to four sessions per week and the results indicated an improvement on aerobic fitness and flexibility. The studies from Lisowski et al. (2022) and Jurak et al. (2013) explored the effectiveness of interventions that increased PE lessons from three to five per week. In Lisowski et al.'s (2022) intervention, no major differences were found between the control and the experimental group. In Jurak et al.'s (2013), regardless of the long-term effort to increase PF, PA and health outcomes and the higher level in all motor tasks from the intervention group in a 11-year period, the differences between the control and experimental groups declined over time. An important aspect to explore is not solely increasing the duration across which young people are exposed to PE but rather to ensure that the scheduled PE school provision is meaningful and relevant to young people and their future lives. Ługowska et al. (2023) increased the standard four to ten hours of PE per week.

Results indicated that increasing the number of PE hours at school beneficially affected their PA levels and fitness performance, with better results in boys than girls.

School is considered an ideal place to achieve the recommended levels of PA, given the amount of time young people spend there, with access to PE lessons and the aligned opportunities to be physically active. Uddin et al. (2020) indicated that three days a week of school-based muscle and bone strengthening exercises may support the development of muscular fitness. However, PE is much more than solely increasing students' PA and PF levels. PE has a protective effect on mental health (Solidade et al., 2021), can reduce anxiety, increase resilience and improve wellbeing (Andermo et al., 2020), result in better cognitive health and performance (Biddle et al., 2019) and offers a chance to prepare and motivate students to engage in PA outside school for a lifetime of autonomous wellbeing (McConnell, 2010).

Active schools

Schools can play an important role in increasing the time students spend being physically active (Gil et al., 2022; Greco et al., 2019; Jarnig et al., 2023; Kolle et al., 2020; Seljebotn et al., 2019). According to Centers for Disease Control and Prevention (2017), increasing student's PA levels extends beyond PE classes. Schools can incorporate PA throughout the school day, including during lessons, before and after school programs, and through staff involvement, as well as family and community engagement. Several strategies and resources can be used to enhance students' overall PA levels.

The programmes conducted by Gil et al. (2022) and Greco et al. (2019) focused on one extra PA lesson per week in addition to regular PE. The results indicated an increase in (1) several PF variables, (2) students' PA level during school time, (3) the student-teacher relationship, (4) students' interest in the PE subject and (5) the students' perceived health. Greco et al. (2019) reported no difference in students' behaviour towards maintaining their levels of PA for life.

Seljebotn et al. (2019) added two or three additional 45-minute classes to standard PE, with ten minutes a day of physically active homework and 10 minutes of active recess. The results indicated an increased level of PA for the intervention group and a boosted result in aerobic fitness for the least fit children. The authors added that the activity level was as high in the additional 45-minute classes as in regular PE classes. Uddin et al. (2020) suggested that the intensity of PE classes always needs to be considered, especially when quality PE can promote more effective PA time and intensity for children and adolescent.

Jarnig et al. (2023) used PA activities as homework and academic content classes (in maths and language art) combined with movement activities. They found improvements in cardiorespiratory fitness (CRF), muscle strength and flexibility.

Kolle et al. (2020) studied the effect of two different school-based interventions: 1) connected to physically active learning, and 2) focused on promoting friendships and wellbeing. The experimental group indicated a significantly smaller decrease in daily PA level, less time spent in MVPA and increased CRF when compared to the control. Regardless, according to the reviews alluded to earlier in the paper (Ahn & Fedewa, 2011; Demetriou & Höner, 2012) that state that effects on PA and PF can be influenced by the intervention type, frequency and students' age, more research is

needed to explore in detail programmes and aligned strategies that do result in instilling a healthy lifestyle disposition.

PE programmes that challenge common practices

Abildsnes et al. (2017) implemented a full school year intervention to explore differences in PA, diet, smoking habits, sleep and screen time among secondary school students between a Sports Enjoyment (PA skill, technique and improvement of physical performance) and a Motion Enjoyment (health, play and having fun) PE programme. Results indicated that students who engaged in Sports Enjoyment accrued more steps/day, lower screen use and a more regular meal pattern. Despite having the same two PE classes in both scenarios, the different outcomes offered valuable insights into the content to consider when enhancing students' lifestyle habits.

Kliziene et al. (2018) performed a DIDFSA (dynamic exercise, intensive motor skill repetition, differentiation, reduction of seating and PA distribution) model in primary school and reported increased levels of PA and PF in the experimental group.

Melero-Cañas et al. (2021) presented a promising study with respect to healthy habits focused on teaching personal and social responsibility. Through two 55-minute PE lessons per week, the programme yielded positive results in CRF, agility, speed, afterschool PA on weekdays and afterschool PA on weekends, and in reducing sedentary time. This study suggests that fostering personal and social responsibility in young people may enhance their PA levels and habits for a lifelong involvement in PA.

Nevertheless, it is important for students to include a wider variety of enjoyable activities (Abildsnes et al., 2017). This is one feasible way to enhance students' PA and PF levels inside and outside school, ultimately improving longevity.

STUDIES RELATING PA, PE AND HEALTH AT SCHOOL

A deeper exploration of PA health-related in PE and its implications to foster an empowering approach to a lifetime of autonomous wellbeing brings this IR to now interrogating 22 studies.

Knowledge development

Despite the different methodological designs and procedures (Liu & Chen, 2020; Syrmipas & Goudas, 2021; Zhang et al., 2014), the authors focus remained on students' comprehension and knowledge development of PA and PF and provided valuable insights into the application of a health-related model in PE.

Zhang et al. (2014) utilised 34 cognitive assignments, throughout ten PE lessons focusing on engagement, exploration, explanation, elaboration and evaluation. Although students engaged and achieved moderate knowledge, there is no data regarding their longitudinal engagement in a healthy lifestyle. Further references indicated that students need to learn not only how physiological resources can help to develop their health, but also psychological, social, cultural, environmental and economic resources to be transformative agents in today's society to promote healthier lives for them and for all (McCuaig et al., 2013). The challenge resides in translating such knowledge into tangible behavioural changes. Other research suggested that longitudinal studies are essential to track possible shifts in behaviour over time (Pate et al., 2011), especially in public health. It is important to embrace the common good, to study what is possible to do and to find strategies to improve healthy lifestyles in society that go beyond the physical aspects.

Liu and Chen (2020) observed different age and ethnicity groups at the same time. The findings conveyed a declining trend in PA with age and a corresponding increase in sedentary behaviour.

Syrmpas and Goudas (2021) supported the idea of potential efficacy of educational programmes in promoting knowledge and skills related to PA. By using a teacher book, a student book and a student workbook, this approach was found to be an effective method for improving students' skills and knowledge related to PA and health. As McConnell (2010) adds, such resources can stimulate learning and help students towards the goal of a state of self-directed independent PA.

These studies underscore the need for educational practices that extend beyond the common approaches in PE. Integrating diverse resources and teaching methods can foster a comprehensive understanding of health for students that extends beyond the classroom. However, the challenge remains in how this is extended into adulthood. Such practices can provide students with knowledge, skills and attitudes towards healthier lives and influence societal health positively. When students comprehend what and why they are doing each task in PE, it can improve learning quality and, with deliberate guidance, contribute to a life of autonomous wellbeing.

Participation in PE and benefits

The participation and the time spent in PE (García-Hermoso et al., 2023; Jarani et al., 2016; Martins et al., 2022; Tassitano et al., 2010) can increase students' PA levels during interventions.

The questionnaires administered by Tassitano et al. (2010), Martins et al. (2022) and García-Hermoso et al. (2023) demonstrated that students who participated in PE classes had higher chances of being active outside school and of having healthier movement behaviours than those who didn't participated in regular PE. These studies also indicated a positive association between PE enrolment and adopting five or more healthy habits, which reinforced the idea that PE can act as a catalyst for multifaced health promotion and not only PA. García-Hermoso et al. (2023) suggests that these benefits could extend into adulthood.

Jarani et al. (2016) promoted a different approach, where students could choose between an exercise-based or a games-base programme. The results indicated that an exercise-based approach could yield more positive changes in coordination skills and CRF. Both groups increased several health-related and skill-related fitness indicators. Students could choose their preferred intervention, highlighting the importance of tailoring PE experiences to individual preferences in a bid to heighten students' engagement.

Key determinants for health

Four studies (Dariotis et al., 2023; Liu et al., 2021; Sevil et al., 2019; Wojtyła-Buciora et al., 2014) emphasize the influence of current behaviours on future health outcomes and attempt to identify key determinants that shape these trajectories.

According to Liu et al. (2021), health and PF in adolescents can predict students' future health and promote a healthier lifestyle and is affected by gender and age. The authors indicate that males exhibited 14% predictive power based on the combined effects of CRF, muscle and explosive strength, while females showed a predictive power of 17% for overall health-promoting lifestyle through the combined effects of CRF, flexibility and body mass index.

Another finding from Wojtyła-Buciora et al. (2014) was that a good relationship between parents and siblings, coupled with parental involvement in PA, is associated to healthier lifestyle choices among adolescents. Only 18% of parents engage in a family habit of exercising together, highlighting the potential for improvement in home environments, to promote PA and the aligned knowledge, beliefs, convictions and skills related to health. The acquirement of these resources during the formative years among adolescents can have a lasting influence on lifestyle choices (Eastham, 2018), especially because the concept of health is influenced by young people's lives, experiences, contexts and histories (Quennerstedt, 2019).

The programme implemented by Sevil et al. (2019) underlines that both curricular and extracurricular activities can facilitate behaviour change and promote healthy lifestyles. Moreover, the programme demonstrated enhancements in specific and general combinations of 24-hour movement guidelines, sedentary screen time, nap duration, healthy diet scores, breakfast intake and soft drink consumption.

The fourth study from Dariotis et al. (2023), using either a mindfulness or a health education programme, found four key determinants in implementation promoting: (1) competent, attentive, and engaging instructors; (2) programs with interactive components; (3) adequate time for program delivery; and (4) students' availability and preferences for program scheduling.

All these studies highlight the importance of holistic intervention strategies that extend beyond traditional health education approaches. Investing in comprehensive, multifaceted programmes during adolescence can yield long-term benefits by shaping future health and lifestyle choices. These interventions should encompass not only PA but also broader dimensions of health, such as nutrition and a positive family engagement and environment, while acknowledging the unique needs and challenges faced by distinct demographic groups (Demetriou & Höner, 2012).

PA for health, wellbeing and HRQoL

While eight studies (Ahmed et al., 2023; Åvitsland, Leibinger, Haugen, et al., 2020; Åvitsland, Leibinger, Resaland, et al., 2020; Kliziene et al., 2021; Melnyk et al., 2013; Resaland et al., 2019; Sigvartsen et al., 2016; Wang et al., 2023) set out to increase PA levels connected to health, wellbeing and HRQoL, the results varied considerably. While some studies indicated no effect (Åvitsland, Leibinger, Resaland, et al., 2020; Resaland et al., 2019), others demonstrated an increase in PA among primary school children following a PE programme (Kliziene et al., 2021), others revealed an association between CRF and psychological difficulties (Åvitsland, Leibinger, Haugen, et al., 2020) and others suggested higher emotional intelligence, self-rated health and life satisfaction (Ahmed et al., 2023; Wang et al., 2023).

Åvitsland, Leibinger, Resaland, et al. (2020) study focused on two distinct interventions: 1) 'active learning' intervention; 2) 'don't worry, be happy' intervention, allowing participants to choose and engage in enjoyable activities. No significant effects were found. The same happened in Resaland et al. (2019) study, when doubling the minutes of PA per week to evaluate the effects on HRQoL.

Other studies suggest that the field of PA and health promotion is taking the direction that is necessary for identifying effective interventions. Kliziene et al. (2021) reported positive effects on PA emotional wellbeing of primary children in somatic, personality and social anxiety. The

findings indicated that school-based interventions can effectively enhance PA, CRF and muscular fitness, psychosocial effects, and other markers of health status. The study from Wang et al. (2023) reported the same, even with its purpose being more directed to emotional intelligence and self-rated health status. Ahmed et al. (2023) 12-week intervention reported that life satisfaction increased, and depressive symptoms decreased. This highlights the potential of well-designed and targeted interventions to positively influence a broad spectrum of health-related outcomes in children. These studies provide further evidence that education departments, schools and families need to undergo a paradigm shift and provide substantial support to encourage engagement in MVPA (Wang et al., 2023).

Åvitsland, Leibinger, Haugen, et al. (2020) partially support such results. Their intervention focused on self-reported mental health revealed an association between psychological difficulties and CRF, and no association with muscular strength or body composition. Melnyk et al. (2013) 15-week intervention with an extra 20 minutes of PA per week revealed different outcomes, with a positive impact on PA and in BMI, psychosocial outcomes and grade performance. The findings remained consistent when analysed immediately after, and six months after, the intervention. This provides some evidence that interventions targeting adolescents can influence their future life and their longitudinal engagement in a healthy lifestyle.

Sigvartsen et al. (2016) focused on the relationship between PA, life goals and HRQoL in two school programmes: 1) motion enjoyment, with higher adherence; 2) sport enjoyment, with better self-reported PA level and HRQoL. Interestingly, all students revealed similar perceived importance of life goals and, predominantly, older adolescents had lower HRQoL, implying that the specific school programmes can influence students' experiences and perceptions of wellbeing.

The diverse outcomes across the studies highlight the need for carefully designing interventions, targeting specific health markers and understanding the nuanced relationships between PA, PF and health. It is crucial to explore strategies to boost students' PA levels, sustain long-term engagement in a healthy lifestyle, and identify successful interventions, considering the duration, intensity and nature of the programmes. This is especially prudent given that adolescent participation in PA has yet to reach its full potential (Wang et al., 2023).

Promoting healthy lifestyles

The promotion of healthy lifestyles extends beyond increasing students' PA levels. Lábiscsák-Erdélyi et al. (2023), Schmidt et al. (2020) and Höner and Demetriou (2014) employed distinct methodologies to promote health in PE by adopting comprehensive approaches to health promotion.

Lábiscsák-Erdélyi et al. (2023) analysed the integration of health education in the curriculum, daily optional PE, teaching training in applying person-centred approach and parental involvement. Schmidt et al. (2020) implemented an active and healthy kids programme that incorporated three main strategies: (1) promoting a healthy diet, (2) raising awareness of important lifestyle factors and (3) increasing PA through physically active lessons, five-minute breaks and regular PE classes. Höner and Demetriou (2014) intervention focused on motor performance, BMI and HRQoL.

The studies from Lábiscsák-Erdélyi et al. (2023) and Schmidt et al. (2020) reported positive changes in school-based PA and PF levels and dietary habits, suggesting that the holistic approach

may contribute to a comprehensive understanding of a healthy lifestyle. However, Höner and Demetriou (2014) reported contradictory outcomes, with small to medium effects on BMI variables and no effect on students' HRQoL. These discrepancies highlight the importance of considering individual variations when designing and implementing health promotion interventions.

Further research from McCuaig et al. (2013) underscored that PE programmes must extend beyond a narrow focus on PA and consider diverse elements contributing to overall health and wellbeing. Understanding the mechanisms driving positive changes, along with potential variations based on individual characteristics, will guide the development of more effective and tailored interventions. Multifaceted intervention strategies such as dietary aspects, lifestyle awareness, and increased PA, considering psychological, social, and emotional aspects and aligned with the concept that a comprehensive approach can yield positive health-related outcomes.

CONCLUSION

By prioritizing enhancements in PA levels, promoting active lifestyles and addressing broader dimensions of health such as wellbeing and social connectedness, PE programmes have the potential to act as catalysts to foster lifelong engagement in health-enhancing behaviours.

It is evident that schools, particularly through PE, can instil in young people an interest and skillset that enables them to pursue a lifetime of autonomous wellbeing. The paper from the Centers for Disease Control and Prevention (2017) presents a variety of resources that can support a comprehensive school PA program to enhance student's' PA levels. However, some studies still struggle to find positive effects (Åvitsland, Leibinger, Resaland, et al., 2020; Resaland et al., 2019). It is crucial to recognize that PE encompasses more than just PA. Although the time spent in PE is important, the quality of the provision plays a pivotal role in shaping students' behaviours. Factors such as the student-teacher relationship, the level of interest in the subject and the participation in enjoyable activities are key to increasing students' PA levels now and in the future.

Furthermore, the findings suggest the importance of personal and social responsibility, considering a multifaceted approach as an effective method for students to understand what they are doing, why they are doing it and in what way they can benefit from it. This level of commitment and of knowledge could be the key for students to become the best version of themselves, with PA integrated in their daily routines.

Schools can play a pivotal role in facilitating comprehensive PE and PA interventions, with the potential to impact current and future healthy habits and lifestyle.

LIMITATIONS AND FUTURE RECOMMENDATIONS

The levels of PA explored in the reviewed studies make it difficult to determine the long-term sustainability PA habits among students. Without longitudinal data, it remains uncertain whether school-based initiatives lead to lifelong PA engagement. Future research should prioritize long-term studies to track PA levels and examine how school interventions influence lifelong PA behaviours and societal attitudes.

Methodological inconsistencies also pose challenges, particularly in PA measurement. While some studies relied on self-reported data, which can introduce bias, others used objective methods such as accelerometers. This inconsistency complicates direct comparisons between findings and underscores the need for standardized measurement tools.

Additionally, the studies included in this review may be subject to selection bias, as this selection was conducted by two of the authors. While all efforts were made to ensure an objective approach, the authors' choices may have influenced the overall conclusions.

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REFERENCES

- Abildsnes, E., Rohde, G., Berntsen, S., & Stea, T. (2017). Fun, influence and competence - A mixed methods study of prerequisites for high school students' participation in physical education. *BMC Public Health*, 17(1), 1-12. <https://doi.org/10.1186/s12889-017-4154-6>
- Ahmed, K. R., Horwood, S., & Khan, A. (2023). Effects of a school-based physical activity intervention on adolescents' mental health: A cluster randomized controlled trial. *Journal of Physical Activity and Health*, 20(12), 1102-1108. <https://doi.org/10.1123/jpah.2023-0062>
- Ahn, S., & Fedewa, A. L. (2011). A meta-analysis of the relationship between children's physical activity and mental health. *Journal of Pediatric Psychology*, 36(4), 385-397. <https://doi.org/10.1093/jpepsy/jsq107>
- Alalawi, A., Blank, L., & Goyder, E. (2023). School-based physical activity interventions among children and adolescents in the Middle East and Arabic speaking countries: A systematic review. *PloS one*, 18(7), e0288135. <https://doi.org/10.1371/journal.pone.0288135>
- Andermo, S., Hallgren, M., Nguyen, T.-T.-D., Jonsson, S., Petersen, S., Friberg, M., Romqvist, A., Stubbs, B., & Elinder, L. (2020). School-related physical activity interventions and mental health among children: A systematic review and meta-analysis. *Sports medicine*, 6(1), 25. <https://doi.org/10.1186/s40798-020-00254-x>
- Antonovsky, A. (1996). The salutogenic model as a theory to guide health promotion. *Health promotion international*, 11(1), 11-18. <https://doi.org/10.1093/heapro/11.1.11>
- Arday, D. N., Fernández-Rodríguez, J. M., Ruiz, J. R., Chillon, P., Espana-Romero, V., Castillo, M. J., & Ortega, F. B. (2011). Improving physical fitness in adolescents through a school-based intervention: The EDUFIT study. *Revista Española de Cardiología (English Edition)*, 64(6), 484-491. <https://doi.org/10.1016/j.rec.2011.02.010>
- Åvitsland, A., Leibinger, E., Haugen, T., Lerum, Ø., Solberg, R., Kolle, E., & Dyrstad, S. (2020). The association between physical fitness and mental health in Norwegian adolescents. *BMC Public Health*, 20(1), 1-10. <https://doi.org/10.1186/s12889-020-08936-7>
- Åvitsland, A., Leibinger, E., Resaland, G., Solberg, R., Kolle, E., & Dyrstad, S. (2020). Effects of school-based physical activity interventions on mental health in adolescents: The School in Motion cluster randomized controlled trial. *Mental Health & Physical Activity*, 19, N.PAG-N.PAG. <https://doi.org/10.1016/j.mhpa.2020.100348>
- Biddle, S., Ciacconni, S., Thomas, G., & Vergeer, I. (2019). Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality. *Psychology of sport and exercise*, 42, 146-155. <https://doi.org/10.1016/j.psychsport.2018.08.011>
- Braun, V., & Clarke, V. (2012). *Thematic Analysis* (H. Cooper, P. Camic, D. Long, A. Panter, D. Rindskopf, & K. Sher, Eds.). American Psychological Association. <https://doi.org/10.1037/13620-004>
- Control, C. f. D., & Prevention. (2017). *Increasing physical education and physical activity: A framework for schools*.
- Dariotis, J. K., Mabisi, K., Jackson-Gordon, R., Yang, N., Rose, E. J., Mendelson, T., & Fishbein, D. H. (2023). Implementing Adolescent Wellbeing and Health Programs in Schools: Insights from a Mixed Methods and Multiple Informant Study. *Prevention science*, 24(4), 663-675. <https://doi.org/10.1007/s11121-022-01481-2>

- Demetriou, Y., & Höner, O. (2012). Physical activity interventions in the school setting: A systematic review. *Psychology of sport and exercise*, 13(2), 186–196. <https://doi.org/10.1016/j.psychsport.2011.11.006>
- Eastham, S. (2018). Physical fitness test administration practices and students' cognitive understanding of physical fitness. *The Physical Educator*, 75(3), 374–393. <https://doi.org/10.18666/TPE-2018-V75-I3-7933>
- Eriksson, M., & Lindstöm, B. (2008). A salutogenic interpretation of the Ottawa Charter. *Health promotion international*, 23(2), 190–199. <https://doi.org/10.1093/heapro/dan014>
- European Union. (2022). Special Eurobarometer - Sport and Physical Activity. *European Union*.
- García-Hermoso, A., Ezzatvar, Y., & López-Gil, J. F. (2023). Association between daily physical education attendance and meeting 24-hour movement guidelines in adolescence and adulthood. *Journal of Adolescent Health*, 73(5), 896–902. <https://doi.org/10.1016/j.jadohealth.2023.06.014>
- Gil, J., Oliva, D., Gajardo, M., Bordón, J., & Calvo, T. (2022). Effectiveness of a physically active learning program on indicators of physical activity, well-being and academic performance in students. *Cultura, Ciencia y Deporte*, 52(17). <https://doi.org/10.12800/ccd.v17i52.1792>
- Greco, G., Cataldi, S., & Fischetti, F. (2019). Effectiveness of a short after-school intervention on physical fitness in school-aged children. *Ricerche di Pedagogia e Didattica. Journal of Theories and Research in Education*, 14(1), 143–164. <https://doi.org/10.6092/issn.1970-2221/9217>
- Höner, O., & Demetriou, Y. (2014). Effects of a health-promotion programme in sixth grade German students' Physical Education. *European Journal of Sport Science*, 14(sup1), S341–S351. <https://doi.org/10.1080/17461391.2012.704080>
- Jarani, J., Grøntved, A., Muca, F., Spahi, A., Qefalia, D., Ushtelenca, K., Kasa, A., Caporossi, D., & Gallotta, M. (2016). Effects of two physical education programmes on health- and skill-related physical fitness of Albanian children [Article]. *Journal of sports sciences*, 34(1), 35–46. <https://doi.org/10.1080/02640414.2015.1031161>
- Jarnig, G., Kerbl, R., Jaunig, J., & van Poppel, M. N. (2023). Effects of a daily physical activity intervention on the health-related fitness status of primary school children: A cluster randomized controlled trial. *Journal of sports sciences*, 41(11), 1073–1082. <https://doi.org/10.1080/02640414.2023.2259210>
- Jurak, G., Cooper, A., Leskosek, B., & Kovac, M. (2013). Long-term effects of 4-year longitudinal school-based physical activity intervention on the physical fitness of children and youth during 7-year follow-up assessment. *Central European Journal of Public Health*, 21(4), 190. <https://doi.org/10.21101/cejph.a3823>
- Kliziene, I., Cibulskas, G., Ambrasė, N., & Čižauskas, G. (2018). Effects of a 8-month exercise intervention programme on physical activity and physical fitness for first grade students. *European Journal of Contemporary Education*, 717–727. <https://doi.org/10.13187/ejced.2018.4.717>
- Kliziene, I., Cizauskas, G., Sipaviciene, S., Aleksandraviciene, R., & Zaicenkoviene, K. (2021). Effects of a Physical Education program on physical activity and emotional well-being among primary school children. *International Journal of Environmental Research and Public Health*, 18(14). <https://doi.org/10.3390/ijerph18147536>
- Kolle, E., Solberg, R., Säfvenbom, R., Dyrstad, S., Berntsen, S., Resaland, G., Ekelund, U., Anderssen, S., Steene-Johannessen, J., & Grydeland, M. (2020). The effect of a school-based intervention on physical activity, cardiorespiratory fitness and muscle strength: the School in Motion cluster randomized trial. *Journal of Behavioral Nutrition and Physical Activity*, 17(1), 1–14.
- Lábiscák-Erdélyi, Z., Somhegyi, A., Veres-Balajti, I., & Kósa, K. (2023). Daily Optional Physical Education Does Not Counteract Increasing Inactivity by Age among Adolescents. *Children*, 10(12), 1929. <https://doi.org/10.3390/children10121929>
- Lisowski, P., Kantanista, A., & Bronikowski, M. (2022). Moderate effects of school-based time increasing physical education intervention on physical fitness and activity of 7-year pupils - A report from a follow-up of a HCSC Study. *Children*, 9(6), 882. <https://doi.org/10.3390/children9060882>
- Liu, H., Liu, Y., & Li, B. (2021). Predictive analysis of health/physical fitness in health-promoting lifestyle of adolescents. *Frontiers in Public Health*, 9, 691669. <https://doi.org/10.3389/fpubh.2021.691669>
- Liu, Y., & Chen, S. (2020). Students' knowledge and behaviors for active living: A cross-sectional survey study. *Journal of Teaching in Physical Education*, 39(2), 206–215. <https://doi.org/10.1123/jtpe.2018-0352>
- Ługowska, K., Kolanowski, W., & Trafialek, J. (2023). Increasing physical activity at school improves physical fitness of early adolescents. *International Journal of Environmental Research and Public Health*, 20(3), 2348.
- Martins, J., Marques, A., Gouveia, É., Carvalho, F., Sarmiento, H., & Valeiro, M. (2022). Participation in Physical Education classes and health-related behaviours among adolescents from 67 countries. *International Journal of Environmental Research and Public Health*, 19(2). <https://doi.org/10.3390/ijerph19020955>

McConnell, K. (2010). Fitness education. In J. B. Publishers (Ed.), *Standards-based physical education curriculum development* (2nd ed., pp. 367–387). Pacific Lutheran University.

McCuaig, L., & Quennerstedt, M. (2018). Health by stealth – Exploring the sociocultural dimensions of salutogenesis for sport, health and physical education research. *Sport, Education & Society*, 23(2), 111–122. <https://doi.org/10.1080/13573322.2016.1151779>

McCuaig, L., Quennerstedt, M., & Macdonald, D. (2013). A salutogenic, strengths-based approach as a theory to guide HPE curriculum change. *Asia-Pacific Journal of Health, Sport and Physical Education*, 4(2), 109–125. <https://doi.org/10.1080/18377122.2013.801105>

Melero-Cañas, D., Morales-Baños, V., Manzano-Sanchez, D., Navarro-Ardoy, D., & Valero-Valenzuela, A. (2021). Effects of an educational hybrid physical education program on physical fitness, body composition and sedentary and physical activity times in adolescents: The Seneb's Enigma. *Frontiers in Psychology*, 11, 629335. <https://doi.org/10.3389/fpsyg.2020.629335>

Melnik, B., Jacobson, D., Kelly, S., Belyea, M., Shaibi, G., Small, L., O'Haver, J., & Marsiglia, F. (2013). Promoting healthy lifestyles in high school adolescents: A randomized controlled trial. *American Journal of Preventive Medicine*, 45(4), 407–415. <https://doi.org/10.1016/j.amepre.2013.05.013>

Neil-Sztramko, S., Cadwell, H., & Dobbins, M. (2021). School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18 (Review). *Cochrane database of systematic reviews*(9). <https://doi.org/10.1002/14651858.CD007651.pub3>

Pate, R. R., O'Neill, J. R., & McIver, K. L. (2011). Physical activity and health: Does physical education matter? *Quest*, 63(1), 19–35. <https://doi.org/10.1080/00336297.2011.10483660>

Peralta, M., Henriques-Neto, D., Gouveia, É. R., Sardinha, L., & Marques, A. (2020). Promoting health-related cardiorespiratory fitness in physical education: A systematic review. *PloS one*, 15(8), e0237019. <https://doi.org/10.1371/journal.pone.0237019>

Quennerstedt, M. (2019). Healthying physical education - On the possibility of learning health. *Physical Education and Sport Pedagogy*, 24(1), 1–15. <https://doi.org/10.1080/17408989.2018.1539705>

Ramires, V. V., Dos Santos, P. C., Barbosa Filho, V. C., da Silva Bandeira, A., Tenório, M. C. M., de Camargo, E. M., de Paula Ravagnani, F. C., Sandreschi, P., de Oliveira, V. J. M., & Hallal, P. C. (2023). Physical education for health among school-aged children and adolescents: a scoping review of reviews. *Journal of Physical Activity and Health*, 20(7), 586–599. <https://doi.org/10.1123/jpah.2022-0395>

Resaland, G., Aadland, E., Moe, V., Kolotkin, R., Anderssen, S., & Andersen, J. (2019). Effects of a physical activity intervention on schoolchildren's health-related quality of life: The active smarter kids (ASK) cluster-randomized controlled trial. *Preventive Medicine Reports*, 13, 1–4. <https://doi.org/10.1016/j.pmedr.2018.11.002>

Rhodes, R. E., Janssen, I., Bredin, S. S., Warburton, D. E., & Bauman, A. (2017). Physical activity: Health impact, prevalence, correlates and interventions. *Psychology & health*, 32(8), 942–975.

Rodriguez-Ayllon, M., Cadenas-Sánchez, C., Estévez-López, F., Muñoz, N. E., Mora-Gonzalez, J., Migueles, J. H., Molina-García, P., Henriksson, H., Mena-Molina, A., & Martínez-Vizcaíno, V. (2019). Role of physical activity and sedentary behavior in the mental health of preschoolers, children and adolescents: A systematic review and meta-analysis. *Sports medicine*, 49(9), 1383–1410. <https://doi.org/10.1007/s40279-019-01099-5>

Schmidt, S., Reinboth, M., Resaland, G., & Bratland-Sanda, S. (2020). Changes in physical activity, physical fitness and well-being following a school-based health promotion program in a Norwegian region with a poor public health profile: A non-randomized controlled study in early adolescents. *International Journal of Environmental Research and Public Health*, 17(3). <https://doi.org/10.3390/ijerph17030896>

Seljebotn, P., Skage, I., Riskedal, A., Olsen, M., Kvalø, S., & Dyrstad, S. (2019). Physically active academic lessons and effect on physical activity and aerobic fitness. The Active School study: A cluster randomized controlled trial. *Preventive Medicine Reports*, 13, 183–188. <https://doi.org/10.1016/j.pmedr.2018.12.009>

Sevil, J., García-González, L., Abós, Á., Generelo, E., & Aibar, A. (2019). Can high schools be an effective setting to promote healthy lifestyles? Effects of a multiple behavior change intervention in adolescents. *Journal of Adolescent Health*, 64(4), 478–486. <https://doi.org/10.1016/j.jadohealth.2018.09.027>

Sigvartsen, J., Gabrielsen, L., Abildsnes, E., Stea, T., Omfjord, C., & Rohde, G. (2016). Exploring the relationship between physical activity, life goals and health-related quality of life among high school students: A cross-sectional study [journal article]. *BMC Public Health*, 16(1), 1–9. <https://doi.org/10.1186/s12889-016-3407-0>

Solidade, V., Nascimento, V., Oliveira, D., Ribas, M., Sampaio, R., & Silva, R. (2021). School physical activity and mental health in school-aged Brazilian adolescents: A systematic review. *Revista Brasileira Cineantropométrica de Desempenho Humano*, 23, 1–13. <https://doi.org/10.1590/1980-0037.2021v23e82866>

- Syrmpas, I., & Goudas, M. (2021). Elementary students' knowledge development during the implementation of "After School Exercise" program. *Children*, 8(3), 248. <https://doi.org/10.3390/children8030248>
- Tassitano, R., Barros, M., Tenorio, M., Bezerra, J., Florindo, A., & Reis, R. (2010). Enrollment in Physical Education is associated with health-related behavior among high school students. *Journal of school health*, 80(3), 126. <https://doi.org/10.1111/j.1746-1561.2009.00476.x>
- Uddin, R., Salmon, J., Islam, S. M. S., & Khan, A. (2020). Physical education class participation is associated with physical activity among adolescents in 65 countries. *Scientific Reports*, 10(1), 22128.
- Wang, H., Liu, Y., Zhang, S., Xu, Z., & Yang, J. (2023). Investigating Links between Moderate-to-Vigorous Physical Activity and Self-Rated Health Status in Adolescents: The Mediating Roles of Emotional Intelligence and Psychosocial Stress. *Children*, 10(7), 1106. <https://doi.org/10.3390/children10071106>
- Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *Journal of advanced nursing*, 52(5), 546–553.
- Wojtyła-Buciora, P., Stawińska-Witoszyńska, B., Wojtyła, K., Klimberg, A., Wojtyła, C., Wojtyła, A., Samolczyk-Wanyura, D., & Marcinkowski, J. (2014). Assessing physical activity and sedentary lifestyle behaviours for children and adolescents living in a district of Poland. What are the key determinants for improving health? *Annals of Agricultural & Environmental Medicine*, 21(3), 606–612. <https://doi.org/10.5604/12321966.1120611>
- World Health Organization. (2018). *Physical activity factsheets for the 28 European Union member states of the WHO European Region*.
- Younas, A., Shahzad, S., & Inayat, S. (2022). Data analysis and presentation in integrative reviews: A narrative review. *Western Journal of Nursing Research*, 44(12), 1124–1133. <https://doi.org/10.1177/01939459211030344>
- Zhang, T., Chen, A., Chen, S., Hong, D., Loflin, J., & Ennis, C. (2014). Constructing cardiovascular fitness knowledge in Physical Education. *European Physical Education Review*, 20(4), 425–443. <https://doi.org/10.1177/1356336X14524865>

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