

# HEALTH-PROMOTING SCHOOLS. MULTICOMPONENT INTERVENTIONS TO TEACH MOTOR COMPETENCIES

## SCUOLE CHE PROMUOVONO SALUTE. INTERVENTI MULTICOMPONENTE PER INSEGNARE COMPETENZE MOTORIE



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### ABSTRACT

Schools that promote health constitute a formative context in which to live, learn, and work. The following contribution aims to analyze the effects of multicomponent interventions in the field of physical education and motor activities. Fifteen studies published between 2019 and 2024 were selected, with a sample age range of 6-14 years. The contribution of quality physical education is essential to promote the educational process through motor activities.

Le scuole che promuovono salute costituiscono un contesto formativo in cui vivere, apprendere e lavorare. Il seguente contributo si propone di analizzare gli effetti degli interventi multicomponente nell'ambito dell'educazione fisica e delle attività motorie. Sono stati selezionati 15 lavori pubblicati tra 2019-2024 e campioni di età: 6-14 anni. Il contributo dell'educazione fisica di qualità è essenziale per promuovere il processo educativo attraverso le attività motorie.

### KEYWORDS

Health promoting schools; Multicomponent intervention; Children and Youth

Scuole che promuovono salute; Interventi Multicomponente; Bambini e Adolescenti

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## Introduction

The *promotion of health* within the school context can be defined as any educational activity undertaken to enhance and/or protect the health and well-being of the school community. It is a process that includes projects and educational actions aimed at acquiring behaviors oriented towards student well-being, developing interventions in the physical and social environment where schools are located, and fostering connections with external community partners (IUHPE, 2011).

Different models of pedagogical and didactic intervention converge in the projects of schools promoting health, shaping the curriculum, the teaching process, the implementation contexts, and their interrelationships (Dyson et al. 2016; Arufe-Giráldez, 2023). The pillars that support the model of health-promoting schools and ensure their success and sustainability, therefore, are as follows: the curriculum (teaching-learning), daily educational activities (organization, relationships; spaces and environments), and relationships with the community (associations, organizations and institutions, neighborhood, and family).

A health-promoting school is not simply comprised of a constellation of disparate projects aimed at students, but rather is a system of diverse and complementary experiences involving the school environment, relationships, activity organization, and partnerships with organizations, associations, and health services.

To promote health across different ages, it is essential to offer structured and well-guided physical activity opportunities from early childhood. Healthy habits acquired during developmental stages tend to persist into later ages; therefore, it is crucial to integrate bodily-motor experiences into the curriculum not only during physical education but also before and after school, during recess, and between classroom teachings (Hills et al., 2014).

Schools play a key role in promoting physical activity among children and youth and serve as the ideal setting to help all children meet their daily physical activity needs, considering the duration of the school day. It is essential, therefore, to supplement the contents of disciplinary educational plans with multicomponent interventions to ensure that children are provided with the necessary opportunities to meet the guidelines for engaging in at least 60 minutes per day of moderate to vigorous physical activity (Hills et al., 2014; WHO, 2020).

Physical activity, as proposed through *multicomponent* programs, is an educational activity that can be carried out within the school setting, at home, or in a structured group during extracurricular hours, combining various types of exercise. For physical activity periods to align with national guidelines and school physical

education, interventions need to be intentional, well-designed, methodologically supported, and aligned with educational objectives.

In this regard, the review by Porter et al. (2024) presents 11 opportunities for physical activity, grouped into 6 activities within the school day: physical education, active breaks, active & outdoor learning, break time, active play, daily movement initiatives. Three activities are identified during extended school hours: active travel, active homework, before/after school clubs, and two within extracurricular settings (activities offered by neighborhood organizations and associations).

Multicomponent programs promote the development of an educational and operational framework aimed at supporting schools in the development of personalized interventions linked to the socio-cultural context.

Physical Literacy promotes the educational process and teaching of motor competencies, laying the foundation for an active lifestyle to be maintained throughout life and serving as a means to counteract sedentary behavior and associated illnesses. (Grauduszus et al., 2024).

In this regard, analyzing scientific evidence and best practices related to educational models is essential for designing and implementing well-structured and integrated educational interventions.

## **1. Materials and Methods**

For drafting the Short Review, the following inclusion criteria were followed: a. 15 studies focusing on school-based interventions aimed at increasing physical activity in children and adolescents aged 6-14 years; b. studies published between 2019 and 2024; c. studies published in the English language.

The following databases were consulted: SPORTDiscus, Google Scholar, and PubMed. Data on intervention components (content and methodologies) and outcomes in terms of benefits on participants' physical activity were extracted. The results are presented in Table 1.

Fifteen works were analyzed and selected, including two reviews and 13 studies on interventions that covered the age range of the sample (6-14 years).

From the results, it emerges that the intervention on *physically active breaks* is among the most commonly proposed (González-Pérez et al., 2023; Zhang et al., 2023; Lander et al., 2024; Seljebotn et al., 2019; Li et al., 2021; Li et al., 2022; Wright et al., 2019; Mendoza-Muñoz et al., 2022; Colella et al., 2020). Estevan et al. (2023), through the ALPHYL study protocol, propose physically active learning with in-class intervention to promote PL. Another PL intervention, in addition to curricular

physical education, is proposed by Carl et al. (2023) through the intervention called PLACE.

One study focused on improving motor competencies through a specific 20-minute intervention during school physical education lessons (Ma et al., 2023), while the review by Brandes et al. (2022) analyzes effective interventions in promoting PA, cardiorespiratory fitness, and reducing sedentary behaviors.

The study by Sánchez-López et al. (2019) focused on an intervention aimed at implementing PA through three 60-minute sessions per week during the afternoon (extracurricular). The inclusion of Morris et al. 's study (2023) is crucial for the purpose of this review: the CAS project (Creating Active Schools); the program focuses on school resources (facilities, environments, personnel, etc.) to promote changes aimed at increasing the implementation and effectiveness of school PA interventions.

| Authors                           | Sample                                      | Aims                                                                                                                                                                              | Interventions                                                                                                                                                                                                                                                 |
|-----------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Gonzalez-Perez et al. 2023</b> | Total<br>n=292 (12-14 years old)            | Evaluate the effects of two interventions on PA levels, sedentary time, academic indicators of physical fitness related to health, cognition, and markers of psychological health | The <b>ACTIVE CLASS</b> study implements two intervention programs over a period of 16 weeks: (1) AB and (2) PAL, which involve integrating physical activity during regular curriculum lessons                                                               |
| <b>Estevan et al. 2023</b>        | Total<br>n=264 (10-11 years old)            | The main aim is to enhance physical literacy, academic outcomes, and cognitive functions of children                                                                              | <b>ALPHYL</b> -Apart from physical education (PE) classes, three physically engaging activities in non-PE subjects were conducted daily (5 days a week), totaling approximately 30 minutes of light and moderate-to-vigorous physical activity (MVPA) per day |
| <b>Zhang et al. 2023</b>          | Total<br>n=357<br>(mean age: 8.8±0.7 years) | To examine the effects of school-based intervention integrating PL into active school recesses on physical fitness and academic achievement                                       | Broadcast gymnastics of morning exercise; Martial arts rhyme dance during active mini-breaks; Sports/games during 20- mins active breaks; Activity before PE classes content                                                                                  |
| <b>Lander et al. 2024</b>         | Primary and secondary schools               | Describe the TAB model, which positions active breaks in an integrated approach to proactive classroom management in primary and                                                  | In the <b>TAB</b> model, five types of active breaks—structured, transitional, managerial, energizing, and learning breaks—are positioned within a                                                                                                            |

|                                  |                                               |                                                                                                                                                                                       |                                                                                                                                                                                                                                |
|----------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |                                               | secondary schools, also contributing to effective teaching                                                                                                                            | comprehensive approach to proactive classroom management as a key factor for effective teaching                                                                                                                                |
| <b>Wright et al. 2019</b>        | Schools n=13                                  | Primary aim of the <b>FLEX</b> Study was to evaluate the relative impact of these two programs on children's school-time and total daily MVPA                                         | 100-mile club: School-based walking/running program. CHALK/Just Move: Classroom-based physical activity break program                                                                                                          |
| <b>Seljebotn et al. 2019</b>     | Total n=447 (9-10 years old). Schools n=9     | The primary aim of this study was to document the impact of the Active School program on objectively assessed levels of PA and aerobic capacity                                       | The program comprised one primary element (physically active lessons) and two secondary components (physically active homework and physically active recess).                                                                  |
| <b>Ma et al. 2023</b>            | Students n=127<br>Teachers n=9<br>Schools n=8 | Describe and compare the two modes of implementation of Project <b>FLAME</b> : one 'Original FLAME' and the other group 'Modified FLAME'                                              | 1) Movement activities and resources for students, 2) PE, 3) Digital resources 4) Classroom                                                                                                                                    |
| <b>Carl et al. 2023</b>          | 8-11 years old                                | The primary objective of this study is to examine the efficacy of a professional learning intervention across various schools                                                         | 14 individual sessions. Range between 60 and 90 min. Every session will be guided by the principle of PL                                                                                                                       |
| <b>Sanchez-Lopez et al. 2019</b> | Total n=240 (5-7 years old)                   | Evaluate the impact of a multicomponent PA intervention ( <b>MOVIKIDS</b> ) on improving cognitive performance                                                                        | a) Three weekly after-school sessions of non-competitive recreational activities lasting 60 minutes each during an academic year. b) Educational materials for parents and teachers. c) Modifications to the school playground |
| <b>Mendoza-Munoz et al. 2022</b> | Total n=57; (9-12 years old)                  | Examine the effects of a 4-week recreational active breaks program based on games, aimed at improving motivation and enhancing motor skills in physical literacy among schoolchildren | The AB sessions took place on school break days and lasted approximately 15 minutes each                                                                                                                                       |
| <b>Li et al. 2021</b>            | Total n=76 (9-10 years old)                   | Three-armed intervention program that targeted enhancements in children's PL, PA, sleep, and EFs by                                                                                   | Intervention program (a single PA break intervention group (PA), a blended intervention group                                                                                                                                  |

|                            |                                                                  |                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                       |
|----------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            |                                                                  | constructing an active classroom environment                                                                                                                                                                                               | (combining sit-stand desks and PA breaks; SSPA), control group                                                                                                                                                                        |
| <b>Li et al. 2022</b>      | Total n= 79<br>(F= 59,5%)<br>9 years old                         | The present research aimed to utilize an ecological framework to assess the efficiency of a blended professional learning intervention integrated into the school schedule to enhance children's physical activity and health              | All the participants were randomly assigned to either of the three conditions, which included a blended PL group, a single play-based group and a control group                                                                       |
| <b>Morris et al. 2023</b>  | N=37                                                             | 1. Developing operational procedures and methodologies within educational institutions that have embraced CAS. 2. Identifying innovative features of CAS. 3. Evaluating initial perceptions of CAS                                         | The program focuses on schools' assets to promote behavior change in policy, environments, stakeholders and opportunities.                                                                                                            |
| <b>Brandes et al. 2022</b> | N=192<br>articles (6-10 years old)                               | Identify school-level interventions for promoting PA and CRF or aimed at reducing SB in children aged six to ten years old                                                                                                                 | Single and multifunctional theory-based interventions seem to have the potential to improve effectiveness regarding PA, CRF, and SB outcomes                                                                                          |
| <b>Colella et al. 2020</b> | Total: 1850<br>(F:933; M: 917; age: F. 9,20±0,09; M. 9,26±0,01), | a) Contribute to educating about physicality and daily motor activities. b) Adopt a physically active daily schedule model. c) Acquire and apply principles of proper dietary habits. d) Define an innovative model for sports initiation. | Curricular physical education teaching; Implementation of school-home-school walking routes.; Implementation of educational paths for proper dietary habits; Motor monitoring; Coordination of educational activities and monitoring. |

Table 1 (Results of Interventions)

## 2. Discussion

Health promotion involves the collaboration of numerous individuals and institutions, with schools playing a central role as a privileged setting.

A school that fosters a sense of belonging among youth and social cohesion can influence well-being and counteract health inequalities. In fact, integrated and strategic educational interventions allow for the promotion of positive outcomes both in terms of academic performance and personal well-being, compared to

those that primarily focus on information and classroom intervention (IUHPE, 2011).

Why promote health in schools? One answer to this question can be found in the Protocols and Guidelines for Health-Promoting Schools (IUHPE, 2011): 1) Improve academic performance (healthy students learn better); 2) Facilitate health action through the development of skills, knowledge, and attitudes.

At the European level, there is broad consensus and shared values underlying the approach of **Health-promoting schools** (HPS). Equity, sustainability, inclusion, empowerment, and democracy are recognized as fundamental and indispensable values around which an HPS must establish its setting, as a corollary of interventions that ensure equitable access to education and health for all, in an environment where diversity is valued and where all members of the school community are actively involved (IUHPE, 2011).

Therefore, the educational approach of the health-promoting school is a *comprehensive school approach* aimed at promoting both the health and academic performance of children and adolescents, also through the bodily-motor experiences promoted within the school (IUHPE, 2010).

A comprehensive school approach that consistently integrates school policies with concrete practices of social inclusion and educational engagement leads to improved learning outcomes, increased well-being, and decreased health risk behaviors (IUHPE, 2010).

Analyzing scientific evidence and best practices is essential for designing well-structured and integrated educational interventions.

However, it is advisable that the design of multicomponent interventions is grounded in theoretical and organizational models such as: the socio-ecological approach and self-determination (Raposo et al., 2020), the goals and methodological orientations of Physical Literacy (Martins et al., 2020; Rudd et al., 2020; Cairney et al., 2019; Edwards et al., 2018).

In Model-Based Practice, projects oriented towards movement education converge, undoubtedly, a model implementable mainly in curriculum and instruction. The MBP at the curricular level presents a comprehensive program, inclusive of educational aims and its contents, aiming to facilitate the long-term achievement of learning outcomes by a wide range of students. The instructional MBP, on the other hand, promotes immediate learning outcomes and guides teachers in aligning practices such as classroom management, learning activities, social interaction, pedagogical decisions and assessment, with the specific objectives of the lessons (Dayson et al., 2016).

The teaching of physical education can be attributed to various educational models, not always complementary, recognized and implementable even at the curriculum level, including: Teaching for Personal and Social Responsibility, Cooperative Learning, Adventure Education, Outdoor Education, Teaching Games for

Understanding/Tactical Games, Sport Education, Cultural Studies, and Fitness Education (Dayson et al., 2016). Another model concerning the behavior of teachers and students aimed at teaching and learning motor competencies is the Spectrum Teaching Styles (Mosston & Ashworth, 2008).

Regarding the choice of interventions, one of the first and main multicomponent projects that sparked the debate on health-promoting schools was the Swiss project *School in Motion* – which became an organizational model. This model well identifies the structure to which a multicomponent project can refer. It was conceived with reference to temporal criteria for proposing motor and sports activities (before/after school) and environmental-spatial criteria (at school or in the classroom) where physical activity can be proposed. The educational interventions within the *School in Motion* project are divided into three moments, within which there are areas to propose physical activity: 1) At school (School events-Free time from lessons-Optional school sports); 2) In the classroom (Physical education-Teaching in motion-Interdisciplinary teaching); 3) Before/after school (Commute home/school-Homework) (UFSP, 2016).

In recent years, there has been increased interest and attention towards multicomponent programs in school physical education. At the European level, programs such as Hopp (Fredriksen et al., 2017) and Let's Move It (Hankonen et al., 2016) have been structured to increase physical activity and reduce sedentary behaviors. Additionally, several programs have been developed outside of Europe, such as the iPLAY study (Lonsdale et al., 2016) aimed at increasing physical activity, improving motor abilities and cardiorespiratory fitness, and the program described by Koorts et al. (2023) to reduce sedentary behaviors and increase physical activity. Physical Literacy (PL) plays a central role in this context as an organizational and methodological denominator that brings together various educational actions in different learning environments.

Despite the different interpretations of PL, depending on contexts and different countries, the most widely shared definition is that of Whitehead (2010), in which, depending on each individual's abilities and interests, PL can be described as the motivation, confidence, motor competence, knowledge, and understanding necessary to engage in physical activity across the lifespan.

The concept of PL inevitably corresponds with that of motor competence, which involves different and complementary factors: motor functions (basic motor skills, motor abilities), related psychological factors (motivation, self-perception), cognitive factors (knowledge), behavioral and social factors (interpersonal interaction and communication), interaction with socio-cultural contexts, and education for lifelong physical activity (*long life education*).

The CSPAP (Comprehensive School Physical Activity Program), an evolution of the previous Swiss model, represents an organizational approach to expand children's involvement in physical activities, thus promoting the acquisition of fundamental motor competencies translatable into PL. In fact, the implementation of CSPAP represents the most coherent pathway to increase opportunities for physical activity participation, while simultaneously promoting PL as an educational tool (Castelli et al., 2014) oriented towards body and movement education and education through body and movement.

Physical education plays a prominent role in promoting PA at the school level, as well as being an indispensable part of any CSPAP. Opportunities for PA before, during, and after school, as well as the involvement of families and the community, are components of the model that support the implementation of PA moments in children. However, for PA moments to be connected to school physical education, interventions need to be designed, structured, and intentional, methodologically well-grounded to support educational objectives (Webster et al., 2020).

Beets et al. (2016) propose a theory in which the major changes of many physical activity-based interventions must fall into one of the following categories to produce positive effects: 1) expansion of opportunities for youth to be active; 2) extension of existing physical activity opportunities by increasing the amount of time allocated to such opportunities; 3) enhancement of existing physical activity opportunities through strategies designed to increase physical activity beyond routine practice. The Theory of Expanded, Extended, and Enhanced Opportunities (TEO) offers a new way to understand youth physical activity behaviors and provides a common classification through which interveners can identify appropriate goals for interventions in different contexts (Beets et al., 2016).

Khodaveisi et al. (2021), through their study, have demonstrated that the Health Belief Model (HBM) is a useful model for improving individuals' understanding of the benefits of physical activity, as individual motivation to engage in healthy behaviors is associated with personal perceptions, behavior regulation, and the likelihood of performing such behaviors. Çiftci et al. (2022) have shown that the educational program based on the HBM was found to be effective in increasing self-perceived scores on physical health and Metabolic Equivalent Task (MET) values.

In a health promotion context, significant support and reference are provided by the socio-ecological approach, in which health promotion should focus not only on intrapersonal behavioral factors but also on factors that center on the interplay between individuals and the social, physical, and political environment. The socio-ecological model represents a (macro) comprehensive approach to examining the multiple factors influencing physical activity. This model identifies opportunities to

promote PA considering the individual (gender, beliefs, attitudes), behavior (sedentary and active time), social environment (family, teachers, peers), and physical environment (availability of equipment and facilities), factors that can influence the ability to be sufficiently active (Mehtälä et al., 2014).

Structuring multicomponent projects using the socio-ecological model as a framework for physical education programs is essential for promoting health in the school environment, so that physical activity experiences and healthy behaviors are achievable, accessible, and available to all individuals within the school community (Solmon, 2015).

The health promotion model also encompasses numerous physical activity experiences, some of which involve outdoor activities. However, not all outdoor activities promote health: an urban environment lacking green spaces, polluted air, and heavy traffic does not contribute to health promotion. Therefore, multicomponent projects involving these activities would require further evidence in this regard.

Although in Bailey et al. review (2023), they examined the contribution of Active Transportation to health promotion, concluding that methodologically well-designed interventions contribute to a significant increase in physical activity levels in children, within the context of outdoor activity proposals, one must always consider the promotion of a sustainable human-nature relationship from an environmental perspective. However, it's essential not to forget that the world is constantly changing (climate, air quality, urban infrastructure, removal of architectural barriers, etc.) (Quennerstedt et al., 2024).

Promoting health and well-being across all stages of life means navigating through an intricate maze of constantly evolving biological, social, and environmental factors (Stodden et al., 2021).

If healthy behaviors established during the early years of life are more likely to persist or leave a trace from childhood to adulthood (Telama et al., 2014), greater efforts should be made to capitalize on key opportunities, even within the school environment. Opportunities for physical activity should not only be considered in relation to physical education but also before, during, and after school.

A multicomponent school physical activity program is necessary to ensure children have the opportunity to meet the international guidelines of 60 minutes of moderate to vigorous physical activity (MVPA) per day (WHO, 2020).

To foster the comprehensive development of children, it is necessary to revolutionize pedagogical approaches, starting from early childhood education. This context often represents the primary learning environment outside the family. Interventions should focus on the child, addressing their needs through exploratory

and playful motor activities, promoting both learning and health. These initiatives can support educational goals and integrate public health programs in the early years of life. Providing stimulating experiences in various environments and social contexts can fuel children's intrinsic motivation, encourage exploration, and stimulate physical, cognitive, and emotional engagement for personal growth (Stodden et al., 2021).

## **Conclusions**

Physical education is considered the central curricular teaching from which various educational interventions originate and converge. In recent years, numerous studies have supported the promotion of physically active lifestyles and motor learning. Indeed, ensuring high-quality physical education is essential for planning and coordinating coherent, meaningful, and relevant initiatives to provide accessible and sustainable physical activity opportunities for youth in schools (Cale, 2023).

Recently, significant enhancement of physical education in primary schools has been observed in many countries. This has been achieved through the implementation of multicomponent and inter-institutional projects, increasing the number of curricular hours, and adopting various measures to promote children's motor development and encourage interdisciplinary and cross-cutting educational relationships (Colella et al., 2020).

The current international and national guidelines (WHO, 2020; Ministero della Salute, 2019; Miur, 2019) highlight the need to anchor the promotion of children's physical activities to multicomponent policies (curricular physical education-sports education; urban planning-transportation-daily physical activities-education on healthy eating habits). They affirm that schools (especially primary schools) constitute the privileged setting for health promotion through disciplinary, interdisciplinary, and cross-curricular educational pathways.

Multicomponent programs are activities that can be carried out at home or in a structured group or classroom setting and combine all types of exercise (e.g., aerobic activity, muscle strength, motor coordination) and organizational modes/contexts (Bull et al., 2020). Examples of multicomponent programs include: active transport, educational paths for healthy eating/hands-on taste education; games and other motor activities before school entry, brain breaks during recess, at the end of classes; afternoon sports initiation courses, etc. These activities are methodologically integrated into the curriculum.

The importance of physical education for the health of children and adolescents is well-known, as is its positive influence on the physical, emotional, social, and cognitive domains. Furthermore, it is widely acknowledged that programs and policies with physical education strategies that extend class time, enhance teaching quality, and ensure the presence of qualified physical education teachers represent the most effective elements for achieving health benefits (Ramires et al., 2023).

Quality physical education that places youth at the center and provides physical activity and high-quality learning experiences is indispensable. It should serve as the foundation and starting point, as well as the link to broader initiatives and the involvement of the entire school in promoting physical activity.

Promoting Physical Literacy in schools appears to be a promising approach as the foundation for a lifelong active (and healthy) lifestyle and as a means to combat non-communicable diseases.

Physically active lessons promote numerous and diverse activities interconnected with disciplinary content and represent an accessible, sustainable, inclusive approach, as they do not take away time from other subjects or extend the school day and can be implemented by all teachers. The educational benefits require specific and shared methodological support.

The positive effect of physical activity on behavior is an important prerequisite for encouraging future participation in physical activity interventions at the school level and for overall student engagement in physical activity during physical education class hours.

## References

- Arufe-Giráldez, V., Sanmiguel-Rodríguez, A., Patón, R. N., & Navarro-Patón, R. (2023). News of the Pedagogical Models in Physical Education—A quick review. *International Journal of Environmental Research and Public Health/International Journal of Environmental Research and Public Health*, 20(3), 2586. <https://doi.org/10.3390/ijerph20032586>
- Bailey, R. P., Vašíčková, J., Payne, R., Raya Demidoff, A., & Scheuer, C. (2023). Active transport to school and health-enhancing physical activity: a rapid review of European evidence. *Cities & Health*, 7(5), 875–887. <https://doi.org/10.1080/23748834.2023.2213428>
- Beets, M. W., Okely, A. D., Weaver, R. G., Webster, C. A., Lubans, D. R., Brusseau, T. A., Carson, R., & Cliff, D. P. (2016). The theory of expanded, extended, and enhanced opportunities for youth physical activity promotion. *the*

- International Journal of Behavioural Nutrition and Physical Activity, 13(1).  
<https://doi.org/10.1186/s12966-016-0442-2>
- Brandes, B., Busse, H., Sell, L., Christianson, L., & Brandes, M. (2022). A scoping review on characteristics of school-based interventions to promote physical activity and cardiorespiratory fitness among 6- to 10-year-old children. *Preventive Medicine*, 155, 106920.  
<https://doi.org/10.1016/j.ypmed.2021.106920>
- Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J. P., Chastin, S., Chou, R., Dempsey, P. C., Dipietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., ... Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. In *British Journal of Sports Medicine* (Vol. 54, Issue 24, pp. 1451–1462). BMJ Publishing Group. <https://doi.org/10.1136/bjsports-2020-102955>
- Cairney, J., Dudley, D., Kwan, M., Bulten, R., & Kriellaars, D. (2019). Physical Literacy, Physical Activity and Health: Toward an Evidence-Informed Conceptual Model. *Sports Medicine*, 49(3), 371–383. <https://doi.org/10.1007/s40279-019-01063-3>
- Cale, L. (2023). Physical education: at the Centre of Physical Activity Promotion in schools. *International Journal of Environmental Research and Public Health (Online)*, 20(11), 6033. <https://doi.org/10.3390/ijerph20116033>
- Carl, J., Schmittwilken, L., & Pöppel, K. (2023). Development and evaluation of a school-based physical literacy intervention for children in Germany: protocol of the PLACE study. *Frontiers in Sports and Active Living*, 5. <https://doi.org/10.3389/fspor.2023.1155363>
- Castelli, D. M., Centeio, E. E., Beighle, A., Carson, R. L., & Nicksic, H. M. (2014). Physical literacy and Comprehensive School Physical Activity Programs. *Preventive Medicine*, 66, 95–100.  
<https://doi.org/10.1016/j.ypmed.2014.06.007>
- Çiftci, N., & Kadioğlu, H. (2022). The effect of the health belief model-based educational program on physical activity beliefs and behaviors of university students. *Zeitschrift Für Gesundheitswissenschaften/Journal of Public Health*, 31(12), 1981–1988. <https://doi.org/10.1007/s10389-022-01776-2>
- Colella, D., Bellantonio, S., D'Arando, C., & Monacis, D. (2020). Interventions for the promotion of motor activities in primary school. Assessment of motor performance in relation to perceived self-efficacy and enjoyment. *Italian Journal of Educational Research*, 25, 49-62.

- Dyson, B., Kulinna, P. H., & Metzler, M. W. (2016). Introduction to the special issue: Models based Practice in Physical Education. *Journal of Teaching in Physical Education*, 35(4), 297–298. <https://doi.org/10.1123/jtpe.2016-0203>
- Edwards, L., Bryant, A., Keegan, R., Morgan, K., & Jones, A. (2018). Definitions, foundations, and associations of physical literacy: A systematic review. *Sports Medicine*, 47(1), 113–126. <https://doi.org/10.1007/s40279-016-0560-7>
- Estevan, I., García-Massó, X., Menescardi, C., Ortega-Benavent, N., Montalt-García, S., Romero-Martínez, J., Castillo, I., Álvarez, O., Queral, A., & Molina-García, J. (2023). A Classroom-Based Intervention to Promote Physical Literacy in Children: ALPHYL Study Protocol. *Behavioral Sciences*, 13(7), 609. <https://doi.org/10.3390/bs13070609>
- Fredriksen, P. M., Hjellev, O. P., Mamen, A., Meza, T. J., & Westerberg, A. C. (2017). The health Oriented pedagogical project (HOPP) - a controlled longitudinal school-based physical activity intervention program. *BMC Public Health*, 17(1). <https://doi.org/10.1186/s12889-017-4282-z>
- González-Pérez, M. A., Sánchez-Oliva, D., Grao-Cruces, A., Cano-Cañada, E., Martín-Acosta, F., Muñoz-González, R., Bandera-Campos, F. J., Ruiz-Hermosa, A., Vaquero-Solís, M., Moledo, C. P., Conde-Caveda, J., Segura-Jiménez, V., González-Ponce, I., García-Calvo, T., Castro-Piñero, J., & Camiletti-Moirón, D. (2024). Effects of the inclusion of physical activity in secondary education academic classes on educational indicators and health markers: rationale and methods of the ACTIVE CLASS study. *Frontiers in Public Health*, 11. <https://doi.org/10.3389/fpubh.2023.1329245>
- Graudusius, M., Koch, L., Wessely, S., & Joisten, C. (2024). School-based promotion of physical literacy: a scoping review. *Frontiers in Public Health*, 12. <https://doi.org/10.3389/fpubh.2024.1322075>
- Gruppo scuola UFSPQ in collaborazione con i partner. (2016). La scuola in movimento. Spiegazioni sul modello svizzero. *Ufficio federale dello sport UFSPQ, Sport dei giovani e degli adulti*. <https://backend.baspo.admin.ch/fileservice/sdweb-docs-prod-baspo-ch-files/files/2023/10/31/11a214a0-0f2e-4554-9092-9ca3edac379c.pdf>
- Hankonen, N., Heino, M. T. J., Araújo-Soares, V., Sniehotka, F. F., Sund, R., Vasankari, T., Absetz, P., Borodulin, K., Uutela, A., Lintunen, T., & Haukkala, A. (2016). 'Let's Move It' – a school-based multilevel intervention to increase physical activity and reduce sedentary behaviour among older adolescents in vocational secondary schools: a study protocol for a cluster-randomised trial. *BMC Public Health*, 16(1). <https://doi.org/10.1186/s12889-016-3094-x>

- Hills, A.P., Dengel, D.R., Lubans, D.R., (2014). Supporting Public Health Priorities: Recommendations for Physical Education and Physical Activity Promotion in Schools; *Prog Cardiovasc Dis*; <http://dx.doi.org/10.1016/j.pcad.2014.09.010>
- International Union for Health Promotion and Education (IUHPE). (2010). Promoting Health in Schools: From evidence to Action. Traduzione italiana “Promuovere la Salute a Scuola dall’ evidenza all’ azione” [http://www.iuhpe.org/images/PUBLICATIONS/THEMATIC/HPS/Evidence-Action\\_IT.pdf](http://www.iuhpe.org/images/PUBLICATIONS/THEMATIC/HPS/Evidence-Action_IT.pdf) <https://www.iuhpe.org/index.php/en/iuhpe-thematic-resources/298-on-school-health>
- International Union for Health Promotion and Education, IUHPE (2011). Towards A School That Promotes Health: Guidelines for health promotion in schools. [www.iuhpe.org](http://www.iuhpe.org)
- Khodaveisi, M., Azizpour, B., Jadidi, A., & Mohammadi, Y. (2021). Education based on the health belief model to improve the level of physical activity. *Physical Activity and Nutrition*, 25(4), 17–23. <https://doi.org/10.20463/pan.2021.0022>
- Koorts, H., Timperio, A., Lonsdale, C., Ridgers, N. D., Lubans, D. R., Della Gatta, J., Bauman, A., Telford, A., Barnett, L. M., Lamb, K. E., Lander, N., Lai, S. K., Sanders, T., Arundell, L., Brown, H., Wilhite, K., & Salmon, J. (2023). Scaling up a school-based intervention to increase physical activity and reduce sedentary behaviour in children: protocol for the TransformUshybrid effectiveness–implementation trial. *BMJ Open*, 13(10), e078410. <https://doi.org/10.1136/bmjopen-2023-078410>
- Li, M. H., Rudd, J., Chow, J. Y., Sit, C. H., Wong, S. K., & Sum, R. K. W. (2022). A randomized controlled trial of a blended physical literacy intervention to support physical activity and health of primary school children. *Sports Medicine - Open*, 8(1). <https://doi.org/10.1186/s40798-022-00448-5>
- Li, M. H., Sit, C. H., Wong, S. K., Wing, Y. K., Ng, C. K., & Sum, R. K. (2021). Promoting physical activity and health in Hong Kong primary school children through a blended physical literacy intervention: protocol and baseline characteristics of the “Stand+Move” randomized controlled trial. *Trials*, 22(1). <https://doi.org/10.1186/s13063-021-05925-y>
- Lonsdale, C., Sanders, T., Cohen, K. E., Parker, P. D., Noetel, M., Hartwig, T. B., Vasconcellos, D. I. C., Kirwan, M., Morgan, P. J., Salmon, J., Moodie, M., McKay, H., Bennie, A., Plotnikoff, R. C., Cinelli, R., Greene, D., Peralta, L., Cliff, D. P., Kolt, G. S., . . . Lubans, D. R. (2016). Scaling-up an efficacious school-based physical activity intervention: Study protocol for the ‘Internet-based Professional Learning to help teachers support Activity in Youth’ (iPLAY) cluster randomized

- controlled trial and scale-up implementation evaluation. *BMC Public Health*, 16(1). <https://doi.org/10.1186/s12889-016-3243-2>
- Ma, J., O'Brien, W., Lester, D., Eyre, E., Lander, N., Koorts, H., Barnett, L. M., & Duncan, M. (2023). What keeps FLAME lit? Comparing two modes of implementation of a physical education-based intervention to improve motor competence among Irish adolescents. *Physical Education and Sport Pedagogy*, 1–17. <https://doi.org/10.1080/17408989.2023.2284928>
- Martins, J., Onofre, M., Mota, J., Murphy, C., Repond, R. M., Vost, H., Cremosini, B., Svrdlim, A., Markovic, M., & Dudley, D. (2020). International approaches to the definition, philosophical tenets, and core elements of physical literacy: A scoping review. *Prospects*. <https://doi.org/10.1007/s11125-020-09466-1>
- Mehtälä, A., Sääkslahti, A., Inkinen, M. E., & Poskiparta, M. (2014). A socio-ecological approach to physical activity interventions in childcare: a systematic review. *the International Journal of Behavioural Nutrition and Physical Activity*, 11(1), 22. <https://doi.org/10.1186/1479-5868-11-22>
- Mendoza-Muñoz, M., Calle-Guisado, V., Pastor-Cisneros, R., Barrios-Fernández, S., Rojo-Ramos, J., Vega-Muñoz, A., Contreras-Barraza, N., & Carlos-Vivas, J. (2022). Effects of active breaks on physical literacy: a Cross-Sectional pilot study in a region of Spain. *International Journal of Environmental Research and Public Health (Online)*, 19(13), 7597. <https://doi.org/10.3390/ijerph19137597>
- Ministero della salute - Direzione generale della prevenzione sanitaria - Ministero dell'Istruzione dell'Università e della Ricerca - Dipartimento per il sistema educativo di istruzione e di formazione (2019). *Indirizzi di "policy" integrate per la Scuola che Promuove Salute*. [http://www.salute.gov.it/portale/news/p3\\_2\\_1\\_1\\_1.jsp?lingua=italiano&menu=notizie&p=dalministero&id=3607](http://www.salute.gov.it/portale/news/p3_2_1_1_1.jsp?lingua=italiano&menu=notizie&p=dalministero&id=3607)
- Ministero della salute-Direzione generale della prevenzione sanitaria Ufficio 8 (2019). *Linee di indirizzo sull'attività fisica per le differenti fasce d'età e con riferimento a situazioni fisiologiche e fisiopatologiche e a sottogruppi specifici di popolazione*. [http://www.salute.gov.it/portale/documentazione/p6\\_2\\_2\\_1.jsp?lingua=italiano&id=2828](http://www.salute.gov.it/portale/documentazione/p6_2_2_1.jsp?lingua=italiano&id=2828)
- Morris, J. L., Chalkley, A., Helme, Z. E., Timms, O., Young, E., McLoughlin, G. M., Bartholomew, J. B., & Daly-Smith, A. (2023). Initial insights into the impact and implementation of Creating Active Schools in Bradford, UK. *The International Journal of Behavioural Nutrition and Physical Activity (Online)*, 20(1). <https://doi.org/10.1186/s12966-023-01485-3>

- Mosston, M., Ashworth, S. (2008). *Teaching physical education*. First on line edition available at: <http://www.spectrumofteachingstyles.org/e-book-download>
- Porter, A., Walker, R. P., House, D., Salway, R., Dawson, S., Ijaz, S., De Vocht, F., & Jago, R. (2024b). Physical activity interventions in European primary schools: a scoping review to create a framework for the design of tailored interventions in European countries. *Frontiers in Public Health*, 12. <https://doi.org/10.3389/fpubh.2024.1321167>
- Quennerstedt, M., Backman, E., & Mikael, J. (2024). Returning to the river: the salutogenic model as a theory to explore the relation between outdoor activities and health. *Journal of Adventure Education and Outdoor Learning*, 1–16. <https://doi.org/10.1080/14729679.2024.2342305>
- Ramires, V. V., Santos, P. C. D., Filho, V. C. B., Da Silva Bandeira, A., Tenório, M. C. M., De Camargo, É. M., De Paula Ravagnani, F. C., Sandreschi, P. F., De Oliveira, V. J. M., Hallal, P. C., & Da Silva, K. S. (2023). Physical Education for Health Among School-Aged Children and Adolescents: A Scoping Review of reviews. *Journal of Physical Activity & Health*, 20(7), 586–599. <https://doi.org/10.1123/jpah.2022-0395>
- Raposo, F. Z., Caldeira, P., Batalau, R., Araújo, D., & Silva, M. N. (2020). Self-determination theory and nonlinear pedagogy: An approach to exercise professionals' strategies on autonomous motivation. *Retos*, 37, 680–686. <https://doi.org/10.47197/retos.v37i37.74355>
- Rudd, J. R., Pesce, C., Strafford, B. W., & Davids, K. (2020). Physical Literacy - A Journey of Individual Enrichment: An Ecological Dynamics Rationale for Enhancing Performance and Physical Activity in All. In *Frontiers in Psychology* (Vol. 11). Frontiers Media S.A. <https://doi.org/10.3389/fpsyg.2020.01904>
- Sánchez-López, M., Cavero-Redondo, I., Álvarez-Bueno, C., Ruiz-Hermosa, A., Pozuelo-Carrascosa, D. P., Díez-Fernández, A., Del Campo, D. G., Pardo-Guijarro, M. J., & Martínez-Vizcaíno, V. (2019). Impact of a multicomponent physical activity intervention on cognitive performance: The MOVI-KIDS study. *Scandinavian Journal of Medicine & Science in Sports*, 29(5), 766–775. <https://doi.org/10.1111/sms.13383>
- Seljebotn, P. H., Skage, I., Riskedal, A., Olsen, M., Kvalø, S. E., & Dyrstad, S. M. (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>

- Solmon, M. A. (2015). Optimizing the role of physical education in promoting Physical activity: A Social-Ecological approach. *Research Quarterly for Exercise and Sport*, 86(4), 329–337. <https://doi.org/10.1080/02701367.2015.1091712>
- Stodden, D. F., Lakes, K. D., Côté, J., Aadland, E., Brian, A., Draper, C. E., Ekkekakis, P., Fumagalli, G. F., Laukkanen, A., Mavilidi, M. F., Mazzoli, E., Neville, R. D., Niemistö, D., Rudd, J., Sääkslahti, A., Schmidt, M., Tomporowski, P. D., Tortella, P., Vazou, S., & Pesce, C. (2021). Exploration: an overarching focus for holistic development. *Brazilian Journal of Motor Behavior/Brazilian Journal of Motor Behavior*, 15(5), 301–320. <https://doi.org/10.20338/bjmb.v15i5.254>
- Telama, R., Yang, X., Leskinen, E., Kankaanpää, A., Hirvensalo, M., Tammelin, T., Viikari, J., & Raitakari, O. T. (2014). Tracking of Physical Activity from Early Childhood through Youth into Adulthood. *Medicine and Science in Sports and Exercise*, 46(5), 955–962. <https://doi.org/10.1249/mss.0000000000000181>
- Webster, C. A., Rink, J. E., Carson, R. L., Moon, J., & Gaudreault, K. L. (2020). The Comprehensive School Physical Activity Program model: a proposed illustrative supplement to help move the needle on youth physical activity. *Kinesiology Review*, 9(2), 112–121. <https://doi.org/10.1123/kr.2019-0048>
- Whitehead, M. (Ed.). (2010). *Physical literacy: Throughout the lifecourse*. New York, NY: Routledge
- Wright, C., Chomitz, V. R., Duquesnay, P. J., Amin, S., Economos, C. D., & Satchek, J. M. (2019b). The FLEX study school-based physical activity programs – measurement and evaluation of implementation. *BMC Public Health (Online)*, 19(1). <https://doi.org/10.1186/s12889-018-6335-3>
- Zhang, D., Shi, L., Zhu, X., Chen, S., & Liu, Y. (2023). Effects of intervention integrating physical literacy into active school recesses on physical fitness and academic achievement in Chinese children. *Journal of Exercise Science & Fitness*, 21(4), 376–384. <https://doi.org/10.1016/j.jesf.2023.09.004>