

ACTIVE BREAKS AT SCHOOL: MOVING TO LEARN AND PROMOTE DAILY PHYSICAL ACTIVITY

LE PAUSE ATTIVE A SCUOLA: MUOVERSI PER IMPARARE E PROMUOVERE L'ATTIVITÀ MOTORIA QUOTIDIANA



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ABSTRACT

Active breaks (AB) are an opportunity to improve physical activity levels (PAL) and factors related to academic performance (AP). The aim was to investigate the efficiency of AB on the PAL and AP of students. 15 studies were selected according to the following inclusion criteria: a) studies published between 2020 and 2024; b) participant aged from 8 to 15. The consulted databases were SPORTDiscus, PubMed and Web of Science. This short review highlights the benefits of AB on the learning process.

Le pause attive (PA) sono un'opportunità per migliorare i livelli di attività fisica (LAF) e i fattori correlati al rendimento scolastico (RS). L'obiettivo è quello di indagare l'efficacia delle PA sui LAF e RS degli studenti. Sono stati inclusi 15 studi con i seguenti criteri: a) pubblicati tra il 2020 e il 2024; b) campione di età tra 8 e 15 anni. I database consultati sono SPORTDiscus, PubMed e Web of Science. Questa breve revisione evidenzia i benefici delle AB sul processo di apprendimento.

KEYWORDS

Active breaks, classroom behaviour, children, preadolescent students
Pause attive, comportamenti in classe, bambini, preadolescenti

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Introduction

The decline in levels of physical activity during childhood and adolescence constitutes a concerning phenomenon on various levels, including organic-metabolic, cognitive, and emotional-relational, as it entails a quantitative and qualitative reduction in experiences lived through bodily movement and physical activity.

In recent years, interdisciplinary studies on the centrality of bodily experience in the educational process have highlighted the importance of guiding educational pathways according to a holistic approach to promote the unity of the individual, emphasizing application contexts and educational mediation (Stodden et al., 2023).

Experiences lived through the body and physical activities promote the educational process of the individual through reciprocal relationships between cognitive, emotional, motor, and social development. In particular, the contribution of physical activity to cognitive processes has gained significant emphasis: neuroscientific research has confirmed that sedentary habits inhibit learning, with repercussions on brain functioning, neuroplasticity, and neural connections (Olivieri, 2016).

Within the field of educational neuroscience, the paradigm of Embodied Cognition (EC) has emerged as an emerging scientific approach (Gomez-Paloma, 2009), aiming to emphasize how cognitive and linguistic activities can be influenced by children's bodily-motor experiences.

EC (embodied cognition) considers behaviour as the result of the body in action, emphasizing the subordination of cognition to the body (Berthoz, 1998) and highlighting the strong link between perception-action and cognitive processes, especially executive functions (Glenberg et al., 2013).

The body and movement thus emerge as two fundamental nuclei within the educational process, capable of contributing to the promotion of awareness, autonomy, and the acquisition of motor skills by students (Belgianni, 2017). Even in the school context, experiences lived through the body and the practice of physical activity are valuable for the development of cognitive processes, influencing students' learning modalities (Latino et al., 2020).

In particular, educational experiences lived through the body and active participation facilitate the construction of knowledge also thanks to the possibility of generating positive emotional experiences (Gomez Paloma, 2015).

Among the tasks of the school is, therefore, that of designing good practices, emphasizing the guidelines of neuroeducation, to be integrated into the curriculum through innovative interventions aimed at active learning, with greater emphasis on the relationship between learning, corporeality, and emotions (Gomez Paloma, 2016).

Several studies have emphasized the centrality of physical activity for the realization of educational mediations with learning related to curricular disciplines. The association of mathematical content with bodily-motor experiences proposed in class or during physical education lessons, for example, is capable of generating meaningful learning.

The direction is already outlined by the National Guidelines (MIUR, 2012) which guides the contribution of physical activities at school towards the growth of the individual, outlining the directions of the curriculum towards the following directions of the educational process: a) through the body and movement, b) of the body and movement, and c) to the body and movement.

Education through the body and movement does not occur randomly but requires the teacher to function as educational mediation, highlighting the contribution of physical education to the promotion of learning in all curricular areas.

The importance of identifying, designing, and implementing innovative pedagogical approaches (Paniagua & Istance, 2018) that are able to stimulate students' motivation in learning settings emerges. The contribution presents a short review of the literature, through databases (SPORTDiscus; Pubmed; Web of Science), in order to highlight the educational contribution of active breaks in the curriculum of primary and lower secondary schools.

1. Active breaks: What purposes?

In the school context, physical education faces numerous challenges that hinder physical activity practice and the promotion of active lifestyles. In order to increase opportunities for physical activity in schools, interventions aimed at ensuring numerous and diverse motor experiences and quality physical education are necessary (Cale, 2023).

In the European context, the promotion of multicomponent and interinstitutional projects oriented towards health has indeed received considerable momentum. These interventions include a series of educational activities achievable through different organizational modalities and in various contexts (Bull et al., 2020).

With the aim of integrating physical activity into everyday life and increasing the time children and young people spend being physically active, Babey et al., (2014) evaluated four types of approaches adoptable within the school system:

- *Pre-school* programs;
- Motor activity and sports programs *post-school*;
- *Extending* the school day to provide 60 minutes of physical education;
- Short intervals (10 minutes) of motor activity *during* the school day.

This allows innovative interventions aimed at increasing motor activity practice in curricular teaching to be categorized into one of the following three categories (Beets et al., 2016):

- Expansion of existing curricular opportunities for children to be active;
- Extension of opportunities to be physically active;
- Enhancement of opportunities to engage in motor activities already present in the curriculum, through targeted strategies to increase motor engagement time.

Evidence emphasizes that among the factors related to the need to increase the time children are physically active in school, there is a predominance of motivations predominantly attributable to the biomedical field, which consider physiological and organic-metabolic aspects, overlooking the importance of the contribution of physical education to the development of social, affective, and emotional skills. In the context of health-promoting schools, educational actions should instead promote qualitative rather than quantitative motor learning (Saiz-Gonzalez et al., 2024) and represent opportunities to promote positive behaviours and engage children in correct lifestyles (McLennan & Thompson, 2015).

Among the most common interventions carried out to increase opportunities for being physically active are active breaks (Porter et al., 2024), which are an effective educational strategy to interrupt long periods of sedentary behaviours with brief 5-10 minute periods of playful motor activities during the school day (Bailey et al., 2023; Masini et al., 2023).

This educational strategy allows for various purposes, including:

- a) Contributing to achieving the recommended 60 minutes of daily physical activity for health;
- b) Improving student behaviours;
- c) Improving attention and memory with positive effects on academic performance;
- d) Promoting learning and motor development.

Consistent with the *American Academy of Pediatrics* (AAP), which emphasizes the importance of recess and defines it as the most enjoyable time for children (Murray & Ramstetter, 2013), active breaks can be introduced at the beginning, during, or at the end of the school day.

Brief bouts of physical activity allow children to process knowledge specific to disciplines through movement, which, if intentionally proposed, allows for generating connections between learning, with the material before or after the break.

Consistent with international guidelines (WHO, 2020), active breaks offer the possibility of increasing the quantitative aspect of physical activity by involving students in motor activities and increasing daily motor engagement time. Likewise,

this methodological framework allows for stimulating the qualitative aspect of physical activity in the learning process, favoring the interconnection of different cognitive, emotional, and relational factors: interdisciplinary bonds can be generated through cognitive-motor connections, thanks to the relationships between the contents of curricular disciplines and motor activity.

In this sense, motor activity assumes the role of mediator of learning, linking active learning interventions to the curriculum, methodologically.

The implementation of active breaks identifies:

- Motor interventions not anchored to the curriculum;
- Interventions attributable to the curriculum;
- Active breaks with a higher cognitive load, capable of being challenging and engaging student participation (Salmon et al., 2020).

Proposals for learning through movement also allow for generating fun during physical activity practice, increasing the levels of intrinsic motivation of each student (Vitali et al., 2019).

Therefore, implementing active breaks in teaching can be an effective intervention to increase children's levels of physical activity, improve cognitive processes, and evaluate their direct and indirect effects on academic achievement and classroom behaviours.

The design of educational proposals concerning active breaks allows for adapting them to the needs of students, making them inclusive and accessible to all. In this sense, they represent a sustainable intervention within the school environment, thanks to the simplicity of implementation that does not require the use of specific equipment.

The American Academy of Paediatrics (AAP) has issued recommendations concerning recess periods within the school day (Murray, R., & Ramstetter, 2013), stating that:

1. It is a necessary break in the school day; it promotes improvement in children's social, emotional, physical, and cognitive aspects and should not be denied for reasons related to academic success or punitive reasons;
2. It impacts mental processes and, consequently, academic performance;
3. Breaks should be structured to provide sufficient leisure opportunities for students;
4. It does not replace physical education;
5. It contrasts with long periods of sedentary behaviours and can contribute to achieving the recommended 60 minutes of physical activity according to international guidelines. It represents an optimal tool for reducing the risk of overweight;
6. It is safe and well-supervised.

A recent approach aimed at implementing active breaks in education is the TAB model (Natalie J. et al., 2024), which considers active breaks not as separate interventions from lessons but as curriculum-embedded proposals. The model identifies five types of active breaks for effective teaching:

1. Structured breaks with integrated physical activities within the lesson structure, during which students respond to questions or prompts through movement.
2. Transition breaks involving active movements during specific phases of the lesson.
3. Management breaks involving interruptions and physical activity practice for 20-30 minutes, whether integrated into the curriculum or not.
4. Energizing breaks with high-intensity motor demands.
5. Learning breaks aimed at actively promoting and consolidating knowledge through embodied learning opportunities.

Among the rising trends, numerous studies have been conducted to evaluate the use of "Brain Breaks." These are short intervals of physical activity during the school day, facilitated using technology. This allows for varying organizational methodologies and directing interventions using different technological tools that offer a range of physical activity-related videos capable of generating enjoyment during physical activity. In this way, attitudes toward physical activity can be favourably changed, resulting in reduced sedentary behaviours (Zhao et al., 2023).

2. Methods

Fifteen studies were selected (Table 1), analysed, and included in this short review. The inclusion criteria were as follows:

- a) Studies published between 2020 and 2024;
- b) Participants in the studies aged from 8 to 15;
- c) Studies presenting the effectiveness of active breaks on physical activity levels and executive functions (attention, memory);
- d) Systematic reviews were excluded.

The studies were selected from the following databases: SPORTDiscus, PubMed, and Web of Science.

AUTHORS	OBJECTIVES	RESULTS
Mavilidi et al., 2020	Effects of AB on EF and MP	↑EF ↑MP
Masini et al., 2020	Effects of AB on EF	↑EF
Gallè et al., 2020	Effects of AB on PAL	↑PAL
Graham et al., 2021	Effects of AB on EF	↑EF
Fiorilli et al., 2021	Effects of AB on EF and MP	↑EF ↑MP
Muñoz-Parreño et al., 2021	Effects of AB on EF	↑EF
Ruiz Ariza et al., 2021	Effects of AB on EF	↑EF
Arribas-Galarraga & Maiztegi-Kortabarria, 2021	Effects of AB on EF	↑EF
Mendoza-Muñoz et al., 2022	Effects of AB on PAL	↑PAL
Zask et al., 2022	Effects of AB on PAL	↑PAL
Méndez-Giménez & Pallasá-Manteca, 2023	Effects of AB on EF	↑EF
García Vallejo et al., 2023	Effects of AB on PAL	↑PAL
Rodríguez-Maimón, 2023	Effects of AB on PAL	↑PAL
Rosa-Guillamon & Carrillo Lopez, 2024	Effects of AB on EF	↑EF
Maiztegi-Kortabarria et al., 2024	Effects of AB on EF	↑EF

Table 1. Selected studies

3. Results

Of the fifteen studies included in this short review, ten articles investigated the effectiveness of active breaks on children's executive functions (Mavilidi et al., 2020; Masini et al., 2020; Fiorilli et al., 2021; Muñoz-Parreño et al., 2021; Ruiz Ariza et al., 2021; Arribas-Galarraga & Maiztegi-Kortabarria, 2021; Méndez-Giménez & Pallasá-Manteca, 2023; Rosa-Guillamon & Carrillo Lopez, 2024; Miztegi-Kortabarria et al., 2024), and five considered the implementation of active breaks in the curriculum to increase physical activity levels and improve motor skills learning, coordination development, and fitness improvement (Gallè et al., 2020; Mendoza-Munoz et al., 2022; Zask et al., 2022; García Vallejo et al., 2023; Rodríguez-Maimón 2023).

Concurrently, two studies also addressed the effectiveness of active break interventions on math academic performance (Mavilidi et al., 2020; Fiorilli et al., 2021).

The selected evidence has demonstrated that short sessions of physical activity introduced during the school day, in both primary and secondary schools, can contribute to enhancing the educational process.

Indeed, from the analysis of the works, it emerges that the implementation of active breaks in education can increase not only students' daily physical activity levels, providing an additional opportunity to move and stay active during the day, but also improve students' attention and concentration levels, as well as their performance in curricular subjects such as mathematics.

Overall, the choice to integrate active breaks into the school setting can be effective both in academic performance and physical activity levels and related factors.

Conclusions

The choice to implement active breaks in the school setting represents an innovative educational strategy capable of producing significant benefits for students' development process.

This short literature review has analysed the effectiveness of active breaks in increasing students' physical activity levels, countering long periods of sedentary behaviour, and promoting qualitative learning.

Through active breaks, it is possible to adapt and contextualize learning, expanding and reinforcing the relationship between teachings.

Active breaks allow for generating positive behaviours in the classroom due to their contribution to the development of executive functions, fundamental for improving academic performance and academic success.

In this direction, the school as a place where students spend much of their day could set up active learning settings in which the student is the protagonist of their own learning.

In conclusion, the effectiveness of active breaks on physical activity levels and factors related to academic performance allows considering such interventions as an effective strategy to promote a healthier and more stimulating learning environment, oriented towards competence. A didactic research perspective is to include active breaks in the planning of curricular activities to integrate them during lessons, classifying interventions according to educational objectives and well-defined methodological guidelines.

References

- Andrades-Suárez, K., Faúndez-Casanova, C., Carreño-Cariceo, J., López-Tapia, M., Sobarzo-Espinoza, F., Valderrama-Ponce, C., Villar-Cavieres, N., Castillo-Retamal, F., Westphal, G. (2022). Relationship between physical activity, academic performance and executive function in adolescents: A systematic review. *Revista Ciencias de la Actividad Física*, 23, 1–17.
- Arribas-Galarra, S., & Maiztegi-Kortabarria, J. (2021). Evolución de la atención, concentración y rendimiento académico tras una intervención basada en descansos activos. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, 24 (3), 87-100.
- Babey, S. H., Wu, S., Cohen, D. (2014). How can schools help youth increase physical activity? An economic analysis comparing school-based programs. *Preventive Medicine*, 69, 555-560.
- Bailey, R., Ries, F., Heck, S., Scheuer, C. (2023). Active Learning: A Review of European Studies of Active Lessons. *Sustainability*, 15 (4), 3413. <https://doi.org/10.3390/su15043413>.
- Beets, M. W., Okely, A., Weaver, R.G., Webster, C., Lubans, D., Brusseau, T., Carson, R., Cliff, D. P. (2016). The theory of expanded, extended, and enhanced opportunities for youth physical activity promotion. *International Journal of Behavioral Nutrition and Physical Activity*, 13, 120. DOI 10.1186/s12966-016-0442-2
- Belgianni, C. (2017). Educazione corporea e al movimento. Il ruolo educativo del corpo e del movimento nella Scuola Primaria Italiana. *Rivista Italiana Di Pedagogia Dello Sport*, 2 (1), 19–25.
- Berthoz, A. (1998). Il senso del movimento. Milano: McGraw-Hill.
- Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., ... Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, 54 (24), 1451-1462. doi: 10.1136/bjsports-2020-102955.
- Cale, L. (2023). Physical education: At the centre of physical activity promotion in schools. *International Journal of Environmental Research and Public Health*, 20 (11). <https://doi.org/10.3390/ijerph20116033>
- Cappuccio, M. L. (Ed.). (2019). *Handbook of Embodied Cognition and Sport Psychology*. Cambridge: MIT Press.

Chaddock, L., Erickson, K. I., Prakash, R. S., Kim, J. S., Voss, M. W., VanPatter, M., ... Kramer, A. F. (2010). A neuroimaging investigation of the association between aerobic fitness, hippocampal volume and memory performance in preadolescent children. *Development & Aging, Cognitive Neuroscience Soc.*, 82-76.

Damiani, P., Santaniello, A., & Gomez Paloma, F. (2015). Ripensare la Didattica alla luce delle Neuroscienze Corpo, abilità visuospaziali ed empatia: una ricerca esplorativa. *Giornale Italiano della Ricerca Educativa*, VIII (14), 83-105.

Fiorilli, G., Buonsenso, A., Di Martino, G., Crova, C., Centorbi, M., Grazioli, E., ... di Cagno, A. (2021). Impact of Active Breaks in the Classroom on Mathematical Performance and Attention in Elementary School Children. *Healthcare (Basel)*, 9 (12), 1689. doi: 10.3390/healthcare9121689

Gallè, F., Pecoraro, P., Calella, P., Cerullo, G., Imoletti, M., Mastantuono, T., ... Sorrentino, C. (2020). Classroom Active Breaks to Increase Children's Physical Activity: A Cross-Sectional Study in the Province of Naples, Italy. *International Journal of Environmental Research and Public Health*, 17 (18), 6599. <https://doi.org/10.3390/ijerph17186599>

García Vallejo, A., Sánchez-Alcaraz Martínez, B. J., Hellín Martínez, M., & Alfonso Asencio, M. (2023). Influencia de un programa de recreos activos en la condición física de estudiantes de Educación Primaria [Influence of an active recess program on the physical condition of Primary Education students. *Retos*, 48, 222–228. <https://doi.org/10.47197/retos.v48.96099>

Glenberg, A. M., Witt, J. K., & Metcalfe, J. (2013). From the revolution to embodiment: 25 years of cognitive psychology. *Perspectives on Psychological Science*, 8 (5), 573–585.

Gomez Paloma, F., & Damiani, P. (2015). *Cognizione corporea, competenze integrate e formazione dei docenti: I tre volti dell'Embodied Cognitive Science per una scuola inclusiva*. Trento: Centro Studi Erickson.

Gomez Paloma, F., & Tafuri, D. (2016). *The body in didactic*. Napoli: Idelson Gnocchi.

Graham, J. D., Bremer, E., Fenesi, B., & Cairney, J. (2021). Examining the Acute Effects of Classroom-Based Physical Activity Breaks on Executive Functioning in 11- to 14-Year-Old Children: Single and Additive Moderation Effects of Physical Fitness. *Frontiers in Pediatrics*, 9, 688251. doi: 10.3389/fped.2021.688251.

Jiménez Boraita, R., Gargallo Ibort, E., Dalmau Torres, J. M., & Arriscado Alsina, D. (2022). Factors associated with a low level of physical activity in adolescents in La Rioja (Spain). *Anales de Pediatría*, 96, 326–333.

Latino, F., Fischetti, F., & Colella, D. (2020). The influence of physical activity on school-age children's cognitive function and academic performance: A review of the literature. *Formazione & Insegnamento*, 18 (3), 124–134. https://doi.org/10.7346/-fei-XVIII-03-20_10.

Maiztegi-Kortabarria, J., Arribas-Galarraga, S., Luis-de Cos, I., Espoz-Lazo, S., & Valdivia-Moral, P. (2024). Effect of an Active Break Intervention on Attention, Concentration, Academic Performance, and Self-Concept in Compulsory Secondary Education. *European Journal of Investigation in Health, Psychology and Education*, 14 (3), 447-462. doi: 10.3390/ejihpe14030030.

Masini, A., Lanari, M., Marini, S., Tessari, A., Toselli, S., Stagni, R., Dallolio, L. (2020). A Multiple Targeted Research Protocol for a Quasi-Experimental Trial in Primary School Children Based on an Active Break Intervention: The Imola Active Breaks (I-MOVE) Study. *International Journal of Environmental Research and Public Health*, 17 (17), 6123. doi: 10.3390/ijerph17176123.

Masini, A., Marini, S., Ceciliani, A., Barone, G., Lanari, M., Gori, D., Bragonzoni, L., Toselli, S., Stagni, R., Bisi, M. C., Sansavini, A., Tessari, A., Dallolio, L. (2023). The effects of an active breaks intervention on physical and cognitive performance: results from the I-MOVE study. *Journal of Public Health*, 45(4), 919–929. <https://doi.org/10.1093/pubmed/fdad102>.

Masini, A., Coco, D., Russo, G., Dallolio, L., & Ceciliani, A. (2023). Active breaks in primary school: Teacher awareness. *Formazione & insegnamento*, 21(15), 107-113.

Mavilidi, M. F., Drew, R., Morgan, P. J., Lubans, D. R., Schmidt, M., & Riley, N. (2020). Effects of different types of classroom physical activity breaks on children's on-task behaviour, academic achievement and cognition. *Acta Paediatrica*, 109 (1), 158-165. doi: 10.1111/apa.14892.

McLennan, N., & Thompson, J. (2015). *Educación física de calidad (EFC): Guía para los responsables políticos*. UNESCO.

Méndez-Giménez, A., & Pallasá-Manteca, M. (2023). The Effects of Active Breaks on Primary School Students' Attentional Processes and Motivational Regulation. *Apunts Educación Física y Deportes*, 151, 49-57. [https://doi.org/10.5672/apunts.2014-0983.es.\(2023/1\).151.05](https://doi.org/10.5672/apunts.2014-0983.es.(2023/1).151.05).

Mendoza-Muñoz, M., Calle-Guisado, V., Pastor-Cisneros, R., Barrios-Fernandez, 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*, 19 (13), 7597. <https://doi.org/10.3390/ijerph19137597>.

Muñoz-Parreño, J. A., Belando-Pedreño, N., Manzano-Sánchez, D., & Valero-Valenzuela, A. (2021). The Effect of an Active Breaks Program on Primary School Students' Executive Functions and Emotional Intelligence. *Psicothema*, 33 (3), 466-472. doi: 10.7334/psicothema2020.201.

Murray, R., & Ramstetter, C.; Council on School Health; American Academy of Pediatrics. (2013). The crucial role of recess in school. *Pediatrics*, 131 (1), 183-188. doi: 10.1542/peds.2012-2993.

Natalie J. Lander, Ana Maria Contardo Ayala, Emiliano Mazzoli, Samuel K. Lai, Jess Orr, & Jo Salmon. (2024). Beyond “Brain Breaks”: A new model for integrating classroom-based active breaks. *Journal of Physical Education, Recreation & Dance*, 95(4), 22-30. doi: 10.1080/07303084.2024.2308253.

Olivieri, D. (2016). Mente-corpo, cervello, educazione: L'educazione fisica nell'ottica delle neuroscienze. *FORMAZIONE & INSEGNAMENTO*, 14 (1), 89-106.

Paniagua, A., & Istance, D. (2018). *Teachers as designers of learning environments: The importance of innovative pedagogies*. OECD Publishing. doi: 10.1787/9789264085374.

Porter, A., Walker, R., House, D., Salway, R., Dawson, S., Ijaz, S., ... Jago, R. (2024). 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, 1321167. doi: 10.3389/fpubh.2024.1321167.

Rosa-Guillamón, A., & Carrillo-López, P. J. (2024). Efecto agudo de descansos físicamente activos sobre la atención en adolescentes. *Estudios sobre Educación*, 46, 173-194. DOI. <https://doi.org/10.15581/004.46.008>.

Ruiz-Ariza, A., López-Serrano, S., Mezcua-Hidalgo, A., Martínez-López, E. J., & Abu-Helaiel, K. (2021). Efecto agudo de descansos físicamente activos en variables cognitivas y creatividad en Educación Secundaria. *Retos*, 39, 635-642. <https://doi.org/10.47197/retos.v0i39.78591>.

Saiz-González, P., Iglesias, D., & Fernandez-Rio, J. (2024). Más Educación Física: Análisis Crítico del Discurso Biomédico Predominante en las Noticias de Prensa. *Retos*, 54, 541-547. <https://doi.org/10.47197/retos.v54.103578>.

Salmon, J., Mazzoli, E., Lander, N., Contardo Ayala, A. M., Sherar, L., & Ridgers, N. (2020). Classroom-based physical activity interventions. In *Deakin University (Ed.)*, 523-540.

Sneck, S., Viholainen, H., Syväoja, H., et al. (2019). Effects of school-based physical activity on mathematics performance in children: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 16 , 109. doi: 10.1186/s12966-019-0866-6.

Stodden, D. F., Pesce, C., Zarrett, N., et al. (2023). Holistic functioning from a developmental perspective: A new synthesis with a focus on a multi-tiered system support structure. *Clinical Child and Family Psychology Review*, 26, 343–361. doi: 10.1007/s10567-023-00428-5.

Vitali, F., Robazza, C., Bortoli, L., Bertinato, L., Schena, F., & Lanza, M. (2019). Enhancing fitness, enjoyment, and physical self-efficacy in primary school children: A DEDIPAC naturalistic study. *PeerJ*, 7 , e6436. doi: 10.7717/peerj.6436.

World Health Organization. (2020). *WHO Guidelines on Physical Activity and Sedentary Behaviour*. World Health Organization.

Zask, A., Pattinson, M., Ashton, D., Ahmadi, M., Trost, S., Irvine, S., Stafford, L., Delbaere, K., Adams, J. (2023). The effects of active classroom breaks on moderate to vigorous physical activity, behavior and performance in a Northern NSW primary school: A quasi-experimental study. *Health Promotion Journal of Australia*, 34 (4), 799-808. <https://doi.org/10.1002/hpja.688>.

Zhao, M., Kuan, G., Kueh, Y., Zhou, K., Wang, S. (2023). Efficacia di Brain Breaks® per gli studenti: una revisione sistematica e meta-analisi. In: Kuan, G., Chang, YK., Morris, T., Eng Wah, T., Musa, R.M., P. P. Abdul Majeed, A. (eds) Avanzamento dello Sport e dell'Esercizio tramite Innovazione. Lecture Notes in Bioengineering. Springer, Singapore. https://doi.org/10.1007/978-981-19-8159-3_2.