ALL ROAD LEAD TO MOVEMENT? PHYSICAL LITERACY AND ACTIVE BREAK IN PRIMARY SCHOOL – SCUOLA ATTIVA PROJECT

TUTTE LE STRADE PORTANO AL MOVIMENTO? ALFABETIZZAZIONE MOTORIA E PAUSE ATTIVE NELLA SCUOLA PRIMARIA – IL PROGETTO SCUOLA ATTIVA

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ABSTRACT
In recent years Physical Literacy has received increasing interest as an educational process aimed at promoting health in children. According to numerous researches physical activity is considered an unavoidable area of educational intervention for health's promotion. In this article we explain the Active Break project (Scuola Attiva Kids - Sport e Salute). The twofold aim of the Active Breaks was to increase physical activity levels, and to integrate motor experiences into curricular teaching

Physical Literacy si è affermata come processo educativo per la promozione della salute dei bambini. Secondo numerosi studi l'attività motoria strutturata è un ambito d'intervento educativo ineludibile per la promozione della salute. In questo documento è presentato il progetto Pause attive (Scuola Attiva Kids - Sport e Salute), rivolto alla scuola primaria. I due principali obiettivi delle PA sono: aumentare i livelli di attività fisica, integrare esperienze motorie nella didattica curriculare.

KEYWORDS
Active breaks, Physical activity learning, primary school, non-linear pedagogy, motor creativity.
Pause attive, Apprendimento fisicamente attivo, scuola primaria, pedagogia non-lineare, creatività motoria.

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Introduction

Physical literacy is an essential educational process to promote physical activity and lifelong health. It is a concept shared worldwide and includes not only of physical fitness development, but also motivation, self-perception and knowledge to practice physical activities throughout life (Martins et al., 2020). During the last two decades, school has been the focus of many initiatives that support opportunities for physical activity to integrate with fundamental educational objectives (Beets et al., 2016; Mandelid et al, 2022). Schools are complex and situated in an ever-changing educational landscape, at the same time it allows to reach pupils from all social cultural and economic groups, counteracting social inequalities. Grauduszus et al. (2024) argue that in pursuing a right development in children and adolescents, the role of physical activity is undisputed and educational interventions carried out in schools are now considered an educational priority.

In school context the interventions implemented are mainly prompted by health promotion by researchers and the institutional world, who highlight the need to strengthen teachers' skills and support school environments encouraging young people to be physically active (WHO, 2018). The imperative seems to be that, especially young student must move much more, to contrast sedentary lifestyle (e.g. overweight and childhood obesity), and the regression of motor coordination among the main causes of *physical illiteracy* (Faigenbaum et al., 2018). In school environment, this healthier line of intervention is associated with the benefits of motor activity for cognitive, social and emotional development and learning.

Recent studies from many countries have found that, in primary school active breaks added to curriculum content show a positive impact on both physical activity levels and educational outcomes. These findings support cross-institutional initiatives that encourage the integration of active breaks into lessons in theoretical subjects. (Norris et al. 2020). Therefore, the *active school*, is not only a school that *makes* its students *move more*, but encourages them, through new teaching strategies, to learn and to relate to others through physical activity and sensory-motor experience. Two main research approaches explained the relationships between physical activity, cognition and learning.

Traditionally, research on e*xercise & cognition* founded on the physiological mechanisms through which movement improves cognitive processes: greater vascularization with increased brain activity; release of neurotransmitters; development of complex neural circuits (Hillman et al., 2009; Tomporowski, Mc Cullick, Pendleton and Pesce, 2015). In a class-groups, if teachers simply ask students to stand up and stretch, the brain gets 7% more oxygen (Krock, and Hartung, 1992). By incorporating movement activities such as active breaks,

teachers improve students' brain activity. Research conducted on children aged between 9 and 11 years showed that 4-minute of physical active break during class time improved selective attention, which is essential for learning (Ma et al., 2015). Daily active breaks of ten minutes in class ('Energizer') improved attention and on-task behaviour, especially in students who usually showed 'off-task' behaviour (see Doherty and Forés Miravalles 2019 for a review).

More recently, *embodied cognition approach* emphasizes a dynamic interaction between mind, body and environment underlining the role of motor experience in learning, emotions and social relationship. Researchers highlight the central role of bodily experiences for development and learning, supporting that there is no cognitive experience without the implication of the body and emotions that, in turn, have a strong impact on the way in which we learn, consolidate and transfer our knowledge (Paloma et al., 2016). This approach focused on the explanations why sensory-motor, affective and intersubjective experiences influence cognitive and learning processes underlying the value of movement in learning. For example, Mavilidi et al. (2015) found that children who were involved in whole- body movement in task-relevant, achieved the highest learning outcomes in foreign vocabulary. Similar effects of active learning were found in math and geometry (Ruiter et al, 2015; Shoval,2011) with children in experimental condition (e.g. using movement in representing geometric figures) that showed better results than in conventional taught. The body through movement, its first and principal language, becomes an accelerator and multiplier of learning, an essential and unavoidable educational mediation factor.

During the last years these lines of research have led to a growing number of intervention studies focused on the effects of physical activity on cognition and learning and on the promotion of physical activity at different times of the school day. Well-known examples are projects related to *active breaks (ABs)* short breaks in which students are physically active, with or without curricular content, and to P*hysical Activity Learning (PAL)*, integration of motor activity into academic lessons. The projects gained more momentum as evidence emerged of the role of physical activity in cognitive processes, attention, and behaviour in the classroom (Daly-Smith et al. 2018; Mavilidi, 2020).

Very recently, the research interest has focused on the role of teachers: their involvement, as well as their beliefs, could be different in a case of adopting active breaks (perhaps more feasible) or integrating a topic with motor activity. In this condition, *moving while learning* a subject is often considered an *experiment* but not a common practice. Asking what teachers think about this can provide useful food for thought when designing.

1. **Active breaks and physical active learning: what do they mean for teachers?**

Regarding *active breaks*, primary school teachers in Central Italy involved in the I-MOVE active break projects and Active Breaks Study ABS (Masini et al. 2020), reported in questionnaire and focus group: feasibility and sustainability of the project, students emotional and cognitive behaviour, as main effects (Masini et al, 2023). In the study of Mavilidi et al. (2020), a more effective participation of class-group in curricular teaching and in the acquisition of related learning has been noticed; teachers have detected better cognitive (attention, concentration, memory) and social (decrease conflicts, emotional control, collaboration) behaviours.

Regarding *Physical Active Learning (PAL)*, very recent studies have evaluated teacher motivation and behaviour using focus groups and questionnaires, proposed before and after PAL interventions (Madsen et al, 2020; Daly-Smith et al, 2021; Mandelid et al, 2022, 2023; Teslo et al, 2023). Teachers often assert that they are not skilled to integrate movement into teaching showing low confidence and competence (Quarmby, Daly-Smith, & Kime, 2018). Some studies report how movement integration of into school subjects has been challenging due to the perceived lack of relevance and clarity on the part of teachers (Knudsen et al., 2021; Schmidt et al., 2022). In other words, it is not a question of whether an integrated approach to teaching may contribute positively to teaching but more a question of how it can do so. In a Danish study (Madsen et al, 2020), primary school teachers experienced a discrepancy between movement activities as an integral part of their teaching methods on the one hand and the difficulty in aligning physical activity focused on quantity, frequency and intensity on the other, with the nature of the topic. The teachers' frustration with this discrepancy has become a crucial starting point for the resulting didactic observations. This have led to a gradual shift in attention from a traditional concept of “physical activity" to a broader understanding of movement as something that involves a deeper dimension of bodily and sensory experiences.

As consequence, activities focused less physical activity variables (e.g. frequency, intensity and duration) to consider how movement can provide students with sensorimotor, affective and intersubjective experiences related to the topic. In a recent study Teslo et al. (2023) also highlights:

- the need for teachers to give priority to students' learning and to use physical active learning as a facilitator to transfer concepts into bodily experiences.

- moving away from the concept of physical activity and its healthy connotations towards the concept of movement to support learning (increasing the chances of using PAL);
- the inclusion of all students in the learning process by diversifying daily teaching models (in integrated activities, students with different needs were more involved in the learning process). (in integrated activities, students with different needs were more involved in the learning process).

2. The "Active Breaks — Active School" project

The "Active Breaks" project, promoted in Italy by Sport and Health and the Ministry of Education and Merit, is aimed at all primary schools and is in continuity with the Scuola Attiva Kids educational kit section. The project constitutes an additional tool available to teachers and schools, to enhance motor activity intervention by increasing movement time, through *active breaks*, and encouraging the integration of sensory-motor experience into curricular learning, with proposals for *physical active learning*.

The project has as its key point to identify the need to contrast sedentary lifestyle through motor proposals, methodologically well supported, in accordance with the student's motivations for physical activity.

Teachers play a central role in this innovative proposal, they can experience the *benefits* that active teaching offers to children's learning and cognitive, emotional and social growth. In this direction, and beyond the health aspects, movement implies the ability to perceive, experiment and learn, giving a more complete meaning to the reasons that drive people to move. Not all boys and girls show pleasure in moving for many different reasons, but undoubtedly everyone feels the impulses towards the movement that we should be able to intercept and value. Children are spontaneously oriented to growth and integration; they try to learn things, to participate actively in the world and to connect with others. This human orientation toward learning, relationships, and socialization can occur through/within physical activity (Ryan & Deci, 2017).

Therefore, the starting point is to receive the urge to move our students, in other words, the motivation for physical activity. This impulse should be transformed into group experiences and active learning and not inhibited as a source of inattention or disorder. From a pedagogical point of view, recognizing the impulses behind the movement helps to understand the factors to be valued to promote physical activity and those that could be avoided.

A recent contribution (Matias & Piggin,2022) provides a new concept of physical activity seen as an essential act of our lives. In this theory- approach, the authors argued that movement derives from intrinsic impulses such as to feel, to explore, to transform, and to connect which inform ongoing physical activity and its quality, as well as connect the sense of movement with the sense of life.
In our project, we have tried to value these impulses by giving them the opportunity to express themselves through practical activities. Urge to feel concerns both the experience of perception through action, and the emotions and memories associated with feeling. Some activities are sensory-motor experiences that, for example, use tactile perception to carry out new awareness and sense of integration. Many activities have stimulated the urge to explore: a new space, a body part, an object. In this vein, research and exploration through action drive children to move towards new knowledge. Urge to transform through movement follows the developmental phases and it is a creative act because it allows flexible adaptations to unstructured problems that require new solutions. This aspect has been particularly considered in our proposals because the development of creative ability through movement still appears to be under-stressed today. Finally, most of the activities presented in this project are carried out in small groups, thus fostering the urge to connect, the urge to socialize and the pleasure of sharing motor experiences with others

3. Methodological approach: teaching styles

The need to combine the impulses underlying movement, the needs/requests of teachers and the space and time constraints of motor activity in the classroom, has led us to consider different teaching strategies. Depending on the purpose of the activity, motor activities are presented both following a linear teaching model, which traditionally reflects reproductive teaching styles, and through a non-linear approach, expressed through productive teaching styles. Teaching styles include and outline the contexts in which students can *reproduce* (imitate or repeat) and *produce* (discovering, reworking and creating) motor skills and knowledge (Colella, 2016, 2018). Teaching styles include and outline the contexts in which students can reproduce (imitate or repeat) and produce (discovering, elaborating and creating) motor skills and knowledge (Colella, 2016, 2018). In *reproduction teaching styles*, teachers present predefined motor tasks, in linear sequence with closed response possibilities, proceeding from the easy and known to the difficult and lesser-known or from simple to complex; students perform numerous repetitions, using memory to continuously recall previous motor experiences. According to *ecological-dynamic*

approach, motor responses emerge from the interaction between the learner and the environment that constrains their action. Motor learning process does not follow a predefined and sequential path but a non-linear path, that is, variable and open to the interconnections between motor skills and executive variables (Chow, 2013). Within *production styles*, the divergent discovery style describes how the teacher defines the objective to be achieved (semi-defined task), allowing students to explore different solutions and suspending judgment. This methodological approach promotes motor creativity, defined as the ability to produce functional or expressive solutions to motor tasks that are novel and pertinent (Scibinetti, 2019). The advantages of using non-linear pedagogy could be particularly appreciated considering the inclusive school context: each pupil, starting from your own level of potential/ability, will be able to provide different solutions to a productive motor task.

3.1 Methodological approach: relevance and integration

The present project has examined different strategies to enhance physical activity in school context and to integrate movement in learning. The activities change depending on whether our goal is to improve motor skills and/or to support curricular learning through action. A recent work of Mavilidi et.al (2018) offers significant insight on how movements are relevant and /or integrated with the learning task. During an active break, if students jump or swing their arms or walk, their actions are not *relevant* and poorly *integrated* with the learning task but have an indirect effect linked to other purposes such as: attention, increased availability for the next lesson, enjoyment, and increased of specific aspects of motor learning (e.g. breathing, posture, coordination skills and creativity). Movements are *relevant* to the learning task when they express a concept that we are developing in the curricular lesson; they are also *integrated* if the motor action occurs *during the learning task*. An example is to ask students who are walking between desks to form a small group and taken by hand, take the form of a geometric figure (during a math/geometry lesson). Relevance refers to the level of correlation (incarnation) between movement and the learning task; integration is essentially linked to time. So, activities with *high integration* require that students perform a movement *while* they are carrying out a learning task. There is a continuum that ranges from non-integrated movements, in which there is no temporal overlap between the movement and the learning task, and integrated movements, that is, connected and included during learning. The executive variables of the motor task (spatial, temporal, quantitative, qualitative and reciprocal relationships) are the basis of the

variability of practice and of the above-mentioned *integration* parameter. Our empirical work shows relevant and integrated activities distributed on various levels. The Dice (*Abs*) are activities for active breaks designed to increase physical activity time and to raise students' awareness of some factors of motor learning (e.g. balance, posture, breathing, creativity). Integrated activities (PAL) are proposed to be included in curricular disciplines with the purpose of supporting, through sensory-motor activities, the specific learning of the discipline (Fig. 1).
In the upper right quadrant, we find the proposals for activities related to disciplines (PAL) that are highly relevant and highly integrated.

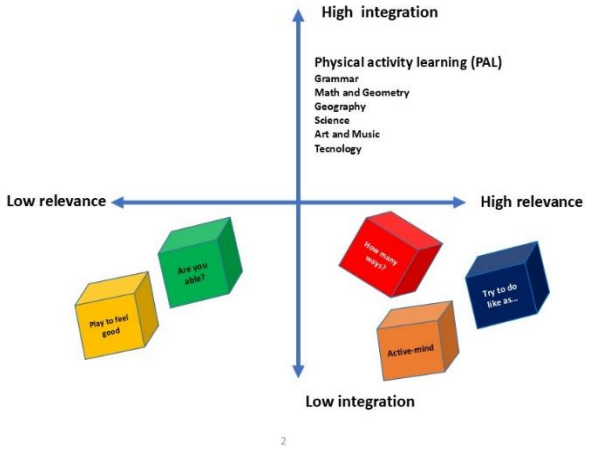

Fig. 1 - Integrated activities (Source: Mavilidi M.F. et al., 2018)

3.2 Dice (*Abs*)

Recent studies have provided promising evidence regarding the effects of *AB*s on: Classroom behavior (increase in observed behaviors that promote learning in the classroom/do not interfere with good curricular-disciplinary performance).
b) Cognitive functions (improvement of mental processes that may influence school performance/underlying and related functions).
c) School outcomes (effects on performance related to homework through grades, standardized national tests or progress monitoring tools, as well as perceived self-reported results in school competence) (Norton et al., 2020).
Considering the Learning Objectives of the National Indications (Primary School Curriculum,2012), we have structured our activities on the following thematic areas: the body and its relationship with space and time; body language as a

communicative-expressive mode; the game, sport, rules and fair play; health and well-being, prevention and safety.

The scientific and methodological references that have emerged so far outline the conceptual framework referring to physical literacy, in which the contribution to learning process and motor development can be identified: the preventive effects of physical activity, the *non-linear* pedagogy approach and the variability of practice according to the ecological-dynamic approach, inclusion, curricular interdisciplinarity.

The "Active Breaks" project (Sport e Salute SpA), also due to the high number of the educational institutions involved, contains the necessary scientific and methodological links to configure itself as an Italian model to which primary schools can adhere. All activities are easy, with a short time in explaining motor tasks, and they could be a successful way of implementing and promoting project sustainability and physical literacy in schools.

The following active breaks starts from the playful idea of throwing the dice. Class-group can easily build six dice as explained in the manual (*Scuola Attiva Kids*, educational kit Pause Attiva editor's note) and use these tools in many ways.

Each dice has been designed to improve defined motor abilities, except for a *traditional dice* (color white) with numbers on each face (1-6). Added to others, the white dice modulates repetitions and/or activity's time. The others have six different activities, one for each face. Because of changing characteristics/climate of the class-group, the teacher can choose the dice to be carried out in daily school time (for example need of energy or quiet; on-task behaviour; enhance cooperative climate). All activities are illustrated in the form to be adapted to all pupils. This model offers a countless of variations involving pupils in motion enrichment, surprising themselves (by throwing one, two or more dice) to see what happen.

Teacher has the opportunity:

• To establish a playful climate;
• To adapt communication according to age and context;
• To adopt a competence-oriented approach.

Pupil can experience how:

- To be a protagonist in the motor repertoire's construction;
- To imagine your actions and your role in a game scenario;
- To enhance self-efficacy and self- esteem;
- To develop executive functions (cognitive flexibility, working memory, inhibition).

For each dice, the following main goals and a brief example of activity are illustrated (Ta1,2).

Orange Dice- *Active-mind*!
Main goal*: Fundamental motor skills* (walking, running, jumping, throwing, grabbing) in relation with actions of daily life.
Activities. Throwing the dice added to the white dice: Running and 3: children get up and run around the desk for three time. Below you can:
Using repeatedly and throwing the white *dice* once again.
Changing the direction (turning around on yourself, changing places with your partner by your side), in speed, in intensity (for example, adding a '0' to the number '3' and transforming the duration into 30";
Throwing the white dice many times and adding or multiplying the two or three numbers indicated each time by the face of the dice;
In this way, pupils are involved in motor tasks relevant for learning (e.g. combining actions with numerical operations) varying the fundamental motor skills.
Green Dice- *Are you able to?*
Main goal: *Balance* (body and objects) *and rhythm* (with body percussion).
Activities: Green and white dice. To explore for how many time pupils are in balance on one foot; or keep an object (pencil, book) in balance on a body part. The white dice shows the balance-time and/or repetitions. These activities promote mental processes that may influence school performance/underlying and related functions. In fact, balance activity implies attention that can well be used, e.g., before a mathematic task.
Furthermore, rhythm tasks have effects on the motor system with activation of brain structures related to movement (premotor cortex, basal ganglia, cerebellum) and on cognitive and emotional functions (body percussion in pairs or in small groups, encourage a cooperative climate).

Tab. 1 – The Dice

Red Dice- How many ways?
Main goal: Motor creativity
Activity Butterfly: Each pupil has a sheet of newspaper. Pupils can move it on different body parts, exploring different movement solutions, as if the sheet of newspaper were a butterfly. Each time you will have to change the position of the body and the type of movement to follow the trajectory of butterfly. Imaging a butterfly, the sheet must not be tight (task constraint). Semi-defined tasks presented in this dice, improving problem solving, creativity and cognitive flexibility.
Yellow Dice- *Play to feel good*
Main goal: Posture, joint mobility and breathing awareness
Activity: Like a C: Sitting on the chair pupils imagine to be a "C" (the spine is curve). Below and breathing, an invisible string on your head began stretch upwards (the spine is not a C). Posture awareness can be enhance adding breathing, expanding the rib cage (e.g. holding your breath, counting in apnea).
Blue Dice- *Try to do like as*
Main goal: Sport experiences
Activities: By throwing the dice, pupils represent different sport in many ways and environments. Swimming: trying various styles, with different intensity and times (throwing the white dice). Sharing sports experiences is the focus of this dice: a fun tool to recall images, aspirations, concepts and desires, with a positive impact on mood and social behavior.

Tab. 2- The Dice

3.3 Physically Active Learning (PAL)

The endeavor to combine physical activity with teaching learning has led to the integration of motor activity in theoretical subject lessons. In recent years research on Physically Active Learning (PAL), underlined benefits in curricular outcomes (Mandelid,2023). Beyond traditional learning, founded on the perception that learning takes place only in a *static condition* (on the desk), curricular learning can be enriched by movement experiences represents a new challenge, that can only be tackled with a strong synergy between different educational figures:

- Family should be informed to understand the benefits of integrated educational projects;
- Educational institution should be first implementing facilitation practices and behave

ours for an effective implementation of the projects;

- Teachers should be adequate training for a paradigm shift from traditional teaching strategies to move towards *active* teaching models.

In this project, PAL has been developed on relevant and integrated motor tasks with the curricular subjects learning, considering the impulses to move described above (to feel, to explore, to transform and to connect). Embodied approach it was the start point who has illuminated these activities. Some integrated physically activities are given below.

Math- I become a number. Pupils can try to be solving math-questions using motor behavior, being numbers themselves. The activity can be easily carried out by inviting the children to stand up and, moving freely around the classroom, and creating small groups in the four corners of the room. The check that each child must carry out on himself and on the other is to respect the task required in terms on subtraction and/or addition or other math questions.

*Chemistry- I become an atom***.** The perceptual-motor experience can promote the learning of fundamental concepts of chemistry, inviting children to transform into symbols to represent air (oxygen, nitrogen, carbon dioxide and others gas). Air composition it can be visualized with paper cards of different colors in the approximate proportions of its components.

Each child chooses a symbol (cards) and becoming atom: they moving and experiment with bonds between atoms (N_2, O_2, H_2) but also bonds with different atoms (“C” to form a molecule of carbon dioxide CO_2; 'O' to constitute a water molecule (H^2O). A fun solution for translating a chemical concept into motion can be explored by pupils who play the role of noble gases: they not being able to bond with anyone, and they can enter the groups formed by their companions and, without touching them, try to overcome them or to pass under obstacles deriving from the different ways (different parts of the body, different levels of space occupation, etc.) with which couples and third parties remain in contact.

*Sciences- I become a magnet***.** Primary school supports the first observational investigations of the environment and of one's body. The Magnet represent a useful motor activity to enhance body awareness. It is an example of constraint-led approach and non-linear pedagogy to foster the search for solutions with a focus on cooperative creativity, which are meaningful goals of school education. Children are asked to walk freely in the classroom. The teacher names a body part. The pupils in couple, will have to move only with the named part. Later teacher requests two different parts in contact and to further request different ways solutions. In this way, in addition to improving body knowledge, students explore different motor behaviors generated from different body's parts.

*Geometry and geography- I invent a map***.** Space awareness is a fundamental skill linked to learning to *geometry*, *geography* or even *technology*. Through motor experiences we can be led enrichment in cognitive and physical representation of *maps*. Pupils can be asked to invent a simple path/map, to do it while walking, to always return to the starting point. The map/path can be implemented with the possible variables proposed by the teacher that generate different motor responses. For example: now you're all late, you've become balls, you are rubber bands.

Grammar- I become a point! A physical active grammar lesson can allow pupils to recognize syntactic and textual linked increasing their specific functions. Teacher invites pupils listen carefully to a reading and to represent with their body the punctuation mark that is thought to have been used by the writer. Movement actions help to conceive punctuation as road signs and are therefore useful for understanding the use of pauses to give expression when reading and to make others understand the text when writing. The activities examples described above can drive teacher's imagination to create novel integrated activities in any curricular lesson. In fig 2 the “Active School” program is presented.

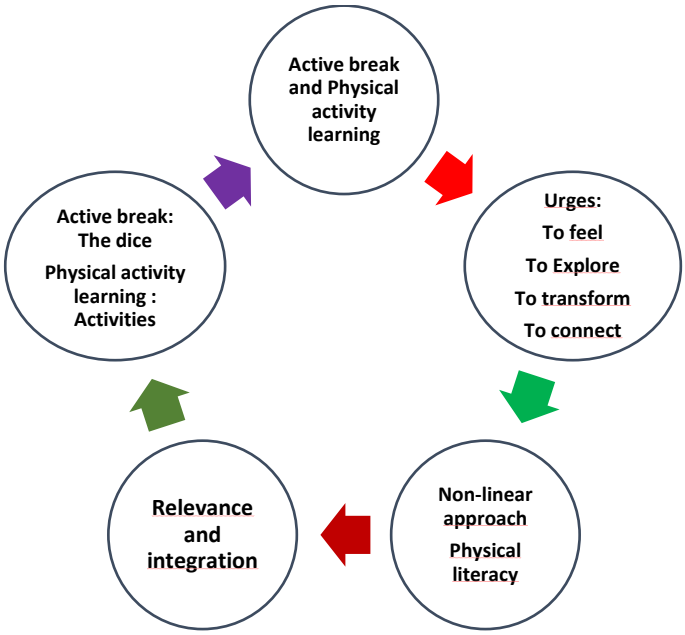

Fig.2 Outline of the "Active Breaks - Active School" Project

Conclusions

The introduction of physical active breaks during school days can increase physical activity levels (*how much I move?*) and promote perceptive-coordinative development (how I move?) of pupils, allowing to acquire cross/longitudinal information on fundamental motor skill Physical literacy (PL) seems to be a valid holistic approach which combines physical, cognitive and affective domains. Grauduszus et al. (2024) underline those methodological strategies aimed at not only motor development, but also cognitive, emotional and social development, have positive effects on motor skills and enjoyment. However, although a growing body of studies confirms the value of PL at school, effects and practical application remain relatively underdeveloped.

In this document, the **Active Pause Project** (Abs and PAL) adopted by 1,500 school starting from February 2024 has been described. The project aims both to increase the time dedicated to physical activity (*body and movement education*), and to integrate perceptive-motor experiences into curricular teaching (*education through body and movement*), favouring the important role of movement as mediator for learning.

A first monitoring (questionnaires and forms online), carried out at the end of last school year, 2023-2024, involved teachers, and instructors. In a schedule of active breaks (online kit) teachers can be a report of the activities carried out daily. Teachers' report showed that, on average, active breaks were taken three times a week for 15 minutes each one. Concerning project's sustainability, teachers positive valued on all four areas described in the questionnaire:

• Involve all children by improving social skills with peers and teachers.
• Improve cognitive abilities, attention and overall academic performance.
• Improve children's physical and cognitive well-being and health by counteracting childhood overweight and obesity.
• Increase children's active time, also affecting motor behaviour at home and in leisure time.

Teachers, in addition to stressing how the activities were positively received by their pupils, have contributed with our activities they designed, and have suggested some improvements including an increase of educational tools; improving the activities with appropriate musical tracks; a strengthening of active outdoor breaks. The positive dissemination in schools confirm the idea that a paradigm shifts in the way of approaching physical education at school is possible and desirable. More dynamic and engaging school days, with new forms of movement to support and integrate learning. This could be a good opportunity to consider, in an obvious and evaluable way, all the evolutionary aspects (cognitive, affective and relational) that are deeply connected to each other.

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