

Active breaks: a strategy to counteract sedentary behaviors for Health Promoting Schools. A discussion on their implementation in Italy

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Abstract

School Active Breaks are short bouts of physical activity (5-15 minutes) conducted by appropriately trained teachers and delivered during or between curricular lessons. They are a good strategy to counteract sedentary

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behaviors, and a growing body of evidence shows that they can represent also a tool to promote and improve health, school wellbeing and academic achievements.

On 19 February 2022, the Working Group on Movement Sciences for Health of the Italian Society of Hygiene, Preventive Medicine and Public Health organized an Awareness Day on the effectiveness, usefulness and feasibility of School Active Breaks, opened to teachers, educators, school leaders, pediatricians, personnel from Departments of Prevention and Public Health and Health Policy-makers.

During the event, the testimonies about the experiences already carried out in Italy showed that School Active Breaks are an effective intervention that each school can easily include in its educational offer and apply in any context.

Introduction

School Active Breaks (SABs) are short bouts (5-15 minutes) of physical activity (PA) conducted by appropriately trained teachers and delivered during or between curricular lessons.

They are an excellent strategy to break up periods of extended school-related sedentary behaviors.

Moreover, a growing body of evidence shows that SABs allow children and adolescents to rediscover the pleasure of moving and reach the minimum level of physical activity recommended for health (60 minutes per day of moderate-to-vigorous physical activity in the age group 5-17 years) (1).

There is also substantial evidence of the positive effects that SABs can have on concentration, selective attention and classroom behavior.

The Working Group on Movement Sciences for Health of the Italian Society of Hygiene Preventive Medicine and Public Health (GSMS-SItI), that has been traditionally involved in promoting the movement as a strategy and a tool to maintain and improve health, intends to promote the model of SABs already experienced by some members of the Working Group, hoping for their widespread dissemination

in primary and secondary schools on the Italian territory.

For this purpose, on 19 February 2022, in Rome, the GSMS-SItI organized an Awareness Day on the usefulness and feasibility of SABs as a tool to contrast sedentary behavior and to provide further health benefits.

The event was targeted at potential stakeholders involved in the implementation of SABs: teachers, educators, school leaders, pediatricians, personnel from Departments of Prevention and Public Health and Health Policy-makers. Some testimonies about experiences already carried out in Italy have been presented during the event and here described. The roles and alliances between the different professional figures involved were also discussed, in the perspective of creating an inter-sectorial SABs implementation model.

The regulation context

SABs are recommended by the international evidence-based recommendations for school-related sedentary behaviors for children and youth developed by the Sedentary Behavior Research Network (SBRN). These recommendations, based on the best available evidence, expert consensus and stakeholder input, state that

“a healthy school-day includes breaking up the extended sedentary behavior with both scheduled and unscheduled movement breaks at least once every 30 minutes for ages 5-11 years and at least once every hour for ages 12-18 years” (2).

At a European level, SABs are reported in the “National Guidances or Programmes for the Promotion of Physical Activity in Schools” in at least 12 Countries (3).

The Italian Guidelines on Physical Activity, published in 2019 by the Ministry of Health and updated in 2021, identified SABs as “valuable opportunities for increasing the physical activity levels both inside and outside the classroom with physical, social, emotional and cognitive benefits” (4).

This guideline states that “after their implementation, health benefits (such as reduced blood pressure and weight) and improved educational outcomes have been observed”, referring to the available evidence.

The scientific and feasibility evidence regarding School Active Breaks

There is an emerging evidence that SABs are associated with positive health outcomes for students.

In particular, a systematic review with meta-analysis based on 22 studies has shown that SABs can increase children PA levels and number of steps taken (5).

For this reason, SABs are being proposed as a way not only to reduce sedentary behavior but also to contrast physical inactivity (a term referred to the non-achievement of PA Guidelines).

The lifestyle surveillance systems highlight a worrying reduction of PA and an increase of sedentary time in children and adolescents, which may consolidate in the later stages of life. According to the most recent data, in European countries, only up to 29% of children are categorized as

sufficiently physically active with substantial region-specific differences, higher in the North of Europe (31%), intermediate in the Centre (26%), and significantly lower in the South (23%) (6).

Children who are physically inactive during childhood are more likely to be inactive even when they reach adulthood. In the adulthood, physical inactivity and sedentariness represent clear risk factors for morbidity and mortality related to cardiovascular diseases.

Based on the latest information, physical inactivity is globally responsible for a total of 7.2% of all-cause deaths (7).

Sedentary behaviors may contribute to the cardiometabolic risk by activating the expression of genes involved in metabolic pathways which favor insulin-resistance. Intervention studies in adults have shown that interrupting sedentariness with SABs may counteract insulin-resistance. Therefore, these interruptions are recommended in adults (8).

In the last few years, the research on these aspects has been also extended to childhood. Several studies - performed through accelerometer-based measurements of sedentary time - have found a relationship between prolonged sedentary patterns, cardiometabolic risk and adiposity indicators in children (9).

Therefore, while the evidence on the effectiveness of active breaks on children metabolic health is still in progress, recommending the interruption of sedentary time both at school and at home is critical.

Unfortunately, emerging data indicate that, as a consequence of the policies aimed at controlling the spread of COVID-19, there has been recently a further increase in sedentary behavior and a reduction in children's PA levels (10, 11).

For this reason, there is currently an urgent need and interest to provide more opportunities for children for being active. In this scenario SABs can be an opportunity.

Another recent systematic review with meta-analysis, based on 16 studies, highlighted that SABs can have positive effects on attentional outcomes (i.e., accuracy, concentration, inhibition, and sustained attention), especially on selective attention (12).

SABs have also been shown to improve classroom behavior (time-on-task) (5, 13), thus they do not only provide health benefits but they are also a way to improve students' learning.

SABs have also proven to be a feasible intervention. In Italy, one of the most consolidated experiences is that realized by the association "Moving School-21", a non-profit organization promoting citizenship education, educational innovation and health promotion among children. In 2014, on the basis of their experience of thousands of students, "Moving School-21" published the book "Teacher, can we take a break? Improving the classroom behavior and children's learning" (14).

There are also several experiences conducted by local health organizations, municipalities and local authorities, both in Northern, Central and Southern Italy, which are described below.

SABs have also been promoted and became particularly popular after the COVID-19 pandemic by representing a possible and feasible strategy to hinder sedentary behavior even during distance learning (15, 16).

A selection of School Active Breaks experiences conducted in Italy

Naples: the "AulAttiva" program as a way to integrate movement in the classroom

With the aim of promoting physical activity and reducing sedentary time in children, the Food and Nutrition Hygiene Service of the Local Health Authority "Napoli 3 South", in collaboration with

the Department of Movement Sciences and Wellbeing, University "Parthenope" of Naples, has implemented a SABs program named "AulAttiva" ("Active Classroom"), which was included into the action "Schools promoting health" of the 2014–2019 prevention plan of the Campania region, Southern Italy.

In the school years 2017/18, 2018/19, 2019/2020, the program was implemented in the primary schools of the local district. A training course was offered to teachers and parents' representatives. A kit containing a written guide and a CD-rom with tutorials for exercises and a calendar for auto-monitoring was given to participant teachers.

During each school year, two phases including different exercises were proposed: the first from December to February and the second from March to May. The program was carried out through 2-5-minute active breaks performed during the school time on each day of the week, except for the day including the physical education lesson. Each session included four types of moderate-to-vigorous exercises aimed at involving the whole body to increase motor coordination and aerobic-anaerobic skills of children. SABs were performed behind or beside the desk.

In the school years 2017/18, 2018/19 and 2019/20, AulAttiva involved a total of 6,052 children from 195 third-grade, 77 fourth-grade and 62 fifth-grade classes of 43 schools.

In a feasibility study performed on a sample of these pupils, SABs showed a positive effect on the reduction of inactivity of 12 min and an equivalent increase in PA levels, of which 5 min were of moderate/vigorous intensity. A high level of satisfaction was registered among students and teachers (17). In a subsequent cross-sectional study, a sample of pupils participating to the AulAttiva program showed 4 min higher levels of light PA during school time with respect to controls (18).

The action AulAttiva was recognized as a good practice because it was effective in reducing the amount of school sedentary time and increasing children PA in the school setting and beyond.

Bologna: experiencing SABs through the “I-MOVE” and “ABS” studies

The aim of the quasi-experimental study “I-MOVE”, conducted by the University of Bologna, was to investigate the effect of SABs on physical health, cognitive performance and classroom behavior of primary school children. In this study, the SABs protocol consisted in 10 minutes of moderate to vigorous physical activity (MVPA) for three times per day. Each SABs started with a 2 minutes warm-up part focused on cardiorespiratory and mobility exercises, the central 5 minutes tone-up part contained exercises with High Intensity Interval Training (HIIT), consisting of 40 sec of MVPA alternated with 20 sec of recovery, and during the last 3 cool-down minutes part, children perform relaxation and breathing exercises. Experimental group teachers were involved in a training phase and then they started performing ABs with classes. Control group teachers continued with normal school curricular lessons.

Cognitive performance was assessed using working memory test and physical fitness was monitored through accelerometers, motor fitness test (6 min walking test and standing long jump test) and anthropometric evaluation. Classroom behavior was monitored using an *ad hoc* questionnaire. These measurements were performed both during baseline (October 2019) and at the end of interventions (June 2021) in all children.

At the end of the study, children involved in SABs showed a statistically significant higher improvement in working memory performance than children in the control group. The weekly time spent in MVPA and the minutes spent in vigorous and

moderate PA increased in both groups with no statistically significant differences, but the light PA greatly increased in the experimental group. The 6 min Cooper test was significantly different between-groups in favour of the experimental one. For the standing long jump, no statistically significant differences were found between the two groups over time.

About classroom behaviour, both children and teachers reported a general improvement in school wellbeing and quality of life. Teachers referred that children were more focused during lessons, their time on task behaviour improved and also teacher’s work changed. Moreover, teachers provided a positive feedback about the immediate effectiveness of active breaks toward classroom behaviour.

Following the positive results obtained with the I-MOVE study, the University of Bologna has launched a multicentre project started in January 2021, the “Active Breaks Study” (ABS study), aimed at investigating the real feasibility of these SABs over time with more schools, teachers and children involved. The results of this study confirmed what was highlighted by the previous work: the quality of school life improved, the attention of children increased, facilitating their learning, and improving behaviour in the classroom and, consequently, the teacher’s work. These findings underlay and confirm the positive effect of SABs on the children’s cognitive and cardio-fitness performance, and classroom behaviour highlighted in other studies (5, 12).

Furthermore, in the schools where the ABS study was proposed, students expressed the need to carry on the project in the following year, even after the conclusion of the project, and this highlighted several important aspects of this study. Firstly, children had the opportunity to concretely express the need to include movement and play in their school days. This is particularly valuable because school is the place where children

spend most of their daily life and where they can be significantly affected in their approach to life through a change of habits and lifestyles. In fact, the years of primary school represent the right time to propose projects that can help future generations in understanding how important is to maintain a healthy, active and sustainable lifestyle. Secondly, teachers, finding satisfaction and pleasure in the ABS program, testified that the integration of SABs in their lessons has improved class climate and has made the school days dynamic and more pleasant, both for the pupils and for themselves.

As the intervention presents these positive effects, its implementation in schools can have a positive, sustainable and long-term impact on childhood health.

Currently, the research team is conducting a pilot study focused on physically active math lessons.

Rome: assessing the acute effects of a SABs proposal on mathematical performance and attention by primary school children

The sedentary time dedicated to academic tasks in primary school is estimated to be from seven to eight hours per day, while until now ineffective efforts have been made to increase the time allocated for children's PA (19). Despite this, school should be the ideal place to perform PA and to promote active lifestyles, reducing children sedentary time without differences regarding age, ethnicity, gender, and socio-economic status.

In addition to the benefits for health, it is universally recognized and acknowledged that the PA practice improves cognition and academic achievement. Cognitive and motor tasks activate the same neural regions, with synergistic effects (20). Moreover, it has been shown that children's responses, immediately after a bout of PA, improve in term of speed and accuracy (21), memory (22), attention, and concentration capacity (23), by enhancing the physiological arousal and the cerebral blood flow (24).

Consequently, teachers and researchers have worked incessantly to find new useful methodologies to include a greater amount of PA in the school context such as SABs.

In an experimental study conducted by the University of Molise and the University of Rome "Foro Italico" in some primary schools of Rome (in the 3rd, 4th and 5th grades) two different SABs protocols were applied three times in the same school day. After the intervention, the acute responses on task classroom behaviours (cognitive and attentive engagement) of children were assessed.

The different SABs protocols proposed were: the fitness protocol (FIT), designed to propose moderate to vigorous PA, including strength and aerobic activities in which children were asked to imitate the teacher's movements with no much time left for explanation and the new "creative" protocol based on the combination of cognitive-creative and conditional tasks, such as improvisations, dramatization of events or brief stories, and simulation and imitation games (CREAT). In the control condition (CON), children remained seated and involved in social interactions with the research staff. At baseline and at the end of the interventions, all children underwent the Stroop Color and Word test (SCWT) and the math test (MATH) to assess the level of attention and mathematical performance, respectively.

Children in the intervention groups showed significant improvements between pre- and post-intervention on attention levels and MATH tasks. FIT positively influenced attentive and math performances more than the CREAT, probably due to the correct work/rest ratio and executive rhythm that allowed children to reach a good level of exertion. The time needed by the teachers to explain to the children the tasks and the execution modalities in the CREAT protocol could have reduced the effective exertion time. Nevertheless, since creativity stimulates the

divergent thinking, requiring the finding of new ideas in motor problem solving tasks (25), it was hypothesized that, in a chronic condition, the CREAT protocol may provide new stimuli and a major engagement on cognitive performance.

The most interesting result of this study has been that, dividing the sample by level of enjoyment for the activity carried out (low, middle and high level of enjoyment), the children who showed the highest level of satisfaction reached significantly greater improvements in attentive and academic tasks, regardless of age and type of protocol played. Enjoyment is a fundamental factor in the learning process, helping children to better retain information and develop new knowledge, as well as showing a positive correlation with students' use of cognitive learning strategies (26).

Discussion

The workshop was attended by different figures who have or may have a role in the promotion or in the implementation of SABs. Representatives of paediatricians and public health professionals, experts from movement promotion and sport science associations, researchers in the field of health and wellbeing discussed about benefits and barriers related to the possible general application of SABs in the Italian schools.

All these professionals recognized that sedentary behaviour among youth is an important topic and should be addressed to avoid immediate and future negative health consequences.

The interventions presented during the day showed that active breaks may provide teachers and educators with an opportunity to increase students' movement and consequently improve their behaviour and wellbeing at school. Therefore, the key stakeholders who took part in the event agreed on the relevance of SABs.

All of them have expressed their favourable position to adopt a similar intervention as an instrument to counteract sedentary behaviours in Italian children and adolescents, stating the following concepts.

Given the current Italian epidemiological situation, promoting physical activity among the youths represents an urgent need. Innovative strategies are required to improve the interest and increase the frequency in this age. Overall, active breaks have been shown to be easily applicable in various local contexts, with high appreciation by students and teachers and very low economic efforts.

Because of these characteristics, the SABs represent sustainable activities over time without the need for special logistical or economic support.

This type of intervention can also be extended to children and adolescents in specific conditions. A recent pilot study showed that SABs can increase PA and reduce sedentary behaviour in children with intellectual disability and might also benefit their working memory (27).

A further interesting perspective is represented by Tai Chi Chuan, that can be adapted, with appropriate approaches, by children and teens (28) and incorporated in SABs. Indeed, the scientific evidence collected in the past two decades among different populations about the benefits of this practice for health and wellbeing have posed the milestones to define the key points for the design of health promotion strategies in school setting (29). However, the lack of dedicated time during lessons, the need to adapt active breaks to students' and teachers' conditions, preference and personal attitude toward PA were discussed as possible barriers to implement SABs interventions.

For this reason, it is fundamental that their application is planned, structured, and performed by and under the supervision of experts in the field of movement, sport science

and health promotion, who can support and encourage the implementation of this type of interventions in close cooperation with the local school office, school principals and teachers.

The main reasons and indications to the use of SABs which were discussed during the awareness day are summarized in Table 1 and 2.

Conclusions

School active breaks represent a feasible, sustainable, low-cost intervention with several positive effects on psycho-physical health, wellbeing, students' school and classroom behaviour (i.e. time on task) and on academic achievement. Due to these features, they have the potential to constitute

Table 1 - Reasons to take SABs

10 reasons to take school active breaks
1. School active breaks represent an investment in health because they can reduce sedentary in childhood.
2. School active breaks help ensure students to reach the 60 minutes of physical activity per day recommended for health.
3. School active breaks are a valuable tool for teachers to optimize learning and restore student attention.
4. School active breaks help improve students' behaviour in the classroom and their ability to stay focused and follow the lesson.
5. School active breaks have positive effects on academic performance.
6. School active breaks allow to increase cooperation and sociality between colleagues to improve the spirit atmosphere in the classroom.
7. School active breaks are fun and engaging for students and teachers.
8. School active breaks are an economic, effective, and sustainable intervention and they do not require dedicated equipment or spaces.
9. School active breaks are educational tools and can be included in the training offer plans of the schools.
10. School active breaks can be adapted to the characteristics and needs of each student.

Table 2 - Recommendations how to take SABs

10 recommendations on how to take school active breaks
1. School active breaks must be conducted by properly trained teachers, with the support of kinesiologists.
2. The exercises must be planned and structured with kinesiologists and every active break must include an initial phase (warm-up), a central phase (activation) and a final phase (cool down/relaxation).
3. The inclusion of high intensity exercises within the breaks allows to obtain an improvement in the cardio-respiratory fitness of the students.
4. School active breaks should be structured to be performed by every student, regardless of specific conditions.
5. School active breaks should be carried out on at least 2/3 times a day in addition to the hours of curricular physical education.
6. The right time for active break can be chosen by the teacher (at the beginning of the lessons, between one lesson and another, before or after lunch).
7. Exercises included in active breaks can be enriched with educational contents (e.g. English or Mathematics)
8. During indoor active breaks students must keep the distance of at least 1 meter from each other and the classroom must be aerated.
9. Outdoor active breaks allow to reach higher intensity levels and to obtain benefits related to the practice of physical activity outdoors.
10. The students should be involved in the management of active breaks, also inviting them to suggest new exercise proposals.

a reliable strategy to increase physical activity levels in childhood and adolescents. To make this intervention highly effective and to reduce possible risks, its planning should be the result of a careful collaborative work involving local public health services and school offices (30). School principals, so as teachers, should be made aware of the importance of physical activity for health and wellbeing, and teachers should be appropriately trained to conduct the active breaks.

Some Italian regions have already begun to promote SABs in their entire territory following these concepts. In accordance with the key concepts of the Schools for Health in Europe Network Foundation (<https://www.schoolsforhealth.org/concepts>), the movement of Health Promoting Schools of the Region Lombardia has included SABs in the recommended evidence-based techniques that should be proposed as a good practice, in agreement with the class board, and that can be integrated in the Everyday School Life (31). A similar initiative has been launched through the “Sano chi sa” program by the Health Promotion and Prevention Area of the Lazio Region (32).

In addition, in order to advocate for an educational change, the universities should play a decisive role in educating future teachers on how to change their way of teaching using SABs and physically active learning. Furthermore, the kinesiologist should be considered as a key figure for designing the SABs program, adapting them to the specific school, class or classroom characteristics, and supervising its application in close cooperation with teachers.

With such a multidisciplinary approach, SABs could be implemented in the Italian schools and they could also be included in the schools’ Triennial Plan of the Educational Offer, a document which reflects the cultural identity of each school and reports its pedagogical, educational and management periodic goals.

Riassunto

Pause attive: una strategia di intervento contro la sedentarietà per scuole che promuovono salute. Esperienze italiane a confronto

Le pause attive di classe sono brevi interruzioni (5-15 minuti) delle attività scolastiche, durante le quali le alunne e gli alunni eseguono una serie di esercizi fisici gestiti dagli insegnanti stessi.

Le pause attive rappresentano, di per sé, un’ottima strategia per contrastare la sedentarietà ma una sempre più crescente letteratura scientifica ha messo in luce come possano rappresentare anche uno strumento per promuovere e migliorare la salute, il benessere a scuola e l’apprendimento.

Il 19 febbraio 2022 il Gruppo di Lavoro Scienze Motorie per la Salute della Società Italiana di Igiene, Medicina Preventiva e Salute Pubblica ha organizzato una giornata di sensibilizzazione sull’efficacia, l’utilità e la fattibilità delle pause attive aperta a docenti, educatori, dirigenti scolastici, pediatri, personale dei dipartimenti di prevenzione e sanità pubblica e responsabili delle politiche sanitarie.

Nel corso dell’evento sono state presentate, e vengono qui descritte, le testimonianze sulle esperienze già realizzate in Italia che mostrano come le pause attive rappresentino un efficace intervento che ogni scuola può facilmente inserire nella propria offerta formativa e applicare in qualsiasi contesto.

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