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Active breaks in schools: perspectives of students, teachers, and school leaders from a convergent mixed-methods study of the Break4Brain project

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Abstract

Active breaks are brief movement bouts integrated into classroom routines that may support both physical activity and classroom functioning, although little is known about how key stakeholders perceive them before implementation. This study examined pre intervention perceptions of active breaks among primary school students, classroom teachers, and school leaders. Participants were 817 individuals from 16 primary schools in the Balearic Islands, Spain, including 755 Year 5 and 6 students, 38 classroom teachers, and 16 school leaders. A convergent mixed methods design was used during the pre-intervention phase of the Break4Brain project. Students completed a 14-item questionnaire, while teachers and school leaders took part in semi structured interviews. Quantitative data were analysed descriptively, qualitative data were analysed using reflexive thematic analysis, and findings were integrated through a joint display informed by RE-AIM. Students reported limited prior exposure to active breaks but high acceptability and perceived benefits for concentration, motivation, health, and reducing prolonged sitting. They generally preferred sport-based activities, music, sessions lasting 10 minutes, and implementation later in the school day. Teachers and school leaders also viewed active breaks positively and anticipated benefits for attention, self-regulation, and classroom climate. At the same time, they identified barriers related to instructional time, teacher workload, classroom management, training, and access to practical resources. Overall, active breaks were perceived as acceptable and valuable before implementation, although sustainable delivery will likely depend on organisational support, teacher confidence, and structured implementation resources.

INTRODUCTION

Regular physical activity (PA) during childhood and adolescence is widely recognised as a key contributor to physical, cognitive, and psychosocial health, with benefits extending to cardiometabolic profiles, mental well-being, and cognitive functioning (Chaput et al., 2020). Beyond health, growing evidence shows that moderate-to-vigorous PA (MVPA) is associated with a range of academic outcomes, including attention, classroom behaviour, readiness to learn, and overall academic performance (Donnelly et al., 2016; Wang et al., 2025). Despite clear public health recommendations to engage in daily MVPA and limit sedentary time (Bull et al., 2020), international surveillance data consistently show that many school-aged children do not meet these guidelines and spend substantial portions of their day sedentary (Kuzik et al., 2025). Notably, children spend more than 70% of their school day sitting, predominantly in the classroom, highlighting that a large proportion of daily sedentary time accumulates during structured learning periods (Schwenke & Coenen, 2022). This discrepancy between recommendations and the sedentary nature of the school day positions schools as a key setting for promoting PA. It also highlights the need for feasible and scalable strategies to integrate movement into routine classroom practice and support more inclusive access to PA during the school day (Bartholomew et al., 2018).

In this context, active breaks (AB), also referred to as classroom movement breaks or classroom PA breaks, have emerged as a promising strategy to increase movement during the school day (Daly-Smith

et al., 2018). AB consist of brief, teacher-led movement bouts integrated within lessons or between instructional periods and designed to be delivered with minimal time, space, or equipment requirements (Reyes-Amigo et al., 2025). Evidence suggests that AB not only increase PA but may also enhance classroom functioning (Peiris et al., 2022). In primary school settings, a systematic review and meta-analysis reported increases in PA indicators, such as MVPA and step counts, alongside improvements in time-on-task during lessons, while findings regarding broader cognitive and academic outcomes have been more mixed (Masini et al., 2020). However, other reviews indicate emerging positive effects on cognitive processes and aspects of well-being (Albulescu et al., 2022; Infantes-Paniagua et al., 2021). Collectively, these findings suggest that AB represent a feasible and educationally aligned approach to integrating movement into routine classroom practice.

Despite these benefits, the adoption and sustained use of AB in schools remain constrained by practical and organisational barriers, and many teachers and schools struggle to integrate these practices into daily teaching routines (Walker et al., 2025). Research on the implementation of school-based PA initiatives indicates that successful delivery depends not only on the design of the intervention but also on organisational conditions and stakeholder engagement (Lane et al., 2022). Evidence also highlights variation in the extent to which teachers incorporate AB into routine practice, shaped by factors such as beliefs about their educational value, confidence in delivery, perceived social norms, and alignment with school expectations (Walker et al., 2022). In addition, a qualitative research involving both teachers and students underscores the influence of individual, social, and environmental factors on the feasibility of AB, including concerns related to peer behaviour, classroom management, social inclusion, and institutional support (Masini et al., 2024). Taken together, these findings highlight the complexity of AB implementation and the need to examine how stakeholder perceptions influence adoption and sustainability in school settings.

Quantitative studies on AB adoption in schools have typically described levels of acceptability, perceived benefits, and usage patterns at the group level, enabling the identification of shared trends among students and teachers. In contrast, qualitative research has provided in-depth insights into how contextual, organisational, and interpersonal factors influence feasibility, decision-making, and everyday classroom integration (Walker et al., 2025). While these approaches generate complementary forms of knowledge, they have frequently developed in parallel and often focused on a single stakeholder group, most commonly teachers (Emonson et al., 2022). As a result, limited research has simultaneously examined the perspectives of students, teachers, and school leaders prior to AB programme implementation (Parrish et al., 2023).

Implementation frameworks such as Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) emphasise the importance of examining not only intervention effectiveness but also the determinants that influence adoption, implementation, and long-term sustainability (Holtrop et al., 2021). These frameworks highlight the need to understand contextual and organisational factors operating before and during programme delivery, and to align implementation strategies with identified determinants to support sustained delivery of AB (Walker et al., 2025). Evidence indicates that barriers

and facilitators of adoption and sustainability operate across provider, organisational, and policy domains in real-world school settings (Cassar et al., 2019). Therefore, engaging multiple stakeholder perspectives is critical to understanding how these multilevel determinants influence AB implementation (Daly-Smith et al., 2021). Importantly, including student perspectives may reveal additional facilitators and barriers influencing acceptability and engagement that may not be fully captured through adult stakeholder accounts alone (Pinelli et al., 2025).

Overall, the existing literature highlights the need for an integrated, pre-implementation examination of AB that captures perspectives across stakeholder groups and system levels. In response to these gaps, the Break4Brain project seeks to advance understanding of how AB are perceived by key stakeholders prior to implementation in primary schools (Arenas et al., 2024). The present study aimed to explore pre-intervention perceptions of AB among primary school students, classroom teachers, and school leaders using a mixed-methods design informed by the RE-AIM framework and guided by a whole-systems perspective to capture determinants operating across classroom, school, and policy levels.

METHODS

Study design

This study employed a convergent parallel mixed-methods design was selected to allow the simultaneous examination of qualitative and quantitative data during the pre-intervention phase of the Break4Brain project, a school-based cluster randomised controlled trial evaluating the implementation of AB in primary school (Arenas et al., 2024). In convergent designs, qualitative and quantitative strands are collected concurrently, analysed independently, and subsequently integrated to develop a comprehensive understanding of the phenomenon under investigation (Fetters et al., 2013). Data were collected prior to programme delivery between October 2023 and January 2024. Quantitative data were obtained from students using a structured questionnaire, while classroom teachers and school leaders participated in semi-structured interviews. Both strands were afforded equal priority to capture complementary but distinct dimensions of pre-intervention perceptions of AB across stakeholder groups. The study was conceptually aligned with the RE-AIM framework and informed by the determinants identified by Daly-Smith et al. (2021), ensuring that data collection and analysis across strands addressed shared implementation-relevant domains. Findings were integrated at the interpretive level through cross-stakeholder and cross-domain comparison to generate meta-inferences (Fetters et al., 2013).

Participants

A total of 817 participants were recruited from 16 primary schools in the Balearic Islands, Spain, including 755 students, 38 classroom teachers, and 16 school leaders. Nine schools were located in Mallorca, six in Menorca, and one in Ibiza; 14 were public and two were private. Students were enrolled in Years 5 and 6 (mean age = 11.1 ± 0.64 years; range 10–13) and included 422 boys and 395 girls. The

adult sample comprised 38 classroom teachers (mean age = 40.2 years; range 27–63) and 16 members of the school leadership team (mean age = 44.6 years; range 30–61), including principals and other senior leadership staff.

Schools were eligible if they offered Year 5 and/or Year 6 classes, agreed to participate voluntarily, and permitted data collection during regular school hours. Eligible schools were invited to participate through the Break4Brain project. Students were eligible if they were enrolled in Year 5 or Year 6, attended school regularly, had written parental consent, demonstrated sufficient comprehension of Spanish or Catalan, and agreed to participate voluntarily. Students were excluded if they were absent on the day of data collection, lacked parental consent, or were unable to complete the questionnaire due to illness or substantial language difficulties. Classroom teachers were eligible if they served as tutors for Year 5 or Year 6 and provided informed consent. School leaders participated based on their leadership role within participating schools and availability during the pre-intervention data collection period.

Instruments

Three instruments were used to capture baseline perceptions of AB among students, classroom teachers, and school leaders prior to the cluster RCT. All instruments were conceptually informed by the RE-AIM framework and by the determinants identified by (Daly-Smith et al., 2021), ensuring alignment across stakeholder groups and implementation-relevant domains. Students completed a 14-item questionnaire assessing perceptions, attitudes, and preferences related to AB. Item formats included four-point Likert-type scales, multiple-choice questions, ordinal response options, and semi-open items. The full questionnaire is provided in Supplementary Table S1. Classroom teachers participated in semi-structured interviews guided by a RE-AIM-informed protocol, with two versions administered according to teachers' prior experience with AB. School leaders also participated in semi-structured interviews using a parallel protocol of open-ended questions addressing organisational feasibility, perceived barriers and facilitators, and expectations regarding the institutional adoption and sustainability of AB. The interview guides for school leaders and classroom teachers are presented in Supplementary Tables S2a-S2d.

Content validation

Content validity of the three instruments was established through a two-round Delphi process conducted between July and September 2023. A purposive panel of 20 experts in education and school-based PA (including university academics, primary school teachers, and an educational inspector) reviewed a semi-structured interview guide for school leaders, a semi-structured interview guide for Years 5–6 classroom teachers, and a Years 5–6 student questionnaire. In Round 1, items were rated for clarity and relevance using a five-point Likert scale, with a consensus threshold of ≥ 75% agreement (ratings 4–5). Items not meeting this criterion were revised based on quantitative ratings and qualitative feedback. In Round 2, revised and newly added items were re-evaluated using a stricter threshold (≥ 80%). Fourteen

experts completed both Delphi rounds constituted the matched sample used for the final evaluation of revised items. Following the Delphi process, 49 items were retained across the three instruments. Figure 1 summarizes the Delphi flow and item refinement. Detailed item wording and acceptability indicators across Delphi rounds are presented in Supplementary Tables S3-S6.

Procedure

Data were collected prior to the delivery cluster RCT. Student questionnaires were administered in person during regular classroom time under standardised conditions. A member of the research team provided instructions, remained present throughout completion, and addressed clarification questions without influencing responses. Semi-structured interviews with classroom teachers and school leaders were conducted during the period. Interviews were held online via Microsoft Teams, audio-recorded with participants' consent, and lasted approximately 10–15 minutes. All interviews were conducted in Catalan.

Data analysis

Quantitative analysis

Student questionnaire data were analysed using descriptive statistics (frequencies, percentages, means, and standard deviations) to summarise baseline perceptions of AB. All quantitative analyses were conducted using R (R Core Team, v4.5.2).

Qualitative analysis

Interview recordings were transcribed verbatim in Catalan and analysed using reflexive thematic analysis (Braun & Clarke, 2019). The analysis combined inductive coding with theory-informed interpretation, using the RE-AIM framework and the determinants identified by Daly-Smith et al. (2021) as analytic lenses rather than coding templates. Researchers involved in coding had prior experience in school-based PA research. This background was acknowledged throughout the analytic process through ongoing discussion of coding decisions and interpretations. Coding was conducted iteratively by one researcher (MB-T) and discussed with a second (DC-E) to enhance interpretative rigour, with discrepancies resolved through dialogue. Codes were organised into subthemes aligned with implementation-relevant domains. Descriptive frequency counts of codes were generated using R (R Core Team, v4.5.2) to examine patterns across stakeholder groups; these counts were used for descriptive comparison only and did not determine thematic salience, which was guided by interpretative depth and relevance to the research questions. Data were managed in Microsoft Excel. Member checking was not performed.

Mixed methods analysis

Integration of quantitative and qualitative findings occurred at the interpretive stage using a joint display organised across the RE-AIM domains. Student questionnaire results were compared with qualitative findings from classroom teachers and school leaders to identify areas of convergence and complementarity and to generate mixed-methods meta-inferences consistent with the convergent mixed-methods design.

RESULTS

Quantitative findings: students' and teacher's perceptions

Students' preferences regarding the implementation of AB are presented in Fig. 2. Overall, students showed a clear preference for sport-based activities (57.1%) and music as supporting material (53.4%). AB were most frequently preferred during the fourth period of the school day (60.4%) and were considered most appropriate in mathematics classes (52.2%). Regarding frequency and duration, students most preferred AB to be implemented two days per week (30.1%) and to last approximately 10 minutes (72.4%). Data indicated limited prior exposure to AB among students. On four-point response scales, awareness of AB was moderate (mean = 2.59 ± 0.79), whereas prior experience in the school context was low, indicating limited previous exposure to AB at school (mean = 1.85 ± 0.75). Despite this limited exposure, acceptability of integrating AB into classroom routines was high in relation to opportunities for movement during class time and the avoidance of prolonged sitting. The opportunity to move during class (mean = 3.48 ± 0.68) and the preference to avoid prolonged sitting (mean = 3.49 ± 0.69) were rated highly. Students also reported high perceived benefits of AB, including improvements in concentration (mean = 3.16 ± 0.70), motivation (mean = 3.21 ± 0.73), and health-related outcomes (mean = 3.28 ± 0.66). Detailed item-level results are presented in Supplementary Table S7.

Teachers' preferences regarding the implementation of AB are presented in Figs. 3 and 4. Expected benefits of AB emerged as the most frequently coded theme across both stakeholder groups (teachers: 16.35%; school leaders: 11.40%). Among teachers, other prominent themes included context- and attitude-dependent perceived effectiveness (10.19%), temporal conditions for implementation (9.70%), and resource-related considerations (7.76%), whereas school leaders additionally emphasised willingness to support the intervention (9.14%), perceived sustainability factors (8.15%), and staff attitudes toward implementation (7.16%).

Qualitative findings: teacher and school leader perspectives

Findings are presented according to the RE-AIM framework and informed by Daly-Smith et al. (2021). Qualitative findings were organised into five overarching themes corresponding to the RE-AIM domains and structured through Daly-Smith-informed subthemes. A total of 20 codes were identified in teachers' interviews and 23 in school leaders' interviews (Tables 1 and 2; Supplementary Tables S8 and S9).

Table 1

Teachers' perspectives on the implementation of active breaks, framed within the RE-AIM framework and informed by Daly-Smith et al. (2021).

REACH		
Sub-themes according to Daly-Smith et al. (2021)	**Codes**	**Verbatim quotes**
PAL teacher training (Prior experience and training)	Previous knowledge	"I first learned about it this year through your project presentation, with limited prior knowledge." T06
	Previous experience	"They work very well, providing essential recovery after demanding classes and improving readiness and motivation for subsequent lessons." T18
External factors (Perceived inclusiveness and student needs/ external influences on reach)	Perceived predisposition of students	"Most students would accept it, recognise its benefits, and initially reluctant participants would likely engage over time." T19
	Willingness to support the intervention	"It is a very good idea, as students are accustomed to movement and struggle with prolonged sitting." T25
EFFICACY		
	Codes	**Verbatim quotes**
PAL benefits (Perceived value and expected impact)	Cognitive and academic benefits Emotional and affective benefits Social and classroom climate benefits Behavioral and self-regulation benefits Physical health and activation benefits Global or holistic benefits	"Improved mental wellbeing, self-perception, and motivation to sustain engagement throughout the day." T25 "It enhances wellbeing and classroom climate, with potential academic benefits primarily driven by emotional wellbeing." T23 "Highly positive cognitive, social, and classroom climate effects, benefiting students regardless of ADHD status." T24 "Students develop self-regulation, improved calmness and concentration, supporting attention and content retention." T29 "Active breaks promote mental disengagement, counter prolonged

Notes. T = teachers. Sub-themes are organised according to the RE-AIM framework and informed by the determinants identified by Daly-Smith et al. (2021). Codes represent recurring concepts identified in classroom teachers' interviews. Exemplar quotes are illustrative extracts supporting each code. Participant identifiers (T01–T36) correspond to individual classroom teachers.

REACH		
Sub-themes according to Daly-Smith et al. (2021)	**Codes**	**Verbatim quotes**
		sitting, and prepare students for improved attention and learning." T34 "Benefits extend across academic outcomes and students' personal and emotional wellbeing." T35
	Emotional and affective benefits	"It enhances wellbeing and classroom climate, with potential academic benefits primarily driven by emotional wellbeing." T23
	Social and classroom climate benefits	"Highly positive cognitive, social, and classroom climate effects, benefiting students regardless of ADHD status." T24
	Behavioral and self-regulation benefits	"Students develop self-regulation, improved calmness and concentration, supporting attention and content retention." T29
	Physical health and activation benefits	"Active breaks promote mental disengagement, counter prolonged sitting, and prepare students for improved attention and learning." T34
	Global or holistic benefits	"Benefits extend across academic outcomes and students' personal and emotional wellbeing." T35
Teacher's beliefs about own capabilities (Modulating factors of effectiveness)	Context- and attitude-dependent perceived effectiveness	"Effects vary according to contextual factors, timing, and students' daily readiness and attitudes." T01
	Preference for calming strategies	"In a highly diverse school, calming strategies such as music, rest, and massage tools are commonly used." T12
	Preferred intensity level	"Moderate-to-high intensity is appropriate, approximately 70–80%, without excessively elevating heart rate." T17
Teacher's beliefs about own capabilities (Potential barriers)	Classroom management concerns	"The main challenge is regaining calmness, sometimes extending sessions, requiring structured calming strategies." T18

Notes. T = teachers. Sub-themes are organised according to the RE-AIM framework and informed by the determinants identified by Daly-Smith et al. (2021). Codes represent recurring concepts identified in classroom teachers' interviews. Exemplar quotes are illustrative extracts supporting each code. Participant identifiers (T01–T36) correspond to individual classroom teachers.

REACH		
Sub-themes according to Daly-Smith et al. (2021)	**Codes**	**Verbatim quotes**
ADOPTION		
	Codes	**Verbatim quotes**
Whole school approach (Organizational leadership and institutional support)	Organizational leadership and coordination roles	"Be a facilitator: assess whether they work, avoid disrupting teaching, and support concentration and work." T05
	School climate	"The difficulty is my group: calm but questioning; if one dislikes it, families follow. Still, we must try." T08
Teacher's beliefs about own capabilities (Teachers' attitudes toward innovation)	Perceived attitudes on staff	"I am unsure; when time constraints are raised, staff tend to become somewhat reluctant." T36
IMPLEMENTATION		
	Codes	**Verbatim quotes**
PAL delivery (Temporal context of implementation)	Temporal context of implementation - Temporal context of implementation	"I scheduled it in the final periods, as students are usually more tired later in the day." T36
PAL delivery (Pedagogical integration into teaching practice)	Curricular time as a barrier	"My concern is they may want more, leading to loss of curricular time and subject content." T11
	Integration of active breaks into curricular activities	"A very good idea; curricular content could be addressed and revisited during active breaks, depending on the activity." T08
Resources – PAL delivery (Available resources and material needs)	Resources for implementation	"Videos, music, movement-based activities, walking briefly, or moving around." T25
	Availability of resources	In my classroom, there are no barriers: ample space, cooperative groups, digital resources, and no limiting disabilities." T12
Teacher's beliefs about own capabilities (Perceived teacher competence)	Perceived self-competence	"I have not received formal training; my learning has been mainly self-directed, for example through social media." T36

Notes. T = teachers. Sub-themes are organised according to the RE-AIM framework and informed by the determinants identified by Daly-Smith et al. (2021). Codes represent recurring concepts identified in classroom teachers' interviews. Exemplar quotes are illustrative extracts supporting each code. Participant identifiers (T01–T36) correspond to individual classroom teachers.

REACH		
Sub-themes according to Daly-Smith et al. (2021)	**Codes**	**Verbatim quotes**
MAINTENANCE		
	Codes	**Verbatim quotes**
Whole school approach – sustainability (School-level sustainability and institutionalization)	Teacher-related sustainability	“If trialled and shown to produce class-wide results, uptake and sustained use by others is more likely.” T09
	School-level sustainability	“Clear evidence of benefits for learning, classroom climate, and appropriate classroom dynamics is essential.” T05
	Student-related sustainability	“Seeing positive outcomes and students perceiving improved concentration and active disengagement.” T06

Notes. T = teachers. Sub-themes are organised according to the RE-AIM framework and informed by the determinants identified by Daly-Smith et al. (2021). Codes represent recurring concepts identified in classroom teachers’ interviews. Exemplar quotes are illustrative extracts supporting each code. Participant identifiers (T01–T36) correspond to individual classroom teachers.

Table 2

School leaders' perspectives on the implementation of active breaks, framed within the RE-AIM framework and informed by Daly-Smith et al. (2021).

REACH		
Sub-themes according to Daly-Smith et al. (2021)	**Codes**	**Verbatim quotes**
PAL teacher training (Prior experience and training)	Previous knowledge	"More or less, yes, mainly through the talks you have given us." SL13
	Previous experience	"The topic was previously discussed in staff meetings, including a proposed training, but not implemented." SL16
External factors (Perceived inclusiveness and student needs/ external influences on reach)	Equitable reach	"Active breaks may reach many more children, which is greatly needed." P01
	Family experience with TDAH	"It may particularly benefit children with ADHD, who struggle to sustain tension beyond short periods." SL09
	Student state as a facilitator/barrier	"The main difficulty may be some students' reluctance, as changes to routine can affect certain children." SL13
EFFICACY		
	Codes	**Verbatim quotes**
PAL benefits (Perceived value and expected impact)	Expected benefits	"I believe it will have positive effects, as similar disconnection techniques have previously shown benefits." SL01
	Perceived necessity of the intervention	"These breaks can disrupt fatigue, enabling disconnection and a calmer, better-prepared return to activity." SL07
ADOPTION		
	Codes	**Verbatim quotes**
Teacher's beliefs about own capabilities (Staff openness and willingness to engage)	Perceived attitudes on staff	"Some teachers feel it would reduce already limited instructional time." SL07
	Willingness to support the intervention	"For me, it is very important, and I prefer it to passive breaks." SL13

Notes. SL = school leaders. Sub-themes are organised according to the RE-AIM framework and informed by Daly-Smith et al. (2021). Codes represent recurring concepts identified in school leaders' interviews. Exemplar quotes are illustrative extracts supporting each code. Participant identifiers (SL01–SL16) correspond to members of the school leadership teams.

REACH		
Sub-themes according to Daly-Smith et al. (2021)	**Codes**	**Verbatim quotes**
Whole school approach (Organizational climate and openness to innovation)	School climate	"It is essential; this culture is growing, though previously such breaks were not strongly promoted." SL13
Teacher's beliefs about own capabilities (Staff resistance and variability)	Teacher resistance as a barrier	"Everyone agreed initially, but changing schedules and organisation is difficult, so active breaks may face the same issue." SL06
	Teacher intrinsic motivation	"Committed teachers move initiatives forward; unmotivated ones find many excuses, regardless of the activity involved." SL02
	Teacher autonomy as a barrier	"Facing something new without sufficient information on what to do becomes a barrier." SL14
Whole school approach (Leadership and shared decision-making)	Shared decision-making culture	"Leadership decisions are shared through the pedagogical coordination committee, promoting consensus and non-impositional implementation." SL06
External factors (Family-related barriers to adoption)	Family attitudes as a barrier	"Families play a crucial role; alignment between school and home is ideal, though schools can still act independently." SL13
External factors (Role of families in supporting adoption)	Family involvement	"Family awareness of physical activity has increased over time, recognising its broad mental and physical health benefits." SL07
IMPLEMENTATION		
	Codes	**Verbatim quotes**
PAL delivery (Practical constraints in daily school functioning)	Teacher workload as a barrier - Temporal context of implementation	"Nowadays, it is often perceived as an additional burden on teachers' workload." SL01 "High flexibility: daily or weekly implementation, starting with one session of 15–20 minutes." SL06
Resources (Resources & support)	Lack of resources and skills as barrier	"Initial courses may lack strategies and resources, leading to repetitive activities and eventual student boredom." SL01

Notes. SL = school leaders. Sub-themes are organised according to the RE-AIM framework and informed by Daly-Smith et al. (2021). Codes represent recurring concepts identified in school leaders' interviews. Exemplar quotes are illustrative extracts supporting each code. Participant identifiers (SL01–SL16) correspond to members of the school leadership teams.

REACH		
Sub-themes according to Daly-Smith et al. (2021)	**Codes**	**Verbatim quotes**
	Need for teacher training	"Some guidance is expected, but broader implementation would likely require specific teacher training." SL13
	Availability of resources	"Materials are available, and additional resources would be purchased if shown to effectively support active breaks." SL14
	-Resources for implementation	"A shared resource bank would simplify implementation by allowing teachers to select ready-made activities." SL03
External factors (Institutional structures)	Institutional policy support	"We do not have systematic institutional support policies in place." SL07
MAINTENANCE		
	Codes	**Verbatim quotes**
Whole school approach – sustainability (School-level sustainability and institutionalization)	Perceived sustainability factors	"If trialled and shown to produce class-wide results, uptake and sustained use by others is more likely." SL09
Notes. SL = school leaders. Sub-themes are organised according to the RE-AIM framework and informed by Daly-Smith et al. (2021). Codes represent recurring concepts identified in school leaders' interviews. Exemplar quotes are illustrative extracts supporting each code. Participant identifiers (SL01–SL16) correspond to members of the school leadership teams.		

Reach

Classroom teachers and school leaders reported heterogeneous prior knowledge of AB, which was typically acquired through informal exchanges, professional experience, or recent project-related presentations. Despite this variability, both groups perceived AB as broadly relevant and capable of reaching a wide range of students, particularly those who experience difficulties with prolonged sitting or sustained attention. Some participants noted that initial adjustments to classroom routines could be challenging for a small number of students.

"*They can really help students who struggle to stay seated or focused for long periods.*" (Teacher, T12)

"*AB may reach many more children, which is greatly needed*." (School leader, SL01).

Effectiveness

Across stakeholder groups, AB were associated with expected benefits at the cognitive, emotional, and classroom climate levels. Classroom teachers frequently described anticipated improvements in students' concentration, emotional regulation, and readiness to resume academic tasks. School leaders

emphasized the potential contribution of AB to calmer learning environments and improved classroom dynamics. Perceived effectiveness was described as dependent on contextual factors such as timing, activity type, and intensity.

"*Students develop self-regulation and improved calmness, supporting attention and learning*." (Teacher, T29)

"*When classrooms are calmer and students are more focused, learning conditions clearly improve*." (School leader, SL04)

Adoption

Classroom teachers and school leaders expressed a generally positive disposition toward adopting AB, while anticipating variability in uptake across staff. Teachers highlighted differences in individual motivation, confidence, and perceived feasibility, whereas leadership teams underscored the importance of school climate, shared decision-making, and collective commitment. Time constraints and curricular demands were consistently identified as factors that could limit adoption.

"I like the idea, but sometimes it feels difficult to fit everything into the lesson." (Teacher, T18)

"Committed teachers move initiatives forward; others tend to become reluctant when time is limited." (School leader, SL02)

Implementation

Implementation-related considerations emerged as a central concern for both stakeholder groups. Classroom teachers and school leaders identified limited instructional time, classroom management following activity, and the lack of structured guidance as key barriers. Participants consistently emphasized the need for teacher training and access to varied, ready-to-use resources to support consistent delivery and maintain student engagement over time.

"If we don't have clear guidance, it's hard to know what to do or how to manage the class afterwards." (Teacher, T07)

"Without strategies and resources, activities become repetitive, and students lose interest." (School leader, SL01)

Maintenance

Perceived sustainability was closely linked to the visibility of positive outcomes, organisational support, and alignment with school priorities. Classroom teachers' emphasised the importance of observing tangible benefits at the classroom level, while school leaders highlighted the role of institutional endorsement and shared expectations. The absence of formal policies was viewed as a potential barrier, whereas pilot experiences demonstrating positive effects were described as facilitators of continued use over time.

“When I see that it really helps my students, I’m much more likely to keep using it over time.” (Teacher, T21)

“If results are visible at the class level, others are more likely to continue using them.” (School leader, SL09)

Integration of quantitative and qualitative findings

A joint display was used to integrate quantitative and qualitative findings across the five RE-AIM domains (Table 3). Overall, the findings showed broad convergence across stakeholder groups. Students reported high acceptability of AB and perceived benefits for concentration, motivation, and health, whereas teachers and school leaders highlighted the pedagogical, organisational, and institutional conditions shaping adoption, implementation, and maintenance.

Table 3
Joint Display of integrated findings across RE-AIM domains.

RE-AIM domain	Quantitative findings (students)	Qualitative findings (teachers and school leaders)	Integrated interpretation
Reach	Students reported moderate awareness of AB (M = 2.59) and low prior experience in the school context (M = 1.85).	Teachers and school leaders described heterogeneous prior knowledge, often linked to informal exposure, professional experience, or recent project presentations. Despite this, both groups considered AB relevant for a wide range of students, particularly those who struggle with prolonged sitting or sustained attention.	AB were not yet adopted across the schools analysed, but they were perceived as relevant and potentially acceptable once introduced.
Effectiveness	Students reported high perceived benefits for concentration (M = 3.16), motivation (M = 3.21), and health (M = 3.28).	Teachers and school leaders anticipated cognitive, emotional, behavioural, and classroom climate benefits of AB, while noting that perceived effects may depend on timing, activity type, and intensity.	Quantitative and qualitative findings converged in showing a perceived value of AB before implementation.
Adoption	Students reported high acceptability of opportunities to move during class (M = 3.48) and to avoid prolonged sitting (M = 3.49).	Teachers and school leaders expressed a generally positive disposition toward AB, but anticipated variability in uptake due to time constraints, staff attitudes, confidence, and school climate.	Student acceptability was high, whereas adoption was perceived to depend more on adult and organisational readiness.
Implementation	Students expressed clear preferences for sport-based activities (57.1%), music (53.4%), implementation during the fourth period (60.4%), in	Teachers and school leaders identified barriers related to instructional time, classroom management, workload, teacher training, and	Student preferences point to acceptable delivery characteristics of AB, while qualitative findings clarify the support needed for feasible implementation

Notes. AB = active breaks; M = mean. Quantitative findings derive from the student questionnaire, whereas qualitative findings derive from semi-structured interviews with classroom teachers and school leaders. The joint display integrates findings across methods and stakeholder groups to identify areas of convergence and complementarity and to support the generation of mixed-methods meta-inferences. For awareness and perceived benefit items, higher mean scores indicate more positive perceptions on four-point response scales; for prior experience, higher scores indicate greater previous exposure to AB. Values reported in the Implementation domain correspond to the most frequently selected student response categories for each preference item.

RE-AIM domain	Quantitative findings (students)	Qualitative findings (teachers and school leaders)	Integrated interpretation
	mathematics (52.2%), lasting 10 minutes (72.4%), and occurring two days per week (30.1%).	access to ready-to-use resources.	in routine school practice.
Maintenance	The quantitative strand did not directly assess long-term maintenance, although high acceptability and perceived benefits suggest favourable conditions for continued engagement.	Teachers linked sustainability to visible classroom-level benefits, whereas school leaders linked it to institutional endorsement, organisational support, and alignment with school priorities.	Maintenance was informed mainly by the qualitative strand, with student data providing indirect support. Long-term sustainability appears to depend on both positive classroom experiences and school-level support structures.

Notes. AB = active breaks; M = mean. Quantitative findings derive from the student questionnaire, whereas qualitative findings derive from semi-structured interviews with classroom teachers and school leaders. The joint display integrates findings across methods and stakeholder groups to identify areas of convergence and complementarity and to support the generation of mixed-methods meta-inferences. For awareness and perceived benefit items, higher mean scores indicate more positive perceptions on four-point response scales; for prior experience, higher scores indicate greater previous exposure to AB. Values reported in the Implementation domain correspond to the most frequently selected student response categories for each preference item.

DISCUSSION

The present study examined pre-intervention perceptions of AB among primary school students, classroom teachers, and school leaders using a convergent mixed-methods design. Integrated findings showed broad agreement across stakeholder groups in the perceived value and acceptability of AB, particularly regarding their potential benefits for concentration, motivation, and classroom functioning. However, stakeholders differed in emphasis. Students expressed more favourable attitudes and implementation preferences whereas teachers and school leaders were more cautious and focused on the pedagogical, organisational, and institutional conditions required for successful delivery. By bringing these perspectives together prior to programme implementation, this study extends previous research on classroom-based PA, which has mainly focused on teachers or post-implementation experiences, and provides a multilevel understanding of implementation readiness for AB in real-world primary school settings.

Despite limited prior experience with AB, students expressed willingness to engage in them during classroom routines and associated them with improved concentration and motivation. This is broadly consistent with a recent systematic review indicating that brief classroom-based PA breaks are generally well accepted by primary school children and may support enjoyment and selected dimensions of subjective wellbeing, although findings remain heterogeneous across studies (Papadopoulos et al., 2022). Given that implementation research in school-based PA has primarily focused on teachers'

perspectives and delivery-related challenges (Nathan et al., 2018), the integration of student and adult stakeholder accounts in the present study offers a broader understanding of pre-implementation readiness. Taken together with the qualitative findings, the results suggest that student-level acceptability may not constitute a primary constraint to AB integration at this stage. Classroom teachers and school leaders anticipated benefits extending beyond PA itself, particularly in relation to classroom climate and students' readiness to engage in learning. This is consistent with qualitative evidence indicating that teachers are more receptive to PA initiatives when they are framed as supporting instructional goals (McLellan et al., 2022). Although concerns regarding loss of curricular time have been reported as barriers in some contexts (Masini et al., 2024), such tensions were present but not dominant in classroom teachers' and school leaders' accounts. Overall, these findings suggest that AB were not widely perceived as incompatible with instructional priorities at the pre-implementation stage.

Although classroom teachers and school leaders did not generally perceive AB as conflicting with instructional priorities, they anticipated variability in their adoption. In the present study, classroom teachers linked this variability to differences in motivation, confidence, and perceived feasibility, whereas school leaders additionally emphasised the role of school climate, leadership, and family attitudes. A similar pattern has been reported in qualitative research on school-based PA approaches, which shows that adoption decisions are shaped by staff perceptions, competing priorities, and the organisational context in which schools operate (Szeszulski et al., 2020). Our findings from classroom teachers are also consistent with research on movement integration showing that teachers' adoption of classroom PA practices is influenced by their perceived competence and efficacy (Webster et al., 2015). At the organisational level, school leaders highlighted the role of school climate and leadership in shaping adoption, while families' attitudes toward movement-based initiatives were perceived as an additional external influence. This reflects the multilevel influences described in previous research, where the uptake of classroom PA practices emerges from interactions between teacher-level factors and organisational conditions within schools (Barcelona et al., 2022). Similarly, the concerns expressed by both teachers and school leaders in this study align with qualitative syntheses of PAL research, which describe adoption as arising from the interaction between individual capability and the broader school context (Daly-Smith et al., 2021).

Beyond adoption, classroom teachers and school leaders identified several practical constraints shaping the implementation of AB, particularly concerning curricular time, teacher workload, and classroom scheduling. Similar barriers have been widely reported in research on school-based PA initiatives, where competing curricular priorities, limited time, and organisational constraints frequently hinder classroom PA practices (Malden & Doi, 2019; Nathan et al., 2018). Evidence from movement integration research further highlights that both institutional factors, such as administrative support and resource availability, and teacher-level factors, including perceived feasibility, competence, and efficacy, influence the implementation of classroom PA (Barcelona et al., 2022; Michael et al., 2019). At the same time, the student findings add an important complementary perspective, as children expressed clear preferences regarding the type, timing, frequency, and duration of AB. Their preference for sport-based activities, music, and implementation later in the school day suggests that student engagement may depend not

only on whether AB are introduced, but also on how they are designed and delivered in practice. Furthermore, both classroom teachers and school leaders suggested that observing improvements in students' concentration and classroom engagement could encourage the continued use of AB over time, consistent with evidence from a systematic review showing that classroom-based active breaks can enhance classroom behaviour and wellbeing while remaining feasible within school routines (Masini et al., 2022). Additionally, our findings suggest that sustainable implementation may depend not only on organisational feasibility, but also on ensuring that AB are perceived by students as acceptable and engaging, a consideration also noted in previous school-based feasibility research (Lund et al., 2024). From an implementation perspective, perceived programme benefits, together with organisational support -such as leadership and available resources- are recognised as key factors influencing the maintenance of school-based PA practices (Nathan et al., 2023).

Implications for school practice and implementation

The findings of this study offer several considerations for schools planning to introduce AB in primary schools. First, the high level of student acceptability suggests that resistance from children may not represent a major barrier at the pre-implementation stage. Instead, implementation efforts may benefit from focusing on supporting classroom teachers through practical guidance, training, and access to ready-to-use resources that facilitate the integration of AB into existing teaching routines. Second, the perspectives of classroom teachers and school leaders highlight the importance of institutional support and a positive school climate in facilitating the uptake of AB among teaching staff. Finally, the findings suggest that the implementation of AB in classroom practice may require ongoing adaptation to students' responses and classroom dynamics in order to maintain engagement and sustain their use over time.

Limitations and strengths

Several limitations should be considered when interpreting the findings of this study. First, the study explored perceptions of AB prior to programme delivery; accordingly, the findings reflect anticipated benefits and perceived implementation conditions rather than experiences derived from actual implementation. Second, although the participating schools represented different islands and school types, they were recruited within a single regional context, which may limit the transferability of the findings to other educational systems and policy environments. Third, the qualitative component relied on self-reported perspectives from school staff, which may have been shaped by individual expectations and by contextual factors within participating schools. Despite these limitations, the study also has several important strengths. To our knowledge, it represents one of the largest mixed-methods examinations of pre-implementation perceptions of AB in primary school settings. It also brings together the perspectives of three key stakeholder groups (students, classroom teachers, and school leaders), an approach that remains relatively uncommon in the literature on classroom-based PA initiatives. In addition, the use of a joint display made the integration between quantitative and qualitative strands more explicit, strengthening the mixed-methods contribution of the study. More broadly, the convergent

mixed-methods design enabled the integration of evidence across stakeholder and system levels, providing a comprehensive understanding of implementation readiness prior to programme delivery.

Conclusions

This study indicates that AB are generally viewed positively by primary school students, classroom teachers, and school leaders, even in contexts with limited prior exposure. Students reported high acceptability and perceived benefits, particularly in relation to concentration, motivation, and opportunities to interrupt prolonged sitting during the school day. At the same time, teachers and school leaders recognised the potential contribution of AB to classroom functioning while emphasising practical and organisational conditions that may shape their adoption and delivery, including constraints related to instructional time, teacher workload, and the need for structured guidance and accessible resources. Overall, readiness for AB in primary schools appears to depend not only on their perceived educational value but also on organisational and contextual conditions within schools, such as institutional support, teacher confidence, and the availability of practical implementation resources. By incorporating perspectives from students, classroom teachers, and school leaders prior to programme delivery, this study advances understanding of early-stage determinants influencing the adoption and sustainability of classroom-based PA initiatives and informs the design of scalable interventions that can be sustained within the structural realities of primary school systems.

Declarations

Data availability statement

The datasets generated and analysed during the current study are not publicly available because public disclosure could compromise the confidentiality of the participating students, adult participants, and schools. De-identified data may be made available by the corresponding author upon reasonable request, subject to applicable ethical, institutional, and data-protection requirements.

Ethics statement

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was granted by the Ethics Committee of the University of the Balearic Islands (Ref. No. 348CER23).

Informed consent statement

Written informed consent was obtained from all adult participants, including classroom teachers and school leaders, and from the parents or legal guardians of all participating students. Assent was also obtained from all participating students prior to participation.

Author Contribution

D.A. conceptualized the study, developed the methodology, supervised the project, and wrote the original draft of the manuscript. M.B.T. contributed to data curation, investigation, methodology, and manuscript review and editing. D.C.E. contributed to data curation and manuscript review and editing. J.C. contributed to conceptualization, funding acquisition, project administration, resources, supervision, and manuscript review and editing. M.E.V.A. contributed to data curation, formal analysis, methodology, software, and manuscript review and editing. A.M.M. contributed to conceptualization, funding acquisition, investigation, project administration, supervision, validation, and manuscript review and editing. All authors reviewed and approved the final manuscript.

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Figures



Figure 1

Flow diagram of the two-round Delphi process for instrument development and validation.

Notes. N = indicates the number of experts participating at each stage of the Delphi process. Consensus thresholds were defined a priori as ≥75% agreement in Round 1 and ≥80% in Round 2.

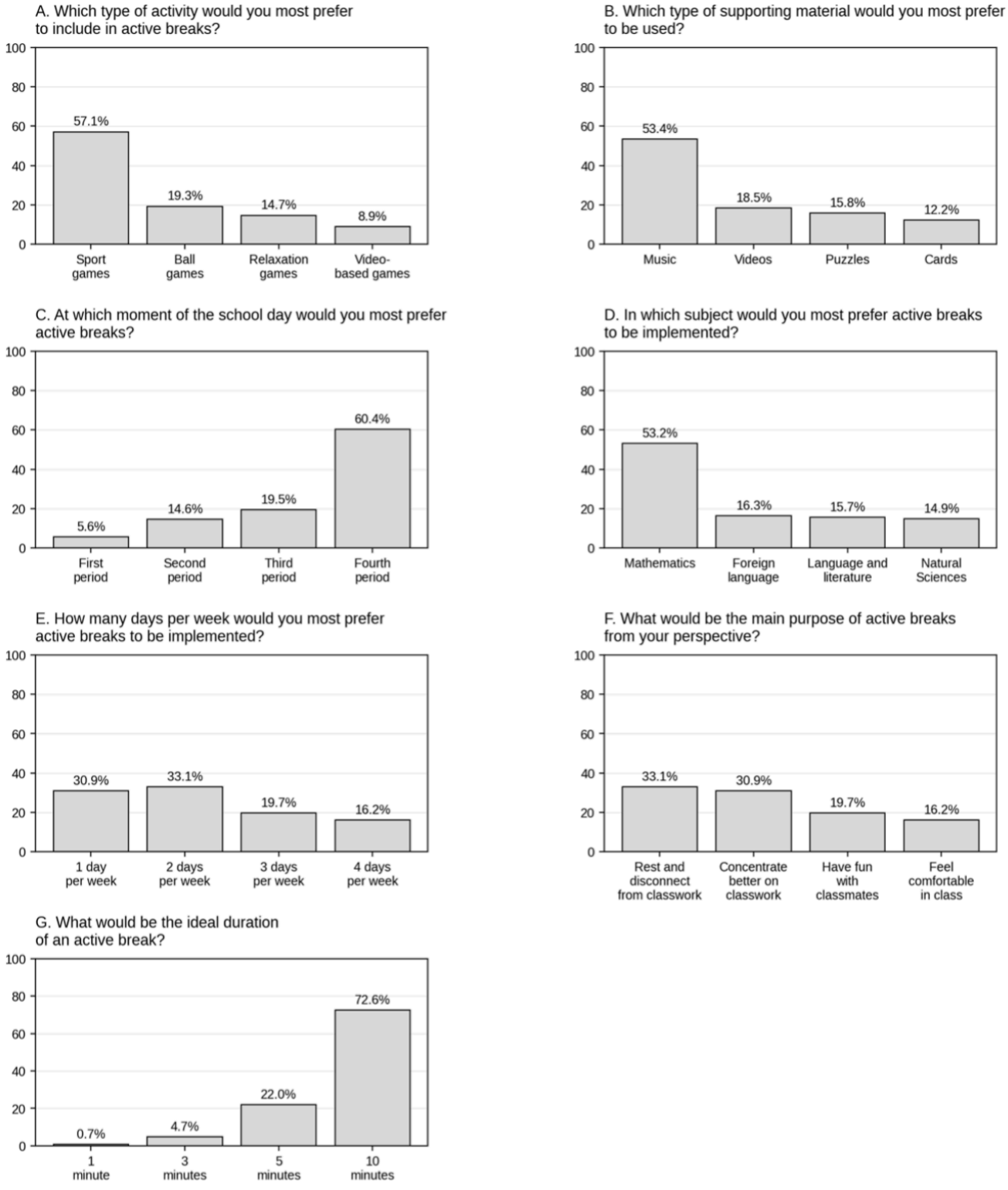
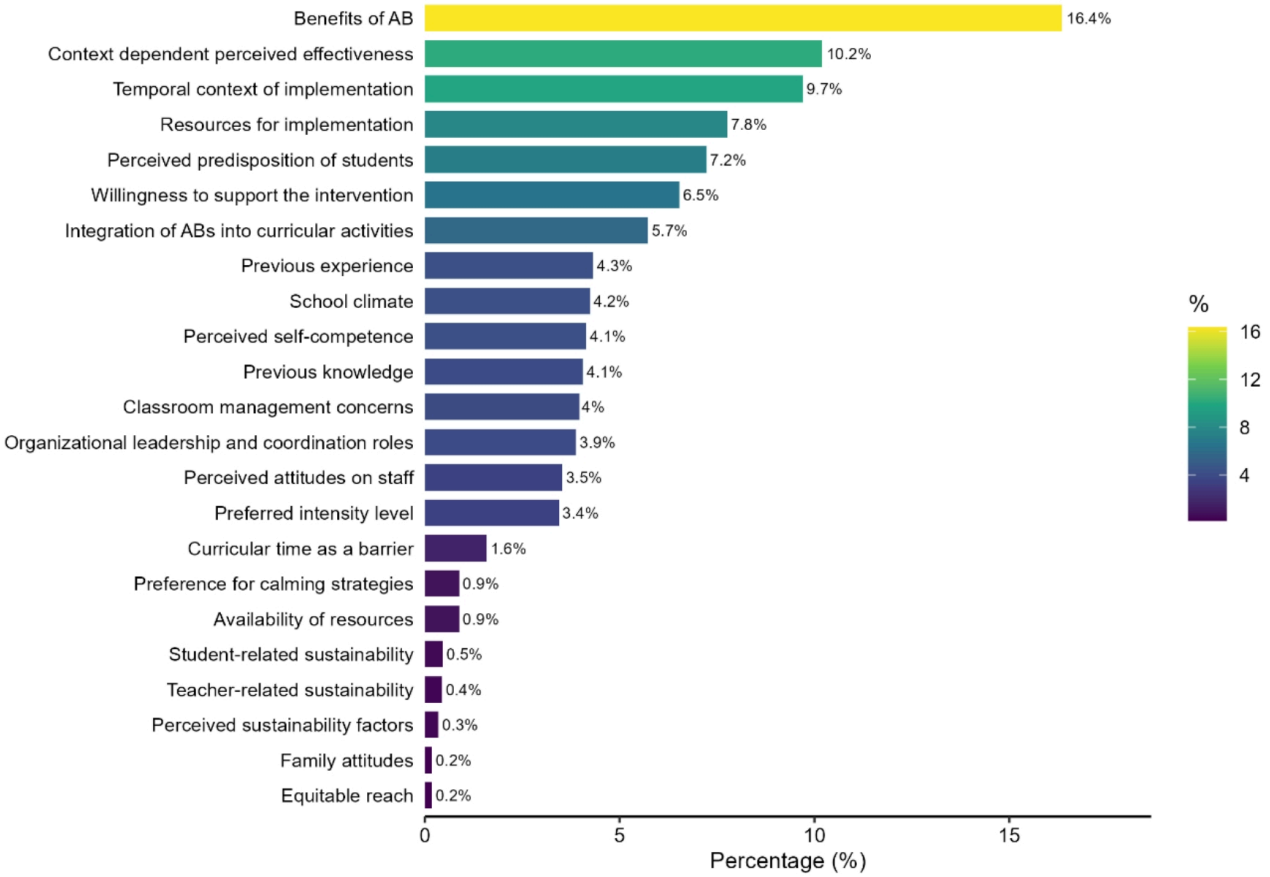


Figure 2

Preferences for implementing active breaks among primary school students.

Notes. Bar charts show the proportions of students selecting preferred activity types (1A), materials or media (1B), timing during the school day (1C), subject of implementation (1D), weekly frequency (1E), perceived purpose (1F), and preferred duration of active breaks (1G).



Notes. Bars represent the relative frequency (%) of each code identified through the content analysis of the interviews. Percentages were calculated based on the total number of valid codifications. Missing values and empty codifications were excluded from the analysis.

Figure 3

Distribution of codes identified in the content analysis of classroom teachers' interviews.

Notes. Bars represent the relative frequency (%) of each code identified through the content analysis of the interviews. Percentages were calculated based on the total number of valid codifications. Missing values and empty codifications were excluded from the analysis.

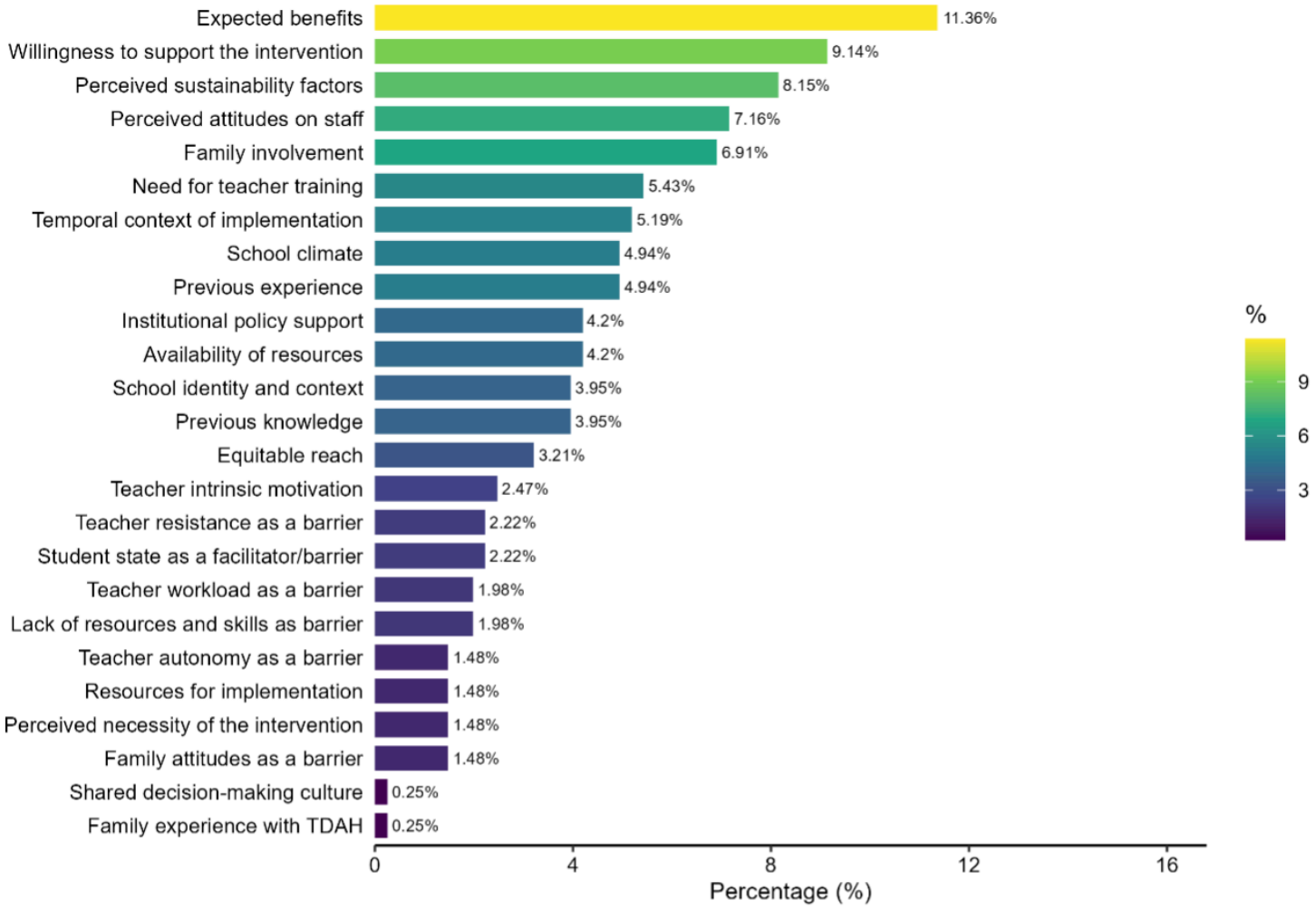


Figure 4

Distribution of codes identified in the content analysis of school leaders' interviews.

Notes. Bars represent the relative frequency (%) of each code identified through the content analysis of the interviews. Percentages were calculated based on the total number of valid codifications. Missing values and empty codifications were excluded from the analysis.

Supplementary Files

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