Classroom-based active breaks to enhance mental health, well-being, and academic self-concept in university students: a pilot feasibility study

Pausas activas en aula para mejorar la salud mental, el bienestar y el autoconcepto académico en universitarios: un estudio piloto de viabilidad

Authors

Nicole González-Calderón [1]
Cristian Escobar-Miranda [1]
Javier Meneses-Pinto [2]
Alicia Contreras-Mu [3]
Pablo Gajardo-Cáceres [1]
Carlos Poblete-Aro [4]
Javier Russell-Guzmán [5]

[1] Universidad Autónoma de Chile (Chile)
[2] Universidad Academia de Humanismo Cristiano (Chile)
[3] Universidad Internacional SEK (Chile)
[4] Universidad de Las Américas (Chile)
[5] Universidad Santo Tomás (Chile)

Corresponding author:
Javier Russell-Guzmán
jrussellguzman@santotomas.cl

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Abstract

Introduction: The transition to higher education was often accompanied by the incorporation of unhealthy habits, such as an increase in sedentary behavior, which negatively affected mental health and well-being in students.
Objective: To explore the feasibility of a classroom-based active break intervention and to examine the preliminary effects of this intervention on depressive symptoms, anxiety, stress, subjective well-being, and academic self-concept in higher education students.
Methodology: A pilot feasibility study with random assignment to parallel groups was conducted. Twenty-three Physical Education Pedagogy students participated and were distributed into an intervention group (n = 11) and a control group (n = 12). The intervention consisted of brief physical exercises of moderate-to-vigorous intensity conducted over eight weeks. The primary feasibility outcomes assessed were retention, adherence, fidelity, intervention dose, acceptability, and safety.
Results: Feasibility outcomes demonstrated high retention (100%), moderate attendance to sessions (66–75%), acceptable fidelity (12 of 16 sessions delivered), appropriate dose (6.7–18 minutes at moderate-to-vigorous exertion), good acceptability of procedures, and no adverse events, supporting the safety of the intervention. After adjustment for multiple comparisons, no significant changes were observed in depressive symptoms, anxiety, stress, affect balance, academic self-concept, or objective academic performance.
Discussion: This pilot study demonstrated the feasibility of classroom-based active breaks but was limited by a small, homogeneous sample, lack of power calculation, and contextual constraints. These limitations restrict generalizability, highlighting the need for larger, more diverse trials to confirm preliminary findings and strengthen methodological rigor.
Conclusions: Classroom-based Active Breaks were feasible and well accepted. Although no significant effects were found, further research with larger samples is warranted to confirm these preliminary findings.

Keywords

Academic self-concept; active breaks; higher education; mental health; sedentary behavior.

Resumen

Introducción: La transición a la educación superior suele implicar la adopción de hábitos poco saludables, como el aumento del comportamiento sedentario, lo que puede afectar negativamente la salud mental y el bienestar de los estudiantes.
Objetivo: Explorar la viabilidad de una intervención de pausas activas en el aula y examinar los efectos preliminares de esta intervención sobre la sintomatología depresiva, la ansiedad, el estrés, el bienestar subjetivo y el autoconcepto académico en estudiantes universitarios.
Metodología: Se desarrolló un estudio piloto de diseño de viabilidad con asignación aleatoria a grupos paralelos. Participaron veintitrés estudiantes de Pedagogía en Educación Física, distribuidos en un grupo intervención (n = 11) y un grupo control (n = 12). La intervención consistió en ejercicios físicos breves de intensidad moderada a vigorosa durante ocho semanas. Se aplicaron escalas validadas antes y después del programa. Los principales resultados de viabilidad evaluados fueron la retención, la adherencia, la fidelidad, la dosis de intervención, la aceptabilidad y la seguridad.
Resultados: La intervención mostró una alta retención (100 %), una asistencia moderada a las sesiones (66-75 %), una fidelidad aceptable (12 de 16 sesiones impartidas), una dosis adecuada (6,7-18 minutos de esfuerzo moderado a vigoroso), una buena aceptabilidad de los procedimientos y ausencia de eventos adversos, lo que respalda la seguridad de la intervención. Tras el ajuste por comparaciones múltiples, no se observaron cambios significativos sobre la sintomatología depresiva, ansiedad, estrés, balance de afectos, autoconcepto académico ni en el rendimiento académico objetivo.
Discusión: El presente estudio piloto demostró la viabilidad de los descansos activos en el aula, pero se vio limitado por una muestra pequeña y homogénea, la falta de cálculo de potencia y las restricciones contextuales. Estas limitaciones restringen la generalización, lo que pone de relieve la necesidad de realizar ensayos más amplios y diversos para confirmar los resultados preliminares y reforzar el rigor metodológico.
Conclusiones: Las pausas activas en el aula demostraron ser factibles y bien aceptadas. Aunque no se encontraron efectos significativos, se requieren nuevas investigaciones, con muestras más amplias, para confirmar estos hallazgos preliminares.

Palabras clave

Autoconcepto académico; comportamiento sedentario; educación superior; pausas activas; salud mental.

Introduction

Mental health has been defined as a foundational component of well-being, enabling individuals to cope with stress, perform effectively, and contribute to society (World Health Organization, 2022). In Chile, mental health issues have been recognized as a major concern among young adults transitioning into higher education (Beroíza-Valenzuela, 2024). A study, conducted in the post-pandemic context, reported that 63.1% of students show depressive symptoms, 69.2% experience anxiety, and 57.0% present elevated stress levels (Martínez-Líbano et al., 2023). In this regard, a greater presence of depressive symptoms has been associated with lower satisfaction with university life (Liu & Wang, 2024), and elevated risk of dropping out of higher education (Martínez-Líbano & Yeomans-Cabrera, 2023).

Difficulties in mental health are often accompanied by a decrease in positive affect and an increase in negative affect—two essential components of subjective well-being (Joshanloo, 2023). Positive affect is characterized by emotions such as joy, high energy, focused attention, enthusiasm, and heightened alertness, whereas negative affect is associated with states of distress, irritability, contempt, fear, and nervousness (Watson et al., 1988). In the university context, higher levels of positive affect and lower levels of negative affect have been reported to be associated with learning environments characterized by greater motivation (González-Arias et al., 2025).

A significant factor associated with mental health problems among university students is their perception of academic abilities, commonly referred to as academic self-concept (Meyer et al., 2023). Although this construct is widely acknowledged as multidimensional (Kadir & Yeung, 2016), prior research has emphasized two particularly relevant dimensions: perceived performance and academic self-efficacy (Méndez-Vera & Gálvez-Nieto, 2018). Notably, evidence suggests that students with higher levels of academic self-concept are more likely to achieve superior objective academic performance (Muñoz et al., 2021).

University students tend to adopt behaviors associated with various health issues, such as poor sleep quality, excessive alcohol consumption, overweight, and increased time spent in sedentary activities (Castro et al., 2020; Savage et al., 2024). Sedentary behavior has been defined as a set of actions characterized by low energy expenditure, including activities such as sitting or lying down (Pinto et al., 2023; Tremblay et al., 2017). Excessive use of electronic devices and prolonged sitting time related to self-directed study or participation in classroom-based instruction are among the main factors contributing to elevated levels of sedentary behavior among university students (Carpenter et al., 2021; Corvalán-Luengo et al., 2023; Vella & Nelson, 2023). Importantly, even students enrolled in Physical Education programs—who are expected to maintain higher levels of activity—have been reported to exhibit elevated levels of sedentary behavior (Godoy-Cumillaf et al., 2022).

Maintaining excessive sedentary behavior has been identified as a risk factor for mental health, associated with symptoms of stress, anxiety, and depression among higher education students (Jiang et al., 2020). In contrast, the regular practice of physical activity acts as a protective factor, mitigating the negative effects of sedentary behavior and reducing the risk of developing mental health complications (Barbosa et al., 2024; Roldán-Espínola et al., 2024). Supporting this, a recent meta-analysis demonstrated that consistent engagement in exercise may significantly reduce depressive symptoms, positioning it as a valuable complement to both behavioral therapies and pharmacological interventions (Noetel et al., 2024). However, despite these benefits, several barriers to adopting a physically active lifestyle have been found, with lack of time consistently reported as a significant obstacle across young adults (Ashton et al., 2015; Bragg et al., 2009; Peng et al., 2023), reinforcing the relevance of this factor in the university context.

The incorporation of Classroom-based Active Breaks, involving the programmed interruption of sedentary behavior through physical exercises, has been proposed as a feasible strategy to promote physical activity among university students (Keating et al., 2022). These interventions have been shown to enhance enjoyment (Peiris et al., 2021), improve attention capacity (Fenesi et al., 2018; Hayes, 2024; Lynch et al., 2022; Pastor-Vicedo et al., 2024), and increase quality of life (Yin et al., 2024a). Additionally, brief bouts of moderate-to-vigorous physical activity, known as exercise snacks (Weston et al., 2025), performed outside the classroom, have been associated with improvements in physical health components, such as better metabolic control (Rafiei et al., 2021) and increased cardiorespiratory fitness (Yin et al.,

2024b) among university students. However, the impact of such interventions—when implemented within the classroom—on depressive symptoms, anxiety, stress, subjective well-being, and academic self-concept has been scarcely explored in university populations.

Therefore, the aim of the present study was to explore the feasibility of a Classroom-based Active Breaks intervention, involving the interruption of sedentary behavior through physical exercise, and to examine the preliminary effects of the intervention on depressive symptoms, anxiety, stress, components of subjective well-being, and academic self-concept in a group university students.

Method

Design

This pilot feasibility study adopted a quantitative approach using a parallel-group experimental design conducted over eight weeks, comparing two groups of students enrolled in the same cohort at a private university in Santiago, Chile.

The study protocol was approved in July 2024 by the Ethics Committee of the Universidad Autónoma de Chile (approval code CEC-21-24). All participants signed a written informed consent form prior to the intervention, indicating their voluntary willingness to participate. All procedures were conducted in accordance with applicable bioethical principles for research involving human subjects, in line with the Declaration of Helsinki.

Participants

A total of 34 students of Physical Education Pedagogy program and belonging to the same class section (2023 cohort) were invited to participate using a convenience sampling approach. Eligible participants were those formally registered in the course in which the intervention was implemented (Exercise Physiology), corresponding to the second year of the program. The exclusion criteria included: (i) having an osteoarticular or musculoskeletal injury or any health-related contraindication, according to the Physical Activity Readiness Questionnaire (PAR-Q); and (ii) voluntary withdrawal from the undergraduate program or study. Random assignment (1:1 ratio with gender balance) was conducted using a random team generator application (Keamk®), with a Classroom-based Active Breaks intervention group (CAB) or a control group (CON).

Procedure

The CAB intervention was conducted during regular daytime class sessions, with a frequency of 2 times per week: Mondays from 08:00 to 09:20 (group 1) and from 11:00 to 12:50 (group 2), and Fridays from 11:00 to 12:50 (groups 1 and 2). During this time, students assigned to the control group were instructed to remain seated. They were permitted to review their notes or rest quietly but were required to stay in their designated seats throughout the session.

The intervention consisted of performing 3 to 4 sets per session of multi-joint exercises at moderate-to-vigorous intensity, following a structured 3:1 progression model (three weeks of progressive loading followed by one week of unloading). Each exercise lasted 30 to 60 seconds, with 15 to 30 seconds of rest between exercises and 1 minute between sets. Active breaks were implemented midway through the class (1–2 sets) and at the end (2 sets). Before the first break, participants performed joint mobility exercises for 2 minutes.

Weeks 1 to 3 involved 3 sets per session, each with three exercises, beginning at 30 seconds per exercise and progressing by 15 seconds weekly up to 60 seconds. Week 4 served as an unloading phase, maintaining the same structure but reducing the duration to 40 seconds per exercise. Weeks 5 to 7 increased training volume to four sets per session, with exercise duration starting at 45 seconds and progressing by 10–15 seconds weekly until reaching 60 seconds.

Each set included three exercise blocks targeting: (i) upper-body muscular endurance and stability (e.g., high plank with alternating arm support, high plank with mountain climbers, push-ups, shoulder press using a weighted bag); (ii) lower-body muscular endurance (e.g., squats, alternating lunges, heel raises); and (iii) cardiorespiratory fitness (e.g., ankle bounces, skipping or high knees, jumping jacks, burpees).

Exercise intensity was periodically monitored using the modified Rating of Perceived Exertion (RPE) scale (0–10), with moderate-to-vigorous intensity defined as a score of ≥4 (Weston et al., 2025). All exercises, along with their respective intensities and durations, were presented to participants via a slide.

Instruments

Participant characterization

According to previous studies (Bustamante-Ara et al., 2022; Corvalán-Luengo et al., 2023; Merellano-Navarro et al., 2022), questions were included to collect general identification data, such as gender, age, and socioeconomic level. Additionally, questions regarding the habitual consumption of tobacco, alcohol, and cannabis were incorporated.

Body mass was assessed using a BC-568 InnerScan Segmental Body Composition Monitor (Tanita Corp., Tokyo, Japan), with a maximum capacity of 150 kg and an accuracy of 0.01 kg (Siedler et al., 2023). Height was measured with a stadiometer (Health o meter® 402KL ROD, IL, USA) with an accuracy of 0.1 cm. Body mass index (BMI) was calculated using the formula: weight (kg)/height^2 (m).

Feasibility

Retention, adherence, fidelity, intervention dose, and acceptability were assessed. Retention was evaluated through completion of post-test assessments, with all participants included at follow-up. Adherence was measured as mean session attendance across groups. Fidelity referred to the number of sessions delivered relative to those scheduled. Dose of the intervention were monitored by session duration and RPE scale, with the target being moderate-to-vigorous intensity. Acceptability was assessed through the ability of the participants to complete self-report questionnaires without difficulty.

Mental health

The DASS-21 scale ("Depression, Anxiety and Stress Scale") was applied, previously validated in Chilean university populations (Antúnez & Vinet, 2012; Román et al., 2016). This instrument consists of 21 items distributed across three subscales: Depression (items 3, 5, 10, 13, 16, 17, and 21), Anxiety (items 2, 4, 7, 9, 15, 19, and 20), and Stress (items 1, 6, 8, 11, 12, 14, and 18). Each item is rated on a four-point Likert scale (0 to 3), based on how often the symptoms were experienced over the past week (from 0 = "did not apply to me at all" to 3 = "applied to me very much, or most of the time"). Scores for each dimension were obtained by summing the corresponding items. In the present study, internal consistency was good for Depression (α = 0.81), questionable for Anxiety (α = 0.69), and acceptable for Stress (α = 0.79).

Subjective well-being

The Positive and Negative Affect Schedule (originally proposed by Mroczek & Kolarz, 1998), modified and validated in Chile (Arancibia-Martini, 2019), was used. This scale includes 12 items, six reflecting negative emotions and six positive ones. Each item is rated on a six-point Likert scale (1 to 6), indicating how often each emotion was experienced in the past hour (1 = "never" to 6 = "always"). Each dimension was calculated by summing the scores of the corresponding items, and the affect balance was estimated by subtracting the negative affect score from the positive affect score. According to Arancibia-Martini (2019), the internal consistency for this adaptation was excellent for positive affect (α = 0.91) and very good for negative affect (α = 0.87). In the present study, reliability was also confirmed, with Cronbach's alpha values of 0.91 for Positive Affect and 0.78 for Negative Affect, indicating excellent and acceptable consistency, respectively.

Academic self-concept

The Academic Self-Concept Scale (Escala de Autoconcepto Académico, in spanish), developed by Schmidt et al. (2008) and validated in Chilean university students (Vera et al., 2024), was administered. This instrument consists of 12 items grouped into two dimensions: Academic self-efficacy (items 1, 2, 4, 5, 6, 12, and 13) and Perceived Academic Performance (items 3, 7, 8, 9, 10, 11, and 14). Responses are given on a five-point Likert scale (1 to 5), based on the level of agreement with a series of statements (from 1 = "strongly disagree" to 5 = "strongly agree"). Items 1, 2, 3, 5, 10, and 11 are positively scored, while items 4, 6, 7, 8, 9, and 12 are negatively scored. According to Vera et al. (2024), the Academic Self-Efficacy dimension showed good internal consistency (α = 0.80), and the Perceived Performance dimension showed acceptable consistency (α = 0.75). In the present study, internal consistency was lower for

the Academic Self-efficacy dimension (α = 0.60), while the Perceived Performance dimension showed excellent reliability (α = 0.88).

Additionally, an objective academic performance measure was included, based on the grades obtained in the targeted course before and after the intervention. These grades were reported on a scale from 1.0 to 7.0, according to the Chilean grading system.

Data analysis

Statistical analyses were conducted using JASP software, version 0.19.3. Graphs were created with GraphPad Prism version 8.0.1. Data normality was assessed using the Shapiro-Wilk test and complemented with visual inspection of Q–Q plots and histograms. Descriptive analyses were conducted using means ± standard deviations for parametric variables and medians ± interquartile ranges for non-parametric data. Categorical variables were described using percentage distributions.

For inferential analysis, within-group comparisons (Pre vs. Post intervention) were conducted using paired Student's t-tests for parametric data or Wilcoxon tests for non-parametric data. Between-group comparisons of differences (Δ = Post – Pre) were conducted using non paired Student's t-tests for parametric data or Mann–Whitney U tests for non-parametric data. In addition, the False Discovery Rate (FDR) was calculated, as previously described (Rouam, 2013), to obtain values of significance corrected (pFDR) according to the number of comparisons performed. Statistical significance was established at a threshold of $p < 0.05$.

To estimate effect size, Hedge's g was used for parametric data to correct for potential small sample bias, with the following thresholds: "very small" (g < 0.20), "small" (g = 0.20–0.49), "medium" (g = 0.50–0.79), or "large" (g ≥ 0.80). For non-parametric data, the rank-biserial correlation (r_b) and its 95% confidence intervals were calculated, interpreted as "very small" ($r_b < 0.10$), "small" ($r_b = 0.10–0.29$), "medium" ($r_b = 0.30–0.49$), or "large" ($r_b \geq 0.50$) (López-Martín & Ardura-Martínez, 2023).

Results

As a result of the recruitment, 23 volunteers (67.7% of approached students) agreed to participate and were randomly assigned to either a Classroom-based Active Breaks intervention group (CAB = 11) or a control group (CON = 12). The sample was characterized following randomization and group assignment. As shown in Table 1, no statistically significant differences were observed in variables such as age, body mass, height, or body mass index.

Table 1. Characterization of numerical variables

	CON (n = 12)	CAB (n = 11)	*p* value
Age (years)[a]	20.5 ± 2.0	21.0 ± 2.0	0.948
Body mass (Kg)[a]	73,0 ± 4.8	63.3 ± 14.9	0.104
Height (cm)	171,3 ± 6.4	167.4 ± 9.2	0.247
Body mass index (Kg/m²)[a]	24,2 ± 2.7	23.5 ± 4.4	0.347

Note: Control Group = CON, Classroom-based Active Breaks = CAB. Parametric variables are presented as means ± standard deviations. a Non-parametric variables are presented as medians ± interquartile ranges. Between-group comparisons are conducted using the Mann–Whitney U test.

Regarding feasibility of the intervention, retention at post-test was 100%, with no attrition. Across the 16 scheduled sessions, 12 were successfully completed, while four were canceled due to overlapping academic activities. The mean duration per session ranged from 6.75 to 18 minutes (7.5% to 20% of the session). Average attendance was 75.0% in the CON group and 65.9% in the CAB group. No adverse events occurred, and all participants completed the self-report questionnaires at both time points without difficulty, indicating good acceptability of the study procedures and instruments.

As shown in Table 2, a higher proportion of male students was observed in both groups. Regarding income level, most participants fall into moderate or low-income categories, both in the CON group (91.6%) and the CAB group (100%). In terms of alcohol consumption, 50.0% of the CON group reported not consuming alcohol, whereas this proportion is lower in the CAB group (9.1%). Conversely, 90.9% of

participants in the CAB group showed alcohol consumption, compared to 50.0% in the CON group. Tobacco use remained low in both groups, with 8.3% in CON and 9.1% in CAB reporting use. Similarly, marijuana use is relatively low, with 16.7% in CON and 18.2% in CAB. Finally, most participants did not have a paid employment at the time of the study, with 75.0% in the CON group and 90.9% in the CAB group.

Table 2. Characterization of categorical variables

	CON (n = 12)	CAB (n = 11)
Gender		
Female	3 (25.0%)	3 (27.3%)
Male	9 (75.0%)	8 (72.7%)
Income level		
Low	4 (33.3%)	6 (54.5%)
Moderate	7 (58.3%)	5 (45.5%)
High	1 (8.3%)	0 (0.0%)
Alcohol consumption		
No	6 (50.0%)	1 (9.1%)
Yes	6 (50.0%)	10 (90.9%)
Tobacco consumption		
No	11 (91.7%)	10 (90.9%)
Yes	1 (8.3%)	1 (9.1%)
Cannabis consumption		
No	10 (83.3%)	9 (81.8%)
Yes	2 (16.7%)	2 (18.2%)
Paid employment		
No	9 (75.0%)	10 (90.9%)
Yes	3 (25.0%)	1 (9.1%)

Note: Control Group = CON, Classroom-based Active Breaks = CAB. Values are expressed as number of cases and percentages (%).

As is shown in Table 3, the weekly progression of the RPE was registered by the participants. As was expected, the CON group consistently reported minimal exertion, with median RPE values remaining at 1.0 ± 0.0 across all weeks. In contrast, the CAB group demonstrated higher perceived exertion, with median values ranging from 5.0 ± 3.3 in Week 1 to 7.0 ± 0.8 in Week 8. Notably, RPE values in the CAB group fluctuated between 5.0 and 7.0, suggesting that the Classroom-based Active Breaks were performed at moderate-to-vigorous intensity during the intervention period.

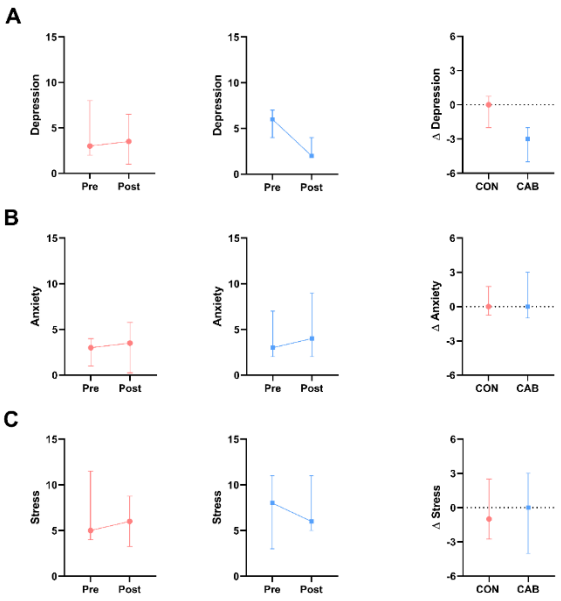
Table 3. Description of Classroom-based Active Breaks perceived exertion

	Week 1		Week 2		Week 3		Week 4		Week 5		Week 6		Week 7		Week 8	
	CON	CAB	CON	CAB	CON	CAB	CON	CAB	CON	CAB	CON	CAB	CON	CAB	CON	CAB
RPE (0-10)	1.0 ± 0.0	5.0 ± 3.3	1.0 ± 0.0	7.0 ± 1.5	1.0 ± 0.0	6.0 ± 2.0	1.0 ± 0.0	6.0 ± 2.0	1.0 ± 0.0	5.0 ± 1.0	1.0 ± 0.0	7.0 ± 2.0	1.0 ± 0.0	7.0 ± 1.0	1.0 ± 0.0	7.0 ± 0.8

Note: Control Group = CON, Classroom-based Active Breaks = CAB, RPE = Rating of perceived exertion. Because the variables exhibited a nonparametric distribution, data are presented as medians ± interquartile ranges.

The effect of the intervention on mental health parameters was subsequently evaluated (Figure 1). First, no significant changes were found in depressive symptoms (r_b = –0.50 [–0.87, 0.22]; pFDR = 0.599), anxiety symptoms (r_b = 0.29 [–0.49, 0.81]; pFDR = 0.875), or stress (r_b = –0.20 [–0.70, 0.44]; pFDR = 0.882) in the CON group during the intervention period. The CAB intervention shower a large effect size large effect size (r_b = –0.89 [–0.97, –0.65]) but non-significant (pFDR = 0.122) reduction of depressive symptoms. This reduction was higher, but not significant, compared to the changes observed in the CON group (r_b = 0.50 [0.07, 0.78]; pFDR = 0.166). In complement, no significant changes were detected in anxiety symptoms (r_b = 0.22 [–0.50, 0.76]; pFDR = 0.836) or stress (r_b = –0.17 [–0.74, 0.54]; pFDR = 0.851) in the CAB group.

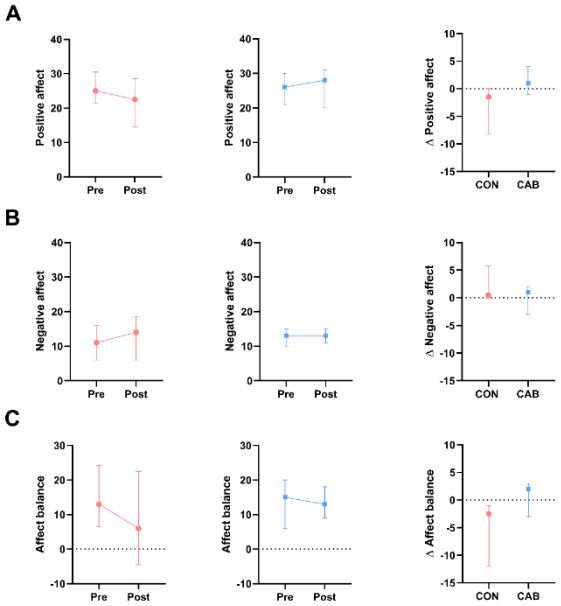
Figure 1. Intervention effects on mental health parameters



Note: Depression (A), Anxiety (B), and Stress (C) scores according to the DASS-21 scale, measured before (Pre) and after (Post) the Classroom-based Active Breaks intervention (CAB, squares in blue) or in the control group (CON, circles in red). Additionally, differences (Δ) between groups (CAB vs. CON) are compared. Because the variables exhibited a nonparametric distribution, data are presented as medians ± interquartile ranges. Within-group comparisons (Pre vs. Post) are conducted using the Wilcoxon signed-rank test. Between-group comparisons (CON vs. CAB) are performed using the Mann–Whitney U test for independent samples.

The effect of the intervention on subjective well-being parameters was subsequently analyzed (Figure 2). A non-significant change in positive affect was observed in the CON group (pFDR = 0.165). When comparing change scores between groups, not significant differences were found (pFDR = 0.171) with a large to very small effect size favoring the CAB intervention in maintaining positive affect (r_b = –0.52 [–0.78, –0.09]). This trend was also reflected in the analysis of affect balance, with a not significant within-group reduction (pFDR = 0.108), but with a between-group difference in favor of the CAB group compared to the CON group (r_b = –0.64 [–0.85, –0.28]; pFDR = 0.122).

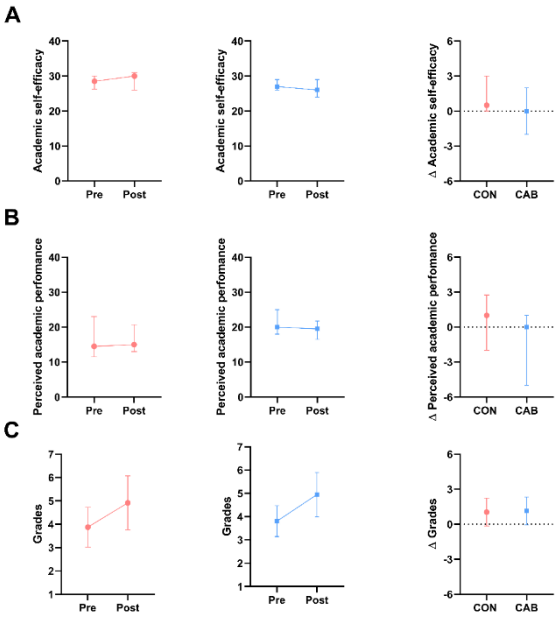
Figure 2. Intervention effects on subjective well-being parameters



Note: Scores for the Positive Affect scale (A), Negative Affect scale (B), and total Affect Balance score (C), measured before (Pre) and after (Post) the Classroom-based Active Breaks intervention (CAB, squares in blue) or in the control group (CON, circles in red). Additionally, differences (Δ) between groups (CAB vs. CON) are compared. Because the variables exhibited a nonparametric distribution, data are presented as medians ± interquartile ranges. Within-group comparisons (Pre vs. Post) are conducted using the Wilcoxon signed-rank test. Between-group comparisons (CON vs. CAB) are performed using the Mann–Whitney U test for independent samples.

Finally, the potential effect of the intervention on variables related to academic self-concept and objective performance was analyzed (Figure 3). No significant changes were observed in academic self-efficacy or perceived performance in either the CON or CAB group. In addition, the rate of improvement in objective academic performance did not differ significantly between groups (g = −0.08 [−0.90, 0.74]; pFDR = 0.919).

Figure 3. Intervention effects on academic self-concept and grades



Note: Scores for Academic Self-Efficacy (A), Perceived Academic Performance (B), and Grades (C), measured before (Pre) and after (Post) the Classroom-based Active Breaks intervention (CAB, squares in blue) or in the control group (CON, circles in red). Additionally, differences (Δ) between groups (CAB vs. CON) are compared. Because the variables exhibited a nonparametric distribution, data are presented as medians ± interquartile ranges. Within-group comparisons (Pre vs. Post) are conducted using the Wilcoxon signed-rank test. Between-group comparisons (CON vs. CAB) are performed using the Mann–Whitney U test for independent samples.

Discussion

The present pilot study explored the feasibility of a Classroom-based Active Breaks intervention and examined the preliminary effects of the intervention on parameters of mental health, subjective well-being, and academic self-concept in a group of Physical Education students. The intervention showed complete post-test retention, moderate session attendance, acceptable fidelity, an appropriate dose of intensity, high acceptability of procedures, and no adverse events. In addition, no significant effects were detected for depression, anxiety, stress, affect balance, academic self-concept, or objective academic performance.

The Classroom-based Active Breaks intervention demonstrated an appropriate short-term retention, with 100% of participants completing the post-test assessments. Moreover, no adverse events were reported, supporting the safety and acceptability of the intervention. Nevertheless, intervention fidelity was partially affected by contextual barriers, as only 12 of the 16 planned sessions were delivered, with four sessions canceled due to conflicts with other academic activities. In complement, mean attendance was 75.0% in the control group and 65.9% in the intervention group, indicating moderate adherence. It is important to note that previous studies did not provide detailed information regarding lecture attendance rates (Keating et al., 2022; Lynch et al., 2022; Peiris et al., 2021). These findings reflect the struc-

tural challenge of embedding active breaks within pre-established curricula, underscoring the importance of stronger institutional coordination to minimize scheduling disruptions in future implementations. At the same time, the moderate attendance rates—particularly the slightly lower participation in the intervention group—may reflect the additional effort required to engage in physical activity compared to remaining seated. This suggests the need for targeted strategies to enhance adherence, such as fostering instructor involvement, emphasizing the academic and well-being benefits of active breaks, and tailoring the activities to student preferences.

Another relevant aspect relates to the load components corresponding to the exercise intervention. In this regard, a load distribution was planned that included execution times per exercise ranging from 30 to 60 seconds, with 3 to 4 sets distributed across 2 breaks per class. As a result, perceived exertion (0-10 RPE Borg Scale) in the intervention group ranged from a median of 5.0 to 7.0. Similarly, the total session duration varied from 6.75 to 18 minutes. These values confirm the targeted moderate-to-vigorous intensity (Weston et al., 2025). In addition, the duration of the sessions was longer than that reported for standing break interventions (Paulus et al., 2021), but comparable to durations observed in previous classroom-based exercise programs (Peiris et al., 2021). Finally, although the selected exercises were well tolerated by the physically active participants, certain exercises may not be appropriate for other university students given their level of difficulty. Accordingly, future studies should consider adjusting both the selection of exercises and their execution times to ensure broader applicability and safety.

Regarding the characteristics of the participants, the results show a predominance of male students. These findings are consistent with those reported in similar studies involving samples of Chilean Physical Education students (Corvalán-Luengo et al., 2023; Flores-Ferro et al., 2020). However, it has been consistently reported that identifying as female is associated with a higher risk of experiencing mental health problems during the university period (Dafogianni et al., 2022; Martínez-Líbano et al., 2023). Additionally, following randomization, the groups exhibited an unbalanced distribution in terms of alcohol consumption. In this context, prior research has shown that problematic alcohol use is associated with adverse outcomes in academic performance, social relationships, and psychological well-being (Castaño-Perez & Calderón-Vallejo, 2014). These findings suggest that both gender distribution and the observed disparity in regular alcohol consumption could function as potential confounding variables.

The intervention showed non-significant effect on depressive symptoms, anxiety, stress, affect balance, or academic self-concept, contrasting with prior evidence on the benefits of physical activity or exercise for mental health (Chen et al., 2025; Huang et al., 2024; Li et al., 2025; Noetel et al., 2024), subjective well-being (Brito-Suárez et al., 2023; Pressman et al., 2020), and academic outcomes (Du et al., 2023; Teuber et al., 2024). These results may be explained primarily by the small sample size (n = 23) achieved in the intervention, which was underpowered to detect statistically significant differences between groups. Furthermore, the Physical Education students in our sample presented specific characteristics, such as a relatively low prevalence of psychological distress compared to the broader university population (Martínez-Líbano et al., 2023; Souza et al., 2021). These features reduced the statistical power of the inferential analyses and limited the generalizability of the findings to broader university student populations.

This pilot feasibility study introduces an innovative approach by promoting the interruption of sedentary behavior through moderate-to-vigorous physical activity performed within the classroom, while also incorporating multiple dimensions of student well-being as key outcome variables. Additionally, although the study does not provide conclusive results regarding the effectiveness of the intervention on mental health, subjective well-being, and academic self-concept parameters, it offers reference values for effect sizes that may be considered in future experimental studies. However, several limitations must be acknowledged. First, the study was not statistically powered to detect between-group differences, as no a priori sample size calculation was performed. The small sample size and single-cohort design were consistent with its exploratory purpose but limit the precision of effect size estimates and increase the risk of Type I error. Second, the use of convenience sampling and inclusion of only students enrolled in a Physical Education Pedagogy program introduces selection bias, restricting generalizability to broader, more diverse university populations. Also, the predominance of male participants further limits external validity. Third, the lack of participant blinding—due to the classroom-based implemen-

tation—raises the possibility of performance and expectation biases, particularly in self-reported outcomes. Fourth, baseline imbalances in covariates, such as alcohol consumption, may have introduced confounding effects, especially for psychological variables. These imbalances were not controlled, given the pilot nature and small sample. Fifth, the large number of statistical comparisons relative to the reduced sample size increases the risk of false-positive findings. While this aligns with the exploratory aims of the study, the results should be interpreted with caution and not as confirmatory evidence of efficacy. Lastly, the absence of a longitudinal follow-up and reliance on self-reported measures for some variables may have limited the ability to detect sustained or objective effects. Taken together, these limitations reinforce the preliminary nature of the findings. Effect size estimates reported here should be used to inform the design, power calculations, and methodological refinements of future fully powered randomized controlled trials.

Conclusions

In summary, this pilot study assessed the feasibility and preliminary impact of a Classroom-based Active Breaks intervention in a group of Physical Education university students. The intervention proved to be feasible and well accepted, with high retention, and no adverse events reported, but with a moderate percentage of attendance. In addition, none of the effects were statistically significant after correction for multiple comparisons.

These findings exhibit the challenges of detecting robust effects in small samples. Future studies, with larger and diverse samples of university students are warranted to verify these preliminary observations and further elucidate the implications of Classroom-based Active Breaks for educational and health outcomes in higher education.

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Authors' and translators' details:

Nicole González-Calderón	nicole.gonzalezcal@gmail.com	Author
Cristian Escobar-Miranda	cristian.escobar3@cloud.uautonoma.cl	Author
Javier Meneses-Pinto	javmeneses.kine@gmail.com	Author
Alicia Contreras-Mu	alicia.contreras@zonavirtual.uisek.cl	Author
Pablo Gajardo-Cáceres	pablo.gajardo@uautonoma.cl	Author
Carlos Poblete-Aro	carlos.poblete.aro@gmail.com	Author
Javier Russell-Guzmán	jrussellguzman@santotomas.cl	Author & translator