

INPLASY PROTOCOL

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Conflicts of interest: None.

Effects of physical activity breaks on the attention of students: A systematic review with meta-analysis

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Review question / Objective: This systematic review with meta-analysis was conducted to compare the effects of physical activity breaks vs. control conditions in the attention of students.

Condition being studied: Attention of students subjected to physical activity breaks.

Information sources: Electronic databases (PubMed, PsycINFO, Scopus, SPORTDiscus and Web of Science) were searched for relevant publications prior to the 12 January 2021.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 January 2021 and was last updated on 15 January 2021 (registration number INPLASY202110054).

INTRODUCTION

Review question / Objective: This systematic review with meta-analysis was conducted to compare the effects of physical activity breaks vs. control conditions in the attention of students.

Rationale: Active breaks (ABs) are currently getting attention within educational context

(Daly-Smith et al., 2018). ABs consist of short periods of classroom-based physical activity (PA), usually between five and 15 minutes (Masini et al., 2019), which are placed into a class routine (Daly-Smith et al., 2018; Masini et al., 2019; Watson et al., 2017). These can be implemented by the teacher (Masini et al., 2019) during academic instructions or between them (Goh et al., 2016). Compared to other kinds

of school-based PA interventions, ABs show some advantages like (i) ABs do not require special spaces or equipment, (ii) teachers can choose the moments when introducing the ABs according to their lessons' necessities (Masini et al. 2019), and (iii) these are not too much time-consuming for real school practice (Van den Berg et al., 2017).

Condition being studied: Attention of students subjected to physical activity breaks.

METHODS

Search strategy: Keywords and synonyms were entered in various combinations in all fields: ("activ* break*" OR "physical break*" OR "physical activity break*" OR "exercise break*" OR "brain break" OR "brain hacking" OR "movement learning" OR "active learning") AND (student* OR class* OR school*) AND attent*.

Participant or population: Students from any age or sex, healthy and with no mental diseases diagnosed.

Intervention: Physical activity breaks consisting in short periods of exercise in class during or between academic lessons.

Comparator: Control conditions (passive or non-active breaks, with a small amount of physical activity).

Study designs to be included: Counterbalanced cross-over design; RCT or non-RCT.

Eligibility criteria: Inclusion criteria: (1) Students from any age or sex, healthy and with no mental diseases diagnosed; (2) Physical activity breaks consisting in short periods of exercise in class during or between academic lessons (e.g., structured exercises, free exercise). (3) Control conditions (passive or non-active breaks, with a small amount of physical activity). (4) Attentional outcomes (e.g. focused or selective attention, vigilance, inhibitory control, etc.) measured before (pre-) and after (post-) activity breaks or a chronic

intervention of active breaks.; (5) Counterbalanced cross-over design (randomized and non-randomized can be included, since all revealing no significant differences in control conditions).; (6) Only original and full-text studies written in English. Exclusion criteria: (1) Other populations than students (e.g., workers, athletes).; (2) No physical activity breaks (e.g., physical education classes; playing with instruments without allowing PA).; (3) Other forms of physical activity interventions (e.g., physical education lessons).; (4) Other outcomes than attention; No pre-post comparison.; (5) Other study designs that do not allow comparisons within-subjects for the two conditions (control and ABs).; (6) Written in other language than English. Other article types than original (e.g., reviews, letters to editors, trial registrations, proposals for protocols, editorials, book chapters and conference abstracts).

Information sources: Electronic databases (PubMed, PsycINFO, Scopus, SPORTDiscus and Web of Science) were searched for relevant publications prior to the 12 January 2021.

Main outcome(s): Aiming to establish consistency in data analyzing and reporting, only measures that were analyzed pre- and post-active breaks were included. Several outcomes were considered for extraction as long as these were a measure of attention: (i) focused or selective attention, (ii) vigilance or sustained attention, and (iii) inhibitory control, among others.

Data management: A data extraction was prepared in Microsoft Excel sheet (Microsoft Corporation, Readmon, WA, USA) in accordance with the Cochrane Consumers and Communication Review Group's data extraction template (Group, 2016). The Excel sheet was used to assess inclusion requirements and subsequently tested for all selected studies.

Quality assessment / Risk of bias analysis: A priori, the Strengthening the Reporting of Observational Studies in Epidemiology

(STROBE) statement purposed by Von Elm et al. (2007) will be used, although depending on the characteristics of all included studies a more appropriate tool could be employed.

Strategy of data synthesis: Analysis and interpretation of results in this systematic review and meta-analysis were only conducted in the case of at least three study groups provided baseline and physical active breaks-related data for the same measure.

Subgroup analysis: Time of exercise; sex; age.

Sensibility analysis: The risk of bias was explored using the extended Egger's test (Egger et al., 1997). To adjust for publication bias, a sensitivity analysis was conducted using the trim and fill method (Duval and Tweedie, 2000), with L0 as the default estimator for the number of missing studies (Shi and Lin, 2019).

Language: English.

Country(ies) involved: Portugal, Spain, Chile.

Keywords: Attention; active breaks; physical activity; performance.

Contributions of each author:

Author 1 - Álvaro Infantes-Paniagua - Lead the systematic review, conducted the search, methodological assessment, data synthesis, wrote and revised the manuscript.

Author 2 - Ana Filipa Silva - Wrote and revised the manuscript.

Author 3 - Rodrigo Ramirez-Campillo - Performed the statistical analysis and report. Wrote and revised the manuscript.

Author 4 - Hugo Sarmiento - Performed the search and screening. Wrote and revised the manuscript.

Author 5 - Francisco Tomás González Fernández - Conducted the search, methodological assessment, data synthesis, wrote and revised the manuscript.

Author 6 - Sixto González-Víllora - Wrote and revised the manuscript.

Author 7 - Filipe Manuel Clemente - Wrote and revised the manuscript.

Conflicts of interest: Álvaro Infantes-Paniagua, Ana Filipa Silva, Rodrigo Ramirez-Campillo, Hugo Sarmiento, Francisco Tomás González Fernández, Sixto González-Víllora, Filipe Manuel Clemente declare that they have no conflicts of interest relevant to the content of this review.