INPLASY

Effects of school-based physical exercise intervention on executive function in children and adolescent: A systematic review

INPLASY2023110118

doi: 10.37766/inplasy2023.11.0118

Received: 29 November 2023

Published: 29 November 2023

Pérez-Ramírez, JA[1]; Valle-Muñoz, VM[2]; González-Fernández, FT[3]; Villa-González, FT[4].

Corresponding author:
Francisco Tomás González Fernández

ftgonzalez@ugr.es

Author Affiliation:
Department of Physical Education and Sports, Faculty of Sport Sciences. University of Granada, Granada, Spain.University of Granada.

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2023110118

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 29 November 2023 and was last updated on 29 November 2023.

INTRODUCTION

Review question / Objective The aim of this systematic review is to investigate and synthesize the effects of school-based physical exercise interventions on specific domains of executive functions in children and adolescents.

Rationale Regular physical exercise has been consistently shown to have positive effects on executive functions, particularly in children and adolescents. Schools provide an ideal environment for promoting physical activity and improving executive functions. This review aims to explore the effects of school-based interventions on different domains of executive functions in children and adolescents. The evidence suggests that regular physical exercise has beneficial effects on executive functions, which are higher cognitive skills involved in self-regulation, impulse control, planning, attention, and mental flexibility. These skills are particularly important during childhood and adolescence as they are related to academic performance, social behavior, and overall success in life. Schools play a crucial role in promoting physical activity and developing executive functions in children and adolescents. School-based physical exercise programs provide a unique opportunity to integrate physical activity into students' daily routines. These interventions often include structured physical education classes, active recess, extracurricular sports programs, and physical activities during school hours. By participating in these activities, students have the opportunity to improve their physical fitness, develop motor skills, work as a team, and experience the cognitive benefits of exercise. Several studies have shown that school-based exercise interventions can improve specific aspects of executive functions such as working memory, inhibition of impulsive responses, and cognitive flexibility. These benefits can have a positive impact on academic performance, classroom concentration, and overall behavior of students.

In summary, planned physical exercise interventions within the school environment offer an effective strategy for promoting physical activity and improving executive functions in children and adolescents. These programs can have a lasting impact on students' cognitive, emotional, and social development by providing them with the necessary tools for successful learning and a healthy lifestyle.

Condition being studied Physical exercise has a consistent and positive effect on executive functions throughout life, particularly in children and adolescents. Schools are an ideal environment for promoting physical activity and improving executive functions. This review aims to explore the effects of school-based interventions on different domains of executive functions in children and adolescents.

METHODS

Search strategy Keywords and synonyms were entered in various combinations in the title, abstract or keywords: ("child" OR "children" OR "schooler" OR "preadolescent" OR "kid" OR "childhood" OR "schoolchildren" OR "youth" OR "young" OR "adolescent" OR "teen") AND ("school" OR "school-based OR "primary school" OR "secondary school") AND ("resistance training" OR "resistance activity" OR "resistance exercise" OR "strength" OR "muscle strengthening" OR "strength training" OR "strength exercise" OR "weight training" OR "bodyweight training" OR "high intensity training" OR "high intensity exercise" OR "high intensity activite" OR "high intensity intermitent training" OR "intensity intermittent exercise" OR "high intensity interval training" OR "high intensity interval exercise" OR high intensity interval activite OR moderate-intensity continuous training OR endurance training OR endurance exercise OR aerobic training OR aerobic exercise OR concurrent training OR concurrent exercise OR combined training OR aerobic and resistance training OR aerobic and strength exercise OR endurance and resistance exercise OR endurance and strength exercise OR sport recreational OR exergames OR small-sided games) AND ("executive function" OR "Executive Control" OR "inhibitory control" OR "working memory" OR "cognitive flexibility" OR "planning" OR "attention" OR "memory") AND ("intervention" OR "interventions" OR "program" OR "programme" OR "programs" OR "programmes" OR "evaluate" OR "evaluation" OR "promotion" OR "effect" OR "effectiveness" OR "efficacy" OR "effective" OR "experiment" OR "experimental").

Participant or population Children and adolescents between the ages of 5 to 17 who are seemingly healthy (free from injuries, chronic or acute illnesses, with normal weight, and attending primary or secondary educational institutions).

Intervention Planned physical exercise interventions within the school environment.

Comparator Control conditions (passive control).

Study designs to be included RCT and non-RCT.

Eligibility criteria (1) apparently healthy children and adolescents (between five and seventeen years old); (2) physical exercise interventions within school hours; (3) assess at least one specific domain of executive functions; (4) designs (randomized and nonrandomized trials); (5) Only original studies and full text written in English. Exclusion criteria: (1) Other population other than children and adolescents (for example adults); (2) children and adolescents with some type of injury, chronic or acute illness, overweight or obesity; (3) Other physiological or physical conditions not related to the included results; (4) Other study designs that do not allow within-subjects comparisons for the two conditions; (5) Written in a language other than English. Other types of articles in addition to the original (e.g., reviews, letters to the editors, trial records, protocol proposals, editorials, book chapters, and conference abstracts).

Information sources Electronic databases (PubMed, Scopus, SPORTDiscus, and Web of Science) were searched for relevant publications prior to 29 november 2023.

Main outcome(s) Assess at least one component of EF such as working memory, cognitive flexibility, attention, concentration, planning.

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. The Excel sheet was used to assess inclusion requirements and subsequently tested for all selected studies.

Quality assessment / Risk of bias analysis The quality assessment standard for a cross-over study was used. This tool assesses nine items: (i) appropriate cross-over design; (ii) randomized treatment order; (iii) carry-over effect; (iv) unbiased data; (v) allocation concealment; (vi) blinding; (vii)

incomplete outcome data; (viii) selective outcome reporting; and (ix) other bias. A possible scoring of low, unclear, and high can be provided by each item.

Strategy of data synthesis Analysis and interpretation of results in this systematic review were only conducted in the case of at least study groups provided scientific evidence found in previous literature regarding the effect of school-based physical exercise interventions on specific domains of executive functions in children and adolescents.

Subgroup analysis Fitness status; Age; Sex.

Sensitivity analysis To adjust for publication bias, a sensitivity analysis was conducted using the trim and fill method, with L0 as the default estimator for the number of missing studies.

Language restriction English.

Country(ies) involved Spain.

Other relevant information N/A

Keywords school; health; cognitive function; exercise interventions.

Contributions of each author

Author 1 - José Antonio Pérez-Ramírez - Performed the search and methodological search and made the synthesis of results. Wrote and revised the manuscript.
Email: perez.es@gmail.com
Author 2 - Victor Manuel Valle-Muñoz - Performed the methodological search, search and methodological search and made the synthesis of results.
Email: victorvalle66@gmail.com
Author 3 - Francisco Tomás González-Fernández - Wrote and revised the manuscript.
Email: ftgonzalez@ugr.es
Author 4 - Emilio Villa-González - Wrote and revised the manuscript.
Email: evilla@ugr.es