

# INPLASY

## Relationships between motor skills and academic achievement in school-aged children and adolescents: A systematic review

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### ADMINISTRATIVE INFORMATION

**Support -** No.

**Review Stage at time of this submission -** Completed but not published.

**Conflicts of interest -** None declared.

**INPLASY registration number:** INPLASY202420043

**Amendments -** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 09 February 2024 and was last updated on 09 February 2024.

### INTRODUCTION

**Review question / Objective** This review systematically summarizes the studies of the relationship between primary to secondary school students' motor skills and academic achievement and analyzes the relationship between gross and fine motor skills and performance in different subjects.

**Rationale** Motor and cognitive skills are intertwined because they share the same brain structures. Functional neuroimaging has revealed the close co-activation of the neocerebellum and dorsolateral prefrontal cortex during several motor and cognitive tasks (Desmond et al., 1997; Diamond, 2000). Cognitive skills are also closely related to academic performance (Oberer et al., 2018; Alloway & Alloway, 2010).

**Condition being studied** This review systematically summarizes the studies of the relationship between primary to secondary school students' motor skills and academic achievement and analyzes the relationship between gross and fine motor skills and performance in different subjects.

### METHODS

**Participant or population** For normal primary school (i.e. approximately 5-11 years old; Grades 1-6) to high school students (i.e., approximately 12-17 years old; Includes students in grades 7-12 studies targeting primary (i.e. approximately 5-11 years of age; Grades 1-6) to high school students (i.e. approximately 12-17 years of age; Grades 7-12) were included.

**Intervention** It involves the influence of gross motor skill and fine motor skill intervention on different academic achievement.

**Comparator** It involves the influence of gross motor skill and fine motor skill intervention on different academic achievement.

**Study designs to be included** The inclusion and exclusion criteria are as follows: (1) studies examining the associations between motor skills and academic achievement were included, (2) studies that tested gross or fine motor skills separately were included, (3) The subjects included in the study were primary, middle and high school students without special diseases; (4) studies published in peer-reviewed journals in English until March 2023 were included; (5) quantitative studies were included. Studies examining the associations between motor skills and academic achievement were included.

**Eligibility criteria** No.

**Information sources** Five electronic databases, Web Of Science, PubMed, PsycINFO, SPORTDiscus, and Academic Search Premier, were searched in October 2022. Search terms were based on the combination of three main areas: (1) student\* OR youth\* OR teenage\* OR child\* OR juvenile\* OR adolescent\*; (2) motor skill\* OR motor competence OR motor ability\* OR motor development OR motor coordination OR gross motor skill\* OR fine motor skill\*; and (3) academic achievement OR academic performance OR academic grades OR scholastic achievement.

**Main outcome(s)** Seventy-eight articles were included in this systematic review. The semi-quantitative assessment results showed that gross (+, 65.0/62.5%) and fine motor skills (+, 83.3/80%) were positively correlated with overall performance and language performance with  $\geq 60\%$  of the associations in the same direction. For different subjects, fine motor skills are positively correlated with students' mathematics (+, 75.6%), reading (+, 71.1%), writing (+, 66.7%), and spelling (+, 60.0%) scores. However, the association between gross motor skills and students' mathematics achievement (? 51.4%), reading(? , 53.8%), and spelling(?50.0%) is uncertain with  $< 60\%$  of the associations in the same direction.

**Quality assessment / Risk of bias analysis** The researchers used the adapted McMaster Critical Review Form-Quantitative Studies to determine the methodological quality of the included studies (Law et al., 2015). The form was chosen because it

demonstrated a good 75–86% inter-rater agreement (Bloemen et al., 2015). It contains 16 items, which addressed the study purpose (1 item), study background (1 item), study design (1 item), sampling (2 items), measurement (4 items), data analysis (4 items), conclusions (1 item), and implications and limitations (2 items). The researchers scored all items by the degree to which specific criteria were met (yes = 1, no = 0).

**Strategy of data synthesis** Data extraction was conducted by the first author and verified by the second author. The demographic data of these studies were summarized and included the type of research, geographical location, participant characteristics, motor skills measurement methods, and methodological quality (Table 1). The geographical location was summarized into the countries where the study was conducted. The participant samples were split into four groups (500). The methodological quality was divided into excellent, good, and low categories.

**Subgroup analysis** No subgroup analysis was designed.

**Sensitivity analysis** No Sensitivity analysis was designed.

**Language restriction** Studies published in peer-reviewed journals in English.

**Country(ies) involved** China (Shanghai University of Sport).

**Keywords** school children; motor skills; academic achievement; review.

#### **Contributions of each author**

Author 1 - Wang Lijing - Conceptualization; Data collection; Writing an original draft.

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Author 2 - Wang Lijuan - Formal analysis; Methodology; Writing review and editing.

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