

# Active commuting to and from school, cognitive performance, and academic achievement in children and adolescents: A systematic review and meta-analysis of observational studies

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**Background:** Physical activity has a beneficial effect on the brain's development process and cognitive function. However, no review to date has evaluated the effects of active commuting to and from school (ACS) on cognitive performance and academic achievement. The aim of this systematic review and meta-analysis was to evaluate the link between ACS and cognitive performance and academic achievement in children and adolescents. **Methods:** We systematically searched MEDLINE, EMBASE, Web of Science and PsycINFO databases for all observational studies published until May 2019 that examined the association between ACS and cognitive performance or academic achievement. Studies were classified into two groups according to their measured outcomes: cognitive performance (nonexecutive cognitive functions, core executive functions, and metacognition) and academic achievement (marks of different areas). A pooled effect size (ES) was estimated using the DerSimonian and Laird random-effects method for cognitive performance and each area of academic achievement. **Results:** Twelve studies that evaluated the relationship between ACS and cognitive performance or academic achievement were included in the systematic review: four studies analyzed both cognitive performance and academic achievement, one study provided data regarding cognitive performance and seven provided data on academic achievement. Finally, nine of 12 studies provided enough data for inclusion in the meta-analysis. Our findings suggest that ACS was not significantly associated with cognitive performance (ES= -0.02; 95% CI:

-0.06 to 0.03) or academic achievement (ES= -0.33; 95% CI: -0.83 to 0.17 for mathematics-related skills; ES= -0.37; 95% CI: -0.88 to 0.15 for language-related skills). Conclusions: There was insufficient evidence regarding the relationship between ACS and cognitive performance and academic achievement. Future studies should include potential confounders in their analyses and consider the use of standardized self-reports or objective measures of ACS. © 2019 by the authors.

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Academic performance

Active transportation

Active travel

Cognition

Cycling

Exercise

Physical activity

School performance

Walking

Youth

academic performance

adolescence

child

cognition

commuting

cycle transport

meta-analysis

physical activity

walking

academic achievement

adolescent

child

controlled study

effect size

Embase

executive function

exercise

female

human

human experiment

juvenile

language

male

mathematics

Medline

meta analysis

metacognition

observational study

PsycINFO

review

self report

skill

systematic review

travel

walking

Web of Science

academic success

cognition

observational study

school

traffic and transport

Academic Success

Adolescent

Child

Cognition

Exercise

Humans

Observational Studies as Topic

Schools

Transportation