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Active Bodies, Active Minds: The Influence of Physical Activity on Science Learning Cognition in Elementary Students

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ABSTRACT

The purpose of the study. Growing evidence suggests that physical activity can enhance cognitive functioning and academic performance; however, empirical research examining movement-integrated science instruction in elementary education remains limited, particularly in developing-country contexts. This study investigated the effect of physically active science learning on science achievement among fifth-grade elementary school students.

Materials and methods. A quasi-experimental study employing a posttest-only control group design was conducted with 60 Grade 5 students from an elementary school in Denpasar, Indonesia. Participants were assigned to either an experimental group (n = 30), which received physically active science instruction, or a control group (n = 30), which received conventional classroom instruction. Science achievement was assessed using a validated 20-item multiple-choice test (Content Validity Ratio = 1.00; KR-20 = 0.84). Data were analyzed using descriptive statistics, Kolmogorov–Smirnov and Levene's tests, independent-samples t-tests, and Cohen's d effect size analysis.

Results. The experimental group achieved significantly higher science achievement scores (M = 86.07, SD = 6.19) than the control group (M = 75.60, SD = 6.39). Assumption testing confirmed normality and homogeneity of variance. Independent-samples t-test results indicated a significant difference between groups, t(58) = 6.447, p < .001. The intervention produced a very large effect size (Cohen's d = 1.667), demonstrating a substantial educational impact.

Conclusions. Physically active science learning significantly improved elementary students' science achievement compared with conventional instruction. The findings support embodied cognition theory and highlight the potential of movement-integrated pedagogical approaches to enhance science learning outcomes in primary education. Future research should examine the long-term effectiveness of such interventions across diverse educational settings.

Keywords:
active learning; embodied cognition; elementary education; physical activity integration; science achievement; science learning.

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