

Developing a Structural Model of the Effect of a Cognitive Science- and Physical Activity-Based Curriculum on Self-Regulated Learning, Cognitive Flexibility, and Mental Health in Students

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E d i t o r	R e v i e w e r s
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1. Round 1

1.1. Reviewer 1

Reviewer:

In the Introduction paragraph beginning with “Cognitive flexibility is another central construct in the proposed model,” the authors appropriately describe cognitive flexibility as adaptive shifting and alternative thinking; however, the manuscript should better distinguish cognitive flexibility from self-regulated learning. At present, both constructs are described in relation to adaptation, control, and problem-solving, which may create conceptual overlap. The authors should clarify that self-regulated learning refers mainly to regulation of learning processes, whereas cognitive flexibility refers to adaptive restructuring of thought and strategy in response to changing demands.

In the paragraph stating “Alongside cognitive science, physical activity has emerged as a major educational and developmental resource,” the authors cite relevant literature, but the theoretical mechanism linking physical activity to the three dependent variables should be elaborated further. The manuscript should explain whether physical activity is expected to improve outcomes through physiological arousal, executive function enhancement, emotional regulation, peer interaction,

embodied learning, or reduced sedentary behavior. This clarification would strengthen the rationale for integrating physical activity into a curriculum model rather than treating it as a general wellness factor.

In the Methods paragraph under “Study Design and Participants,” the sentence “The present study was conducted using a quantitative, descriptive-correlational design based on structural equation modeling” is appropriate, but the article title uses the term “effect,” which may imply causality. Because the design is cross-sectional and correlational, the authors should revise causal wording throughout the manuscript or explicitly state that the tested paths represent theoretically hypothesized predictive associations rather than experimentally verified effects. This is especially important for maintaining methodological accuracy.

In the Findings section, the demographic reporting is clear, but the authors should add whether gender, grade level, or school type differences were examined before testing the structural model. Since the sample includes male and female students, different grade levels, and public/private schools, it is important to determine whether these characteristics were controlled or whether the structural paths were assumed to be invariant across groups. At minimum, the authors should acknowledge this issue as either an analysis decision or a limitation.

In Table 1, the correlations among the main variables are all positive and statistically significant, with values ranging from 0.44 to 0.58. While this supports the hypothesized associations, the authors should discuss whether these correlations suggest adequate discriminant validity among the constructs. Given the conceptual closeness of self-regulated learning and cognitive flexibility, the manuscript should report discriminant validity evidence, such as the Fornell–Larcker criterion, HTMT ratio, or comparison of AVE values with squared interconstruct correlations.

Response: Revised and uploaded the manuscript.

1.2. Reviewer 2

Reviewer:

In the Methods paragraph reporting that “The final sample included 384 students from Tehran,” the sample size is suitable for structural equation modeling, but the manuscript should provide a formal justification for this number. The authors should state whether the sample size was determined using power analysis, SEM rules of thumb, the ratio of cases to estimated parameters, or Morgan’s table. Providing this justification would improve the methodological rigor and reproducibility of the study.

In the Methods paragraph describing sampling, the authors write that “several educational districts of Tehran were first selected, then schools were randomly chosen from each selected district.” This statement is useful but incomplete. The authors should specify how many districts, schools, and classes were selected, whether both girls’ and boys’ schools were included, and whether public and private schools were proportionally represented. These details are necessary to evaluate the representativeness of the sample and the generalizability of the findings.

In the Data Collection Tools section, the paragraph on the “researcher-made questionnaire” for the cognitive science- and physical activity-based curriculum requires substantial strengthening. Because this is the central independent latent variable of the model, the authors should report the exact number of items, dimensions, example items, scoring range, content validity ratio or content validity index, pilot testing procedure, and reliability coefficients. Without these details, the validity of the main predictor variable cannot be adequately assessed.

In the paragraph describing the Self-Regulated Learning Questionnaire, the authors state that it is “based on the theoretical framework of Pintrich and colleagues,” but the exact instrument version is not specified. The manuscript should identify whether the authors used the Motivated Strategies for Learning Questionnaire, a shortened adaptation, or another self-regulated learning scale. The number of items, subscales, scoring system, and evidence of prior validation in Iranian or adolescent student samples should also be reported.

In the paragraph describing the Cognitive Flexibility Inventory, the authors mention the two dimensions of “alternatives and control,” which is appropriate; however, the original Cognitive Flexibility Inventory was developed mainly for adult populations. The authors should justify its use with secondary school students and explain whether any linguistic, cultural, or

age-appropriate adaptation was performed. If a validated Persian version was used, the authors should explicitly cite and describe its psychometric adequacy.

In the paragraph describing the General Health Questionnaire, the sentence “Depending on the scoring direction used in the analysis, higher scores were interpreted according to the scale manual” is too vague for a scientific manuscript. The authors should specify whether they used the GHQ-28, GHQ-12, or another version, and whether higher scores indicated greater distress or better mental health. Since the findings table states that higher scores reflected better mental health, the authors should explain whether reverse scoring was applied and how interpretation was standardized.

In the Data Analysis paragraph, the manuscript states that “normality of the data was examined using skewness and kurtosis indices,” but it does not mention multivariate normality, outlier detection, or missing data treatment. Since SEM is sensitive to distributional assumptions and influential cases, the authors should report whether Mahalanobis distance, Mardia’s coefficient, missing data patterns, and estimation method assumptions were examined. This would improve confidence in the robustness of the SEM results.

Response: Revised and uploaded the manuscript.

2. Revised

Editor’s decision after revisions: Accepted.

Editor in Chief’s decision: Accepted.