Title

Direct and indirect effects of physiological, psychological and cognitive variables on academic achievement in children

Abstract

Background: Associations between cardiorespiratory fitness (CRF), screen time, psychological well-being, executive functions, and academic achievement have been reported, however, few studies have analysed models considering the effect of all these variables on academic achievement. This study aims to analyse the direct and indirect associations of mothers' education level, CRF, screen time, psychological well-being, executive functions, with academic achievement in schoolchildren, by sex. Methods: This was a cross-sectional analysis of MOVI-daFit! study including 519 schoolchildren (49.52% girls) aged 9–11 years old. Executive functions were assessed with the NIH Toolbox, CRF with the 20-m shuttle run test, academic achievement through the final academic grades in language and mathematics and mother's education level, screen time and well-being by questionnaires. Results: Structural equation modelling revealed that in boys cognitive flexibility had a significant direct effect on academic achievement and screen time a total significant effect on academic achievement. In girls, CRF was associated with inhibition and psychological well-being, and this was associated with academic achievement. Conclusions: Physiological, psychological, and behavioural variables act together to impact academic achievement, and that differences by sex might exist. Thus, strategies to enhance academic achievement in schoolchildren should consider psychological well-being, CRF, screen time, and sex differences. Impact: Physiological, psychological, and behavioural variables, such as cardiorespiratory fitness, screen time, psychological well-being, and cognition all together have an impact on academic achievement, with differences by sex. Previous studies have demonstrated the separate effect of these variables,

however, to date, this is the first study that analyses all together in the same model their impact on academic achievement, by sex. This study shows that in boys cognitive flexibility and screen time impact academic achievement. In girls, cardiorespiratory fitness is highly associated with psychological well-being, and this, in turn, was associated with academic achievement. © The Author(s), under exclusive licence to the International Pediatric Research Foundation, Inc 2024.

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