

Role of Physical Activity and Sedentary Behavior in the Mental Health of Preschoolers, Children and Adolescents: A Systematic Review and Meta-Analysis

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Background: Evidence suggests that participation in physical activity may support young people's current and future mental health. Although previous reviews have examined the relationship between physical activity and a range of mental health outcomes in children and adolescents, due to the large increase in published studies there is a need for an update and quantitative synthesis of effects. **Objectives:** The objectives of this study were to determine the effect of physical activity interventions on mental health outcomes by conducting a systematic review and meta-analysis, and to systematically synthesize the observational evidence (both longitudinal and cross-sectional

studies) regarding the associations between physical activity and sedentary behavior and mental health in preschoolers (2-5 years of age), children (6-11 years of age) and adolescents (12-18 years of age). Methods: A systematic search of the PubMed and Web of Science electronic databases was performed from January 2013 to April 2018, by two independent researchers. Meta-analyses were performed to examine the effect of physical activity on mental health outcomes in randomized controlled trials (RCTs) and non-RCTs (i.e. quasi-experimental studies). A narrative synthesis of observational studies was conducted. Studies were included if they included physical activity or sedentary behavior data and at least one psychological ill-being (i.e. depression, anxiety, stress or negative affect) or psychological well-being (i.e. self-esteem, self-concept, self-efficacy, self-image, positive affect, optimism, happiness and satisfaction with life) outcome in preschoolers, children or adolescents. Results: A total of 114 original articles met all the eligibility criteria and were included in the review (4 RCTs, 14 non-RCTs, 28 prospective longitudinal studies and 68 cross-sectional studies). Of the 18 intervention studies, 12 (3 RCTs and 9 non-RCTs) were included in the meta-analysis. There was a small but significant overall effect of physical activity on mental health in children and adolescents aged 6-18 years (effect size 0.173, 95% confidence interval 0.106-0.239, $p < 0.001$, percentage of total variability attributed to between-study heterogeneity $[I^2] = 11.3\%$). When the analyses were performed separately for children and adolescents, the results were significant for adolescents but not for children. Longitudinal and cross-sectional studies demonstrated significant associations between physical activity and lower levels of psychological ill-being (i.e. depression, stress, negative affect, and total psychological distress) and greater psychological well-being (i.e. self-image, satisfaction with life and happiness, and psychological well-being). Furthermore, significant associations were found between greater amounts of sedentary behavior and both increased psychological ill-being (i.e. depression) and lower psychological well-being (i.e. satisfaction with life and happiness) in children and adolescents. Evidence on preschoolers was nearly non-existent. Conclusions: Findings from the meta-analysis suggest that physical activity interventions can improve adolescents' mental health, but additional studies are

needed to confirm the effects of physical activity on children's mental health. Findings from observational studies suggest that promoting physical activity and decreasing sedentary behavior might protect mental health in children and adolescents. PROSPERO Registration Number:

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