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ADOLESCENT MENTAL HEALTH AND PHYSICAL ACTIVITY

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Abstract: *Mental health is an invaluable resource for personal development and social functioning. Mental health is a priority for successful physical, social, intellectual and emotional development. Mental health problems have a significant impact on the emotional stability and subjective well-being of adolescents. Many factors have a relevant impact on the mental health of adolescents, and the most influential factor is physical activity. The aim of this paper was to investigate the relationship between physical activity and the mental health of adolescents by reviewing the available literature. In March 2025, two authors searched professional and scientific papers published in relevant electronic databases according to predetermined criteria. Twenty papers were reviewed using the keywords "adolescents", "physical activity", "mental health" and "mental disorders" in relevant databases (Scopus, PubMed, PsycInfo and SportDiscuss). The research included nine papers. Papers older than five years that did not study the relationship between physical activity and adolescent mental health, nor were they published in their entirety in English, were excluded. Mental health conditions have negative and positive psychological responses. Negative is associated with unpleasant emotions, and positive with psychological well-being useful for life. Adolescents are often accompanied by mental health problems, and reduced physical activity increases the prevalence of these problems. Physical activity is a beneficial mechanism that improves physical health and has a positive effect on mental health, interpersonal skills, cognitive function and memory. Various forms of physical activity affect neurochemical mechanisms, improve mood and motivation and activate natural antidepressants. The literature confirms the significant impact of physical activity on better sleep quality, emotional control, and reduction of stress, symptoms of depression and anxiety. This review showed a significant positive correlation of physical activity with adolescent mental health and highlighted physical activity as a useful intervention for the prevention of mental health problems.*

Keywords: *adolescents, mental health, mental disorders, physical activity*

Introduction

Mental health is "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community" [1]. Mental health in adolescence is an invaluable resource for physical, social, intellectual, emotional development and social functioning [2]. This important period of growing up is accompanied by ambiguity, exploration of identity and life path, physical, emotional and social changes [2,3]. Many adolescents are susceptible to negative social effects and health repercussions and are particularly vulnerable to mental health problems [2,4]. One in seven adolescents aged 10 to 19 years has mental health problems, which accounts for 15% of the global burden of disease in this age group, and the most common problems are depression, anxiety and behavioral disorders are among the leading causes [2]. In Serbia, 4.1% of adolescents have symptoms of depression, 10.8% report a bad mood, and 21.9% feel nervous once a week. Mental health (MH) problems represent a major challenge, and are linked to academic pressure, social media, family dynamics, and socioeconomic conditions [5-7]. In the prevention and treatment of mental health problems international organizations and scientific literature support lifestyle management strategies and highlight physical activity as an effective intervention [8,9].

Physical activity (PA) functions as a social support system, reduces unproductive thoughts, daily worries, feelings of loneliness, facilitates socialization, encourages social connection, increases self-esteem, improves individual coping strategies and is an effective mechanism for alleviating stress, anxiety and depression symptoms [10,11]. Evidence shows a relevant impact of physical activity in reducing adolescent mental disorders. This work aimed to investigate the relationship between physical activity and adolescent mental health.

Material and method

The study used a scientific literature review methodology and included a review of papers published in relevant databases: Scopus, PubMed, PsycInfo and SportDiscuss that studied the impact of physical activity on adolescent mental health. In March 2025, two researchers searched scientific publications published from 2019 to 2024 in peer-reviewed journals according to pre-defined criteria. Using the keywords "adolescents", "physical activity", "mental health" and "mental disorders", the researchers reviewed twenty papers.

Inclusion criteria were peer-reviewed papers, published in English in their entirety, from 2019 to 2024, that studied the association between physical activity and mental health in adolescents. Publications that did not study the relationship between physical activity and adolescent mental health, non-reviewed publications, publications older than 2019, and publications that were not published entirely in English were excluded from the research.

Results

A search and detailed analysis of the reviewed papers included nine papers that met all inclusion criteria in this study. Two cross-sectional studies, two experimental studies, two systematic reviews, one multicenter, one cohort, and one experimental study were included.

A cross-sectional study conducted in Ireland investigated the relationship of physical activity with positive mental health and mental health problems in 8636 adolescents aged 10-17 years. The sample was classified into three age groups (10–11 years, 12–14 years and 15–17 years), 53% were girls. Mental health was assessed with the Well-Being Questionnaire (WHO-5), the Mental Health Inventory (MHI-5) and the Short Health Scale (SF-36). In the first group in both sexes, mental health and level of physical activity were similar, but there were significant differences in mental health ($p<0.01$) in the older age group and a lower level of PA among girls in the third group ($p < 0.001$). Boys and younger adolescents with moderate, intense and strong levels of PA showed more positive outcomes of MH, especially in life satisfaction and well-being compared to girls and older adolescents who had weak MH. The results showed a positive correlation of moderate PA with life satisfaction and well-being ($p< 0.001$) and highlighted PA as a strong predictor of MH in girls. The weakest correlation was between intensive PA activity and well-being in 10–11-year-olds ($r = -0.07$; $p < 0.05$). The highest correlation between intense PA compared to moderate PA and MH outcomes was in 15-17-year-olds. The research showed PA as a strong predictor of positive outcomes of MH of girls, and highlighted intensive PA as an effective method of improving positive MH of adolescents [12].

A multicenter study by Åvitsland et al. conducted in 2017 assessed the association between health components (physical fitness, body composition, muscle strength, and cardiorespiratory fitness) and mental health in 1486 adolescents, predominantly girls (50.6%) with an average age of 13.9 years. Mental health was assessed using the Strengths and Difficulties Questionnaire, cardiorespiratory fitness was assessed using running, muscle strength was assessed using grip strength, abdominal muscle strength, and standing long jump, and body composition was assessed using body mass index. The results of the study showed that body composition was not associated with psychological difficulties, muscle strength was independently associated, but cardiorespiratory fitness was associated with psychological difficulties [13].

In 2024, Wu et al. examined the correlation between mental health and the positive impact of sports on 60 adolescents. Over the course of eight weeks, 30 participants were followed in each group, divided into two groups: an experimental group with sports interventions and a control group without interventions. The level of mental health was assessed using the Self-Reported Symptom Scale (SCL-90), which examined nine factors (anxiety, affective disorders, interpersonal communication, compulsion, depression, hostility, stress, paranoia, and psychosis). The experiment showed a decrease in test scores in the intervention group, while there were no significant changes in the control group. The intervention group had significantly better results in anxiety, depression, and psychosis, and there were no significant differences in other factors [14].

A cross-sectional study conducted in Colombia among 988 adolescents aged 11-17 years analyzed the association of physical fitness, physical activity, and family aspects with seven indicators of adolescent mental health: stress, depression, anxiety, happiness, quality of life, subjective well-being, and family structure. The study showed a significant, positive impact of physical activity on lower prevalence of depression and anxiety states and a positive association of homogeneous family structure with all indicators of mental health [15].

A cohort study by Chiang et al. examined the association between physical fitness and the risk of mental disorders in two groups of adolescents aged 10 to 11 years. The association of cardiorespiratory fitness, muscular strength, endurance and flexibility with the cumulative incidence of anxiety, depression and attention deficit hyperactivity disorder (ADHD) was examined. Muscular endurance was associated with a reduced risk of depression and ADHD in females and a lower risk of anxiety and ADHD in males (ADHD risk for females < .001.9%, for males $p < .001$). Better muscular strength was associated with a reduced risk of anxiety and ADHD in females and reduced anxiety, depression and ADHD in males (ADHD risk for females $p = 0.05$, and for males $p = 0.001$). The cumulative incidence of mental disorders was lower in participants with better FA. Improved cardiorespiratory fitness was associated with a reduced risk of anxiety, depression, and ADHD in females and a lower risk of anxiety and ADHD in males. The study highlighted the potential protective role of cardiorespiratory fitness, muscular endurance, and muscular strength in preventing the onset of mental disorders and highlighted FA as a preventive measure for mental disorders in adolescents [16].

During the 2021 coronavirus pandemic, Wright et al. conducted a cross-sectional study among 165 adolescents (100 females and 65 males, ages 13–19). They examined the impact of physical activity as a protective factor for adolescent mental health and well-being using an online questionnaire that assessed perceived prevalence, fear of coronavirus, physical activity, and mental health indicators (stress, anxiety, depression, fatigue, vitality, and perceived health). Regression analysis showed that fear of the virus was a negative predictor, and physical activity was a positive and strong predictor of improved mental health and well-being [17].

A systematic review from 2020. by Pascoe et al., which included sixteen randomized and non-randomized controlled trials, aimed to examine the effect of physical activity on mental health outcomes in adolescents with a diagnosed mental disorder. Eight studies included adolescents with depression, three with psychosis/schizophrenia, three with eating disorders, and two studies of adolescents with anxiety. The review found significant benefits of moderate-to-vigorous intensity exercise and a positive impact on reducing various mental disorders, especially depression [19].

In 2021, Bowen et al. conducted a systematic review and meta-analysis of 58 publications to investigate the association between physical activity and youth mental health, i.e. negative and positive psychological reactions during the COVID-19 pandemic. Results showed that greater participation in FA was strongly associated with fewer negative psychological reactions (anxiety, depression, stress, insomnia,

fatigue, and mental health problems) and more positive psychological reactions such as general well-being and positive energy [20].

A systematic literature review conducted by Li et al. in 2024 in PubMed, PsycINFO, Web of Science, and Scopus databases investigated how physical activity can serve as an intervention to help adolescents manage psychological stress and prevent mental health problems, and included 61 publications. The review identified several studies that highlight the positive effects of various forms of physical activity on adolescent mental health.

Discussion

This review investigated the relationship between physical activity and adolescent mental health using evidence from the literature published in the last five years. It included nine studies in which physical activity was delivered through a variety of programs: sports activities, aerobic exercise, and high-intensity training. Our results showed that different physical activity interventions can influence subjective well-being, self-esteem, quality of life, and improve adolescent mental health.

Mental health conditions have both negative and positive psychological responses. A negative response is associated with unpleasant emotions and symptoms associated with a clinically diagnosed illness, and a positive response is associated with affective state and psychological well-being [21]. Reduced physical activity is associated with negative responses such as anxiety, depression, stress, negative affect, and distress, while increased physical activity influences positive outcomes such as emotional well-being, self-esteem and self-concept [22,23]. Regular physical activity is important for promoting and protecting adolescent mental health, as it can prevent and manage negative psychological responses [24]. Appropriate physical activity preserves physical strength, energy, strengthens intellectual functions, and promotes and improves adolescent mental health [14]. Li et al. point out that aerobic exercise improves mood and cognitive function, strength training reduces depressive symptoms and increases self-efficacy, team sports improve social skills and a sense of community, and mind-body exercises manage stress and emotional reactions [25].

The studies included in our study have shown the effectiveness of physical activity in reducing anxiety and depressive symptoms. Our study correlates with a 2020 study by Oberste et al., who highlighted FA as an effective method for controlling or avoiding mild to moderate depression in teenagers [26].

Physical activity activates neurochemical mechanisms and releases serotonin, dopamine, and endorphins. Serotonin regulates mood, sleep, memory, and cognitive abilities, and regular physical activity improves mood, sleep quality, and helps address the prevalent challenges faced by people with depression. Dopamine is associated with feelings of pleasure and satisfaction. Elevated dopamine levels result in happiness, bliss, increased motivation, and focus, while endorphins, which are the body's natural analgesics, increase relaxation, satisfaction, and reduce stress [27]. Specific studies have highlighted the health benefits of physical activity in improving symptoms of mild to moderate depression and have yielded comparable results to psychotherapy [28,29]. Carter et al. say that physical activity is a useful approach to

addressing anxiety symptoms in young people, Nasstasia et al. have highlighted aerobic exercise as the main tool for treating adolescents with depression, or depressive symptoms, and Minghetti et al. have given greater priority to high-intensity exercise as a promising effective treatment strategy [30-32].

Conclusion

The review demonstrated physical activity as an effective tool in improving the emotional and physical well-being of adolescents and highlighted the significant, positive correlation of physical activity as a sustainable preventive measure for mental disorders during this crucial period of growth and development.

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Abbreviations

ADHD - Attention deficit hyperactivity disorder
HADS - Hospital Anxiety and Depression Scale
MH - Mental health
MHI-5 - Mental health inventory
PA - Physical activity
SCL-90R - The Symptom Checklist 90
SF-36 - 36-Item Short Form Survey
WHO-5 - Well-being questionnaire (WHO-5)

MENTALNO ZDRAVLJE ADOLESCENATA I FIZIČKA AKTIVNOST

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Sažetak: *Mentalno zdravlje neprocjenjiv je resurs ličnog razvoja i društvenog funkcionisanja. Za uspješan fizički, socijalni, intelektualni i emocionalni razvoj mentalno zdravlje je prioritet. Značajan uticaj na emocionalnu stabilnost i subjektivno blagostanje adolescenata imaju problemi mentalnog zdravlja. Mnogi faktori imaju relevantan uticaj na mentalno zdravlje adolescenata, a najuticajniji faktor je fizička aktivnost. Cilj ovog rada bio je pregledom dostupne literature istražiti vezu između fizičke aktivnosti i mentalnog zdravlja adolescenata. U martu mjesecu 2025. godine dva autora su prema unaprijed utvrđenim kriterijima pretraživala naučne radove objavljene u relevantnim elektronskim bazama podataka. Korišćenjem ključnih riječi „adolescenti", „fizička aktivnost", „mentalno zdravlje" i „mentalni poremećaji" u relevantnim bazama podataka (Scopus, PubMed, PsycInfo i SportDiscuss) pregledano je dvadeset radova. Istraživanje je uključilo devet radova. Radovi stariji od pet godina koji nisu proučavali povezanost fizičke aktivnosti s mentalnim zdravljem adolescenata, niti objavljeni u cijelini na engleskom jeziku su isključeni. Stanja mentalnog zdravlja imaju negativan i pozitivan psihološki odgovor. Negativan je povezana s neugodnim emocijama, a pozitivan sa psihološkim blagostanjem korisnim za život. Adolescenciju često prate problemi mentalnog zdravlja, a nedostatak fizičke aktivnosti povećava zastupljenost ovih problema. Fizička aktivnost koristan je mehanizam koji poboljšava fizičko zdravlje, pozitivno djeluje na mentalno zdravlje, interpersonalne veštine, kognitivne funkcije i pamćenje. Različiti oblici fizičke aktivnosti utiču na neurohemijske mehanizme, poboljšavaju raspoloženje, motivaciju i aktiviraju prirodne antidepresive. Literatura potvrđuje značajan uticaj fizičke aktivnosti na bolji kvalitet sna, emocionalnu kontrolu, smanjenje stresa, simptoma depresije i anksioznosti. Ovaj pregled pokazao je značajnu pozitivnu korelaciju fizičke aktivnosti s mentalnim zdravljem adolescenata i istakao fizičku aktivnost kao korisnu intervenciju u prevenciji problema mentalnog zdravlja.*

Ključne riječi: *adolescenti, mentalno zdravlje, mentalni poremećaji, fizička aktivnost*