

THE ROLE OF PHYSICAL EXERCISE IN REDUCING ADHD SYMPTOMS IN SCHOOL-AGED CHILDREN

ULOGA FIZIČKOG VJEŽBANJA NA SMANJENJE ADHD SINDROMA KOD DJECE ŠKOLSKOG UZRASTA

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Abstract: Attention Deficit Hyperactivity Disorder (ADHD), characterized by developmentally inappropriate levels of attention, hyperactivity, and impulsivity, is considered one of the most common neurodevelopmental disorders in school-aged children. The number of children diagnosed with ADHD is steadily increasing in most developed and developing countries. This disorder often coexists with other neurodevelopmental disorders such as conduct disorder, specific learning disorders, depression, anxiety, and mood disorders. The global prevalence rate of ADHD is over 5%, and it is about three times more common in males than in females. Symptoms of attention deficit and hyperactivity disorder can hinder academic progress. According to numerous studies, physical activity can help alleviate symptoms and enable students to better focus on school and other daily tasks. Therefore, this paper is dedicated to analyzing the positive impacts of organized physical exercise on ADHD syndrome in school-aged children through a review of some key research studies.

Keywords: attention deficit, hyperactivity, school-age, physical exercise

Sažetak: Poremećaj pažnje i hiperaktivnosti (ADHD) koji karakteriše razvojno neodgovarajući nivo pažnje, hiperaktivnost i impulsivnost, smatra se jednim od najčešćih neurorazvojnih poremećaja u školskom uzrastu. Broj djece sa dijagnozom ADHD je u konstantnom porastu u većini razvijenih i zemalja u razvoju. Ovaj poremećaj često ima komorbiditete sa drugim neurorazvojnim poremećajima kao što su poremećaj ponašanja, specifični poremećaji učenja, depresija, anksioznost i poremećaji raspoloženja. Globalna stopa prevalencije ADHD je preko 5% i oko tri puta je češća kod muškaraca nego kod žena. Simptomi poremećaja pažnje i hiperaktivnosti se mogu smatrati ograničenjima za akademski napredak. Prema brojnim istraživanjima fizička aktivnost može pomoći u poboljšanju simptoma i omogućiti učenicima da se bolje fokusiraju na školske i druge svakodnevne obaveze. Iz tog razloga, ovaj rad je posvećen analizi pozitivnih uticaja organizovanog fizičkog vježbanja na ADHD sindrom djece školskog uzrasta kroz pregled nekih referentnih istraživačkih studija.
Ključne riječi: poremećaj pažnje, hiperaktivnost, školski uzrast, fizičko vježbanje

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD), characterized by developmentally inappropriate levels of attention, hyperactivity, and impulsivity, is considered one of the most common psychiatric disorders and the most prevalent neurodevelopmental disorder in childhood (Gapin and Etnier, 2010). This disorder is typically not diagnosable through medical laboratory tests. Diagnosis is primarily based on reports from parents and teachers, given the learning difficulties caused by attention deficits and/or its fluctuations, impulsivity, and anxiety (Rowland et al., 2002).

Attention Deficit Hyperactivity Disorder (ADHD) has a prevalence of approximately 5.5% worldwide (Er-

UVOD

Poremećaj pažnje i hiperaktivnosti (ADHD) koji je karakteriše razvojno neodgovarajući nivo pažnje, hiperaktivnost i impulsivnost, smatra se jednim od najčešćih psihijatrijskih poremećaja i kao najčešći neurorazvojni poremećaj u detinjstvu (Gapin and Etnier, 2010). Ovaj poremećaj se najčešće ne može dijagnostikovati putem medicinskih laboratorijskih testova. Dijagnoza se uglavnom zasniva na izvještajima roditelja i nastavnika, s obzirom na smetnje u učenju zbog nedostatka pažnje i/ili njene fluktuacije, impulsivnosti i anksioznost (Rowland et al., 2002).

Poremećaj deficita pažnje i hiperaktivnosti (ADHD) ima prevalenciju od oko 5,5% širom svijeta (Erskine et

skine et al., 2017). ADHD is characterized by symptoms of inattention or hyperactivity/impulsivity that persist for at least 6 months to a degree that is inconsistent with the child's developmental level, negatively impacting social and academic activities (American Psychiatric Association & DSM Task Force, 2017). ADHD is associated with a higher risk of comorbid mental disorders, substance use disorders, and impairments in social, academic, and professional functioning (Erskine et al., 2016). This disorder negatively affects social, academic, emotional, and psychological functioning, and imposes significant costs on society and the healthcare system. It is estimated that about 60% of children diagnosed with ADHD continue to have the disorder into adulthood (Sibley et al., 2017).

The number of children diagnosed with ADHD is steadily increasing, while the number of children engaging in physical exercise is decreasing, and the number of children being treated for ADHD with stimulant medications is higher than ever (Meppelink, 2016). Children with ADHD are at greater risk of being less physically fit, are more likely to be obese, and typically have lower functional cognitive abilities and comprehension skills, making academic progress more challenging for this group. They display poorer skills in sports activities, have inferior athletic abilities, and exhibit below-average motor performance and physical fitness (Golubović, 2014). Additionally, children with ADHD are characterized by persistent and disruptive patterns of inattention, hyperactivity, and/or impulsivity. The purpose of this study was to determine whether physical activity reduces ADHD symptoms in children and improves other health-related issues associated with this disorder.

METHOD

In this review paper, several studies from the Web of Science (WOS) database were examined, focusing on research results related to the impact of physical exercise on reducing ADHD symptoms in school-age children. After reviewing 86 scientific papers, those involving children and adolescents aged 6-18 years, from primary and/or secondary school, were selected.

Hoza and Smith (2014) conducted a review study indicating the positive effects of organized physical activity on reducing ADHD symptoms in children. Specifically, in this review paper, the authors searched for studies that investigated the impact of physical exercise on children with ADHD, where researchers attempted to determine whether physical activity was more effective in reducing ADHD symptoms in children than sedentary activities. The physical activity programs in this study

al., 2017). ADHD karakterišu simptomi nepažnje ili hiperaktivnosti/impulsivnosti, koji traju najmanje 6 mjeseci do stepena koji nije u skladu sa razvojnim nivoom djeteta, što ima negativan uticaj na društvene i akademske aktivnosti (American Psychiatric Association, & DSM Task Force, 2017). ADHD je povezan sa većim rizikom od komorbidnih mentalnih poremećaja i poremećaja upotrebe supstanci, kao i socijalnih, akademskih i profesionalnih oštećenja (Erskine et al., 2016). Ovaj poremećaj ima negativan uticaj na društveno, akademsko, emocionalno i psihološko funkcionisanje i stvara visoke troškove za društvo i zdravstveni sistem. Smatra se da oko 60% djece sa dijagnozom ADHD ima taj poremećaj i u odrasloj dobi (Sibley et al., 2017).

Broj djece sa dijagnozom ADHD-a je u konstantnom porastu, dok broj djece koja vježbaju opada, a broj djece koja se liječe od ADHD-a stimulativnim lekovima je veći nego ikada (Meppelink, 2016). Djeca sa ADHD-om su u većem riziku da budu manje fizički sposobna, veća je vjerovatnoća da će biti gojazna i obično imaju niže funkcionalne kognitivne sposobnosti i vještine razumevanja, što otežava akademski napredak ovoj grupi djece. Ona pokazuju lošije veštine u sportskim aktivnostima i imaju inferiorne sportske sposobnosti, kao i ispodprosječne motoričke performanse i fizičku spremnost (Golubović, 2014). Pored toga, djecu sa ADHD karakterišu uporni i narušavajući obrasci nepažnje, hiperaktivnosti i/ili impulsivnosti. Svrha ove studije bila je da se utvrdi da li fizička aktivnost smanjuje simptome ADHD-a kod djece i poboljšava druga zdravstvena pitanja povezana sa ovim poremećajem.

METOD RADA

U ovom preglednom radu razmotrene su neke studije iz baze podataka Web of Science (WOS) u kojima su prezentovani rezultati istraživanja uticaja fizičkog vježbanja na umanjene ADHD-simptoma kod djece školskog uzrasta. Nakon razmatranja 86 naučnih radova odabrane su one u kojima u ispitanici bili djeca i adolescenti osnovnoškolskog i/ili srednješkolskog uzrasta od 6-18 godina.

Hoza i Smith, (2014) su sprovedli pregledno istraživanje koje ukazuje na pozitivne efekte organizovane fizičke aktivnosti na umanjene ADHD simptome kod djece. Konkretno, u ovom preglednom radu pomenuti autori su pretraživali izvore za studije koje su se zasnivale na uticaju fizičkog vježbanja na djecu sa ADHD-om u kojima su istraživači pokušali utvrditi da li je fizička aktivnost efikasnija u smanjenju simptoma ADHD-a kod djece od sedentarnih aktivnosti. Programi fizičke aktivnosti u ovoj studiji uključivali su opcije fizičke aktivnosti u zatvorenom i na

included both indoor and outdoor physical activities, such as active games, yoga, guided walks, cycling, and more. The studies analyzed focused on children and/or adolescents aged 6-18 years who had been previously diagnosed with ADHD and were randomly assigned to one of two groups. One group participated in physical activities, while the other engaged in stationary classroom activities, such as art projects. As part of the group equalization process, the groups were balanced by gender, chronological age, and ADHD risk status (Hoza, 2014). The physical activities were selected based on age-appropriate activities and games to maintain participants' interest. At the end of the 12-week study, the two groups were compared to determine which group benefited more from physical activity. The hypothesis was confirmed that the group of children at risk of ADHD experienced statistically greater reductions in ADHD symptoms by participating in physical activity sessions compared to the group involved in sedentary classroom activities.

In his research study, Zang (2019) included 574 participants with ADHD, aged 6-18 years, who took part in an experimental treatment. Two hundred seventy-six (276) participants were assigned to the group that engaged in daily physical activities, while 298 participants were placed in the control group. The results of this analysis showed that levels of anxiety and depression were significantly reduced through physical activity in children with ADHD (MD: -1.84; 95% CI: [-2.65 – (-1.03)], $P = .00001$). Hyperactive/impulsive symptoms (MD: -0.01; 95% CI: [-0.32 – 0.29], $P = .93$) and inattention symptoms (MD: -0.22; 95% CI: [-0.51 – 0.08], $P = .15$) were also reduced through physical exercise, but the results were not statistically significant. This analysis showed that issues with thinking (MD: -3.49; 95% CI: [-5.51 – (-1.47)], $P = .0007$), social problems (MD: -5.08; 95% CI: [-7.34 – (-2.82)], $P = .0001$), and aggressive behavior (MD: -3.90; 95% CI: [-7.10 – (-0.70)], $P = .02$) were significantly reduced in participants with ADHD who were part of the physical activity program group. The results of this study indicate that the effects of physical exercise contribute to reducing anxiety, depression, and aggressive behavior, while also improving socialization skills in children with ADHD. Therefore, based on the results obtained in this study, the author concludes that physical exercise should be significantly more integrated into the daily lives of children with ADHD.

Seven key studies were conducted to assess the effects of aerobic exercise in children with ADHD (Tantillo et al., 2002; Mackune et al., 2003; Kang et al., 2011; Chang et al., 2012; Verret et al., 2012; Pontifex et al.,

otvorenom prostoru, uključujući aktivne igre, jogu, šetnje sa vodičem, vožnju bicikla, i sl. Analizirane su studije fokusirane na djecu i/ili adolescente uzrasta od 6-18 godina kojima je prethodno dijagnostikovano ADHD poremećaj i nasumično su odabrani i raspoređeni u jednu od dvije grupe. Jedna grupa je učestvovala u fizičkim aktivnostima, a druga u sedentarnim aktivnostima u učionici, kao što su umjetnički projekti. Kao dio procesa ujednačavanja grupa, grupe su uravnotežene po polu, hronološkom uzrastu i statusu rizika od ADHD (Hoza, 2014). Fizička aktivnost je odabrana u skladu sa aktivnostima i igrama prilagođenim uzrastu kako bi se održao interes učesnika. Na kraju studije, koja je trajala 12 nedelja, dvije grupe su upoređene da bi se utvrdilo koja grupa je imala veće koristi od fizičke aktivnosti. Potvrđena je hipoteza da je grupa djece sa rizikom od ADHD imala statistički veće efekte u smanjenju simptoma ADHD učešćem u sesijama fizičke aktivnosti u poređenju sa grupom koja je učestvovala u sedentarnim aktivnostima u učionici.

U svojoj istraživačkoj studiji Zang (2019) je obuhvatio 574 učesnika sa ADHD poremećajem uzrasta od 6-18 godina koji su učestvovali u eksperimentalnom tretmanu. Dvije stotine sedamdeset šest (276) učesnika je raspoređeno u grupu koja je svakodnevno upražnjavala fizičke aktivnosti, dok je 298 učesnika raspoređeno u kontrolnoj grupi. Rezultati ove analize su pokazali da su nivo anksioznosti i stanje depresije značajno umanjene fizičkom aktivnošću kod djece sa ADHD sindromom. (VMD: -1,84; 95% CI: [-2,65 – (-1,03)], $P = .00001$). Hiperaktivni/impulsivni simptomi (VMD: -0,01; 95% CI: [-0,32 – 0,29], $P = .93$) i simptomi nepažnje (VMD: -0,22; 95% CI: [-0,51 – 0,08], $P = .15$) takođe su umanjeni fizičkim vježbanjem ali rezultati nisu bili statistički značajni. Ova analiza pokazala je da su problemi u razmišljanju (VMD: -3,49; 95% CI: [-5,51 – (-1,47)], $P = .0007$), socijalni problemi (VMD: -5,08; 95% CI: [-7,34 – (-2,82)], $P = .0001$), i agresivno ponašanje (OMU: -3,90; 95% CI: [-7,10 – (-0,70)], $P = .02$) značajno umanjeni kod učesnika sa ADHD poremećajem koji su pripadali grupi koja je uključena u program fizičkih aktivnosti. Rezultati dobijeni u ovoj studiji ukazuju na efekte fizičkog vežbanja koji doprinose umanjenju stanja anksioznosti, depresije i agresivnog ponašanja, a doprinosi razvijanju sposobnosti socijalizacije kod djece koja pate od ADHD poremećaja. Stoga, prema dobijenim rezultatima u ovoj studiji, autor zaključuje da fizičke vježbe treba da budu znatno više uključene u svakodnevni život djece sa ADHD poremećajem.

Sedam referentnih studija je realizovano u cilju procjene efekata aerobnog vježbanja kod djece sa ADHD sindromom (Tantillo et al., 2002; Mackune et al., 2003; Kang

2013; Choi et al., 2015). The inclusion criteria were as follows: children and/or adolescents aged 6–18 years with a confirmed diagnosis of ADHD. Studies were selected that evaluated ADHD symptoms, considering primary outcomes such as inattention, hyperactivity, and impulsivity, and secondary outcomes associated with ADHD symptoms, such as anxiety, socialization disorders, and cognitive abilities. The average duration of the aerobic exercise program (running, obstacle course, exercises with music) was about 5 weeks; the average session length was 50 minutes, with an average exercise frequency of two to three times per week. Intensity was monitored using a heart rate monitor. The intensity ranges were similar: 50–75% of maximum heart rate. The results of these studies suggest that physical exercise is effective as an supplementary therapy to prescribed pharmacological treatments for reducing behavioral disorders that interfere with learning and academic performance. This is significant even for children and adolescents who do not respond to pharmacological treatment or who seek alternative treatments (Gapin et al., 2011; Archer & Kostrzewa, 2012). As shown in this research, physical exercise programs reduce ADHD symptoms and have better long-term outcomes for children and adolescents (Bervid & Halperin, 2012).

Montava et al. (2022) published a comprehensive review aimed at analyzing the effects of physical activity, exercise, and sports on executive function in children and adolescents diagnosed with ADHD, through an examination of the results from relevant research studies in this field. This paper reviewed studies from the Web of Science (WOS) database published up to August 2021, focusing on research involving children and adolescents aged 6 to 18 years with a diagnosis of ADHD. The exclusion criteria included participants younger than 6 years and older than 18 years, as well as subjects who were athletes or had a diagnosis of another disorder. The results presented in this study indicate significant effects of physical activity in reducing symptoms of ADHD and the potential for improving the quality of life for children and adolescents with ADHD syndrome.

Christiansen et al. (2019) demonstrated in their review study that moderate to intense aerobic exercise improves attention control functions in children with ADHD, based on the findings of the following research:

Heier et al. (2017) obtained results in their study indicating that organized exercise can be beneficial for behavior management, establishing better socio-emotional skills, and enhancing cognitive functions. Research by Urbin et al. (2015) suggests that physical exercise posi-

et al., 2011; Chang et al., 2012; Verret et al., 2012; Pontifek et al., 2013; Choi et al. 2015). Kriterijumi za ukljućivanje su bili sledeći: deca i/ili adolescenti uzrasta 6–18 godina sa ustanovljenom dijagnozom ADHD. Izabrane su studije koje procjenjuju simptome ADHD-a, uzimajući u obzir primarne ishode, kao što su nepažnja, hiperaktivnost i impulsivnost i sekundarne ishode sa simptomima ADHD kao što su anksioznost, poremećaji socijalizacije i kognitivne sposobnosti. Prosječno trajanje programa aerobnog vježbanja (trćanje, savladavanje poligona, vježbe uz muziku) je bilo oko 5 nedelja; srednje trajanje sesija je bilo 50 min, sa prosječnom učestalosti programa vježbanja od dva do tri puta nedeljno. Intenzitet je praćen monitorom srćane frekvencije. Opsezi intenziteta su bili slični: 50–75% od maksimalnog broja otkucaja srca. Rezultati ovih istraživanja sugerišu da fizićko vježbanje efikasano i kao dopunska terapija uz već propisanu farmakološku terapiju za smanjenje poremećaja ponašanja koja ometaju ućenje i akademski učinak. Ovo je znaćajno čak i za djecu i adolescente koja ne reaguju na farmakološko lijećenje ili koji traće alternativne tretmane (Gapin et al., 2011; Archer & Kostrzeva, 2012). Kao što je pokazano u ovom istraživanju, programi fizićkog vježbanja umanjuju ADHD simptome i imaju bolje dugoroćne rezultate za djecu i adolescente (Bervid & Halperin, 2012).

Montava et al. (2022) su objavili veoma obuhvatan pregledni rad koji ima za cilj da analizira efekte fizićke aktivnosti, vježbanja i sporta na izvršnu funkciju kod djece i adolescenata sa dijagnozom ADHD kroz pregled rezultata referentnih istraživanja u ovoj oblasti. U ovom radu su analizirane neke studije iz baze Web of Science (WOS) koje su objavljene do avgusta 2021. godine i oduhvatale su rezultate istraživanja sprovedenih na djeci i adolescentima od 6 do 18 godina starosti sa dijagnozom ADHD. Kriterijumi iskljućenja bili su ispitanici mlađi od 6 godina i stariji od 18 godina zatim subjekti koji su bili sportisti, ili subjekti sa dijagnozom drugog poremećaja. Rezultati koji su predstavljeni u ovom istraživanju ukazuju na veoma znaćajne efekte fizićke aktivnosti na umanjeње simptoma ADHD poremećaja i mogućnosti poboljšanja kvaliteta života djece i adolescenata koji imaju ADHD sindrom.

Christiansen et al. (2019) su u svom preglednom istraživanju pokazali da umjereno do intenzivno aerobno vježbanje omogućava poboljšanje funkcija kontrole pažnje kod djece sa ADHD sindromom kroz rezultate sljedećih istraživanja:

Heier et al., (2017) su u svom istraživanju dobili rezultate koji ukazuju da organizovano vježbanje može biti korisno za kontrolu ponašanja, uspostavljanje boljih socio-emocionalnih vještina i razvijanje kognitivnih funk-

tively impacts cognitive abilities and behavior management in children with ADHD. Furthermore, they confirmed improvements in neurobehavioral functions that facilitate a reduction in impulsivity and hyperactivity, as well as enhancements in attention and executive functions. In addition, physical exercise programs contributed to a decrease in behavioral problems caused by ADHD syndrome and fostered better relationships between parents and children (Chan et al., 2018). Results from the research conducted by Wigal et al. (2019) confirm that the neurophysiological effects induced by physical activity counteract the pathological effects caused by ADHD, thereby emphasizing the need for significantly greater inclusion of physical activity in organized programs aimed at reducing symptoms of this disorder in children.

The findings of these studies indicate positive effects of physical exercise on the reduction of attention/hyperactivity disorders (ADHD) in children with this syndrome. However, studies analyzing the effects of various types of physical activities on children with this disorder have been quite rare.

Dong et al. (2023) conducted a study analyzing the effects of different types of physical activity on children with ADHD syndrome. In this study, motor skills, attention problems, social issues, cognitive flexibility, inhibition overcoming, and working memory were identified as outcome indicators for comparing the effects of different models of physical activities. The authors employed a method of searching databases including PubMed, Embase, and Web of Science, looking for randomized controlled trials on the effects of physical exercise in children with ADHD. The search timeframe extended from the creation of the database until October 2022. A total of 31 studies were included, and the results showed that perceptual-motor training was the most effective in improving motor skills and positively impacting working memory. For attention problems and cognitive flexibility, water-based exercises proved to be the most effective. Riding exercises had the greatest impact on improving social skills, while cognitive-motor training had the most significant effect on overcoming inhibition.

DISCUSSION AND CONCLUSION

The implementation of appropriate physical exercise programs can not only enhance sensory-motor skills but also increase self-confidence and improve communication and social interaction skills in children. Exercise is an important tool for children with ADHD during their developmental stages. Aerobic exercises or perceptual motor training are beneficial for children with this neuro-

cija. Istraživanja Urbin et al., (2015) upućuju da fizičko vježbanje ima pozitivan uticaj na kognitivni sposobnosti i upravljanje ponašanjem kod djece sa ADHD poremećajem. Pored toga, oni su u svom istraživanju potvrdili poboljšanja neurobihejvioralnih funkcija što omogućava smanjenje impulsivnosti i hiperaktivnosti, poboljšanje pažnje i izvršnih funkcija. Osim navedenog, programi fizičkog vježbanja omogućili su smanjenje simptoma poremećaja ponašanja prouzrokovanih ADHD sindromom i razvijanje boljih veza između roditelja i djece (Chan et al., 2018). Rezultati istraživanja (Wigal et al., 2019) potvrđuju da su neurofiziološki efekti izazvani fizičkom aktivnošću suprotni patološkim efektima izazvanim ADHD-om, pa fizička aktivnost treba da bude u znatno većoj mjeri zastupljena u organizovanim programima usmjerenim na smanjenje simptoma ovog poremećaja kod djece.

Rezultati navedenih istraživanja su ukazali na pozitivne efekte fizičkog vježbanja na umanjenje poremećaja pažnje/hiperaktivnosti (ADHD) kod djece sa ovim sindromom. Međutim, veoma rijetke su bile studije u kojima su analizirani efekti raznih vrsta fizičkih aktivnosti na djecu sa ovim poremećajem.

Dong et al., (2023) su realizovali studiju u kojoj su analizirati efekte različitih vrsta fizičke aktivnosti na djecu sa ADHD sindromom. U ovoj studiji, motoričke sposobnosti, problemi sa pažnjom, socijalni problemi, kognitivna fleksibilnost, prevazilaženje inhibicije i radna memorija su određeni kao indikatori ishoda za upoređivanje efekata različitih modela fizičkih aktivnosti. Autori ove studije su primijenili metodu pretraživanja baza podataka PubMed, Embase i Web of Science u kojima su tražili randomizovana kontrolisana ispitivanja o efektima fizičkog vježbanja kod djece sa ADHD sindromom. Vremenski okvir pretrage je bio od kreiranje baze podataka do oktobra 2022. godine. Uključena je ukupno 31 studija, a rezultati su to pokazali da je perceptivno-motorički trening bio najefikasniji u pogledu poboljšanja motoričkih sposobnosti i pozitivnog uticaja na radnu memoriju. Za probleme sa pažnjom i kognitivnu fleksibilnost kao najefikasnije su se pokazale vežbe u vodi. Najveći uticaj na poboljšanje socijalnih vještina je imalo vježbanje jahanja. Za prevazilaženje inhibicije najveći uticaj je imao kognitivno-motorički trening.

DISKUSIJA I ZAKLJUČAK

Primjena odgovarajućih programa fizičkog vježbanja ne samo da može povećati senzomotoričke vještine, već i povećati samopouzdanje i poboljšati vještine komunikacije i socijalne interakcije kod djece. Vježbanje je važno sredstvo za djecu sa ADHD poremećajem u fazi razvoja. Aerobne vežbe ili perceptivni motorički trening

developmental disorder. Both short-term and long-term exercises can improve blood flow to the brain, increase attention levels and information processing capacity, reduce impulsivity, and enhance inhibitory control, thereby improving interpersonal relationships. When it comes to selecting exercises, planned and combined exercise courses should be chosen, with content emphasizing the intensity of exercise and perceptual motor activities combined with cognitive tasks (such as motor planning skills). This approach can effectively enhance the perceptual and cognitive functions of children with this disorder. Furthermore, the benefits of physical exercise in ADHD therapy include low costs, easy implementation, absence of side effects, active patient involvement with improved cooperation, non-invasiveness, as well as additional psychological and physiological benefits. However, while the results of available studies on moderate-intensity aerobic exercise indicate a reduction in ADHD symptoms in children, other modalities and intensities of exercise, as well as effects in adults, have not been sufficiently researched. Additionally, the results of this systematic review and meta-analysis should be interpreted with caution due to the small number of studies and the heterogeneity of the samples included, as well as the different criteria for establishing the presence of ADHD in school-aged children. Given the significance of this issue for society as a whole and the quality of life of individuals with this disorder, more studies involving a larger number of participants are needed to obtain consistent and relevant results applicable in practice. Existing results should initiate further well-designed randomized controlled trials examining physical exercise as an additional or standalone therapy for individuals with ADHD syndrome.

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su korisni za decu sa ovim neurorazvojnim poremećajem. I jednokratne i dugotrajne vežbe mogu poboljšati protok krvi u mozgu, povećati nivo pažnje i kapacitet obrade informacija, smanjiti impulsivnost i povećati inhibicionu kontrolu, čime se poboljšavaju međuljudski odnosi. Kad je u pitanju odabir vježbi, treba izabrati planirane i kombinovane kurseve vježbi, a sadržaj treba da naglasi intenzitet vježbanja i perceptualne motoričke vježbe u kombinaciji sa kognitivnim zadacima (kao što su vještine motoričkog planiranja). Ovaj pristup može efikasno poboljšati perceptualne i kognitivne funkcije djece sa ovim poremećajem. Dalje, prednosti fizičkog vježbanja u terapiji ADHD poremećaja uključuju niske troškove, laku implementaciju, odsustvo nuspojava, aktivnu ulogu pacijenta uz poboljšanu saradnju, neinvazivnost, kao i dodatne psihološke i fiziološke koristi. Međutim, dok rezultati dostupnih istraživanja aerobnog vježbanja umjerenog intenziteta ukazuju na umanjene simptome ADHD-a kod djece, drugi modaliteti i intenziteti vježbanja, kao i efekti kod odraslih, nisu dovoljno istraženi. Takođe, rezultati ovog sistematskog pregleda i metaanalize treba prihvatiti sa oprezom zbog malog broja studija i heterogenost obuhvaćenih uzoraka kao i različitih kriterijuma utvrđivanja prisutnosti ADHD poremećaja kod djece školskog uzrasta. Zbog značaja ovog problema za društvo u cjelini i kvalitet života osoba kod kojih je prisutan ovaj poremećaj potrebno je realizovati više studija kojima će se obuhvatiti veći broj ispitanika da bi se dobili dosljedni i relevantni rezultati primjenjivi u praksi. Postojeći rezultati treba da iniciraju dalje dobro osmišljene randomizovane kontrolisane studije koje ispituju fizičko vježbanje kao pomoćnu ili samostalnu terapiju za osobe sa ADHD sindromom.

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