FACTA UNIVERSITATIS
Series: **Physical Education and Sport**, Vol. 22, No 2, 2024, pp. 105 - 113
https://doi.org/10.22190/FUPES240903010S

Raview paper

THE EFFECTS OF AN ADDITIONAL RECREATIONAL FOOTBALL PROGRAM ON PHYSICAL FITNESS IN CHILDREN – A REVIEW

UDC 796.325-053.2

Stevan Stamenković[1], Ana Lilić[1], Dušan Nikolić[2]

[1]Faculty of Sport and Physical Education, University of Nis, Niš, Serbia
[2]Academy of Vocational Studies South Serbia, Department of High School for Teachers Bujanovac, Bujanovac, Serbia

ORCID iDs: Stevan Stamenković https://orcid.org/0000-0002-3835-4838
Ana Lilić https://orcid.org/0000-0002-7970-4689
Dušan Nikolić N/A

Abstract. *Football is the most popular sport in the world, so it is hardly unexpected that numerous organizations have employed football-related activities to address and raise awareness of health issues globally. Recreational football has shown to be a useful weapon in the fight against childhood obesity prevention and improve physical fitness. The aim of the present study was to provide a review of evidence about muscular fitness demands and cardiorespiratory fitness during recreational football according to the duration and frequency of training interventions in schoolchildren. The literature review adhered to the PRISMA guidelines. A manual database search was also performed using the following key terms, either singly or in combination: 11 for health, physical activity, motor ability, physical fitness. After the study selection, two sets of research studies were chosen according to their content: muscular fitness and cardiorespiratory fitness. The present study's findings supported the theory that the football training and recreation football program would enhance children's physical health in schoolchildren. The study showed that additional recreational football programs influence better results on muscular fitness demands on sprint 20m ($p \leq 0.05$) and Flamingo test ($p \leq 0.05$). Also, there is a statistically significant difference between the experimental group that participated in an additional recreational football program and the control group at the initial and final measurement in Resting HR and Maximal HR parameters. The recreation football is recommended to be included in the syllabus of the schools in all groups to enhance physical well-being and lower the likelihood of acquiring non-communicable diseases.*

Key words: *soccer, school, Yo-Yo: intermittent recovery children's running, blood pressure, heart rate*

Received September 03, 2024 / Accepted 11 October, 2024
Corresponding author: Ana Lilić
Faculty of Sport and Physical Education, University of Niš, Čarnojevićeva 10A, 18000 Niš, Serbia
E-mail analilic93@gmail.com

INTRODUCTION

In the world, there is a substantial correlation between physical inactivity and health issues (Andersen, Mota, & Di Pietro, 2016; World Health Organization, 2018), and many people do not adhere to national physical activity (PA) recommendations (World Health Organization, 2018). According to Skinner, Perrin, Moss, & Skelton (2015) and McMurray & Andersen (2010), obesity and physical inactivity (PI) are linked to all the risks of cardiovascular illnesses, which raises the possibility of premature mortality (Freedman, Mei, Srinivasan, Berenson, 2007). Globally, PI is becoming a bigger danger to public health. As a result, throughout the course of the 42-year examination, the global prevalence of obesity rose by 4.9% for girls and 6.9% for boys, with no sign that most countries will soon reach a plateau (Cvetković, Stojanović, Stojiljković, Nikolić, Scanlan et al., 2018a). It is often recognized that if overweight and obese children do not make the necessary lifestyle changes, such as increasing physical activity and cutting calories, then over half of them will grow up to be obese adults (Freedman, Khan, Serdula, Dietz, Srinivasan et al., 2005). The World Health Organization (WHO) advises kids and teenagers to participate in moderate-to-intense PA, primarily aerobic, for at least 60 minutes a day on average throughout the week (Burtscher, Millet, & Burtscher, 2023).

Based on the available data, school programs offer a significant chance to boost physical activity levels, as kids spend over 50% of their waking hours in school (Cvetković et al., 2018a). Consequently, it is debatable whether regular PE sessions may prevent childhood obesity without adding more physical exercise. The children's major problem with PE courses is the total amount of active time and low average intensity (Kirkham-King, Brusseau, Hannon, Castelli, Hilton et al., 2017). In order to achieve physical activity recommendations, only a tiny percentage of youngsters (boys = 2.9%, girls = 1.8%) are sufficiently active throughout the entire class (Nettlefold, McKay, Warburton, McGuire, Bredin et al., 2011). Considering that time constraints and low motivation are two frequently mentioned obstacles to physical activity, it is evident that children benefit from extra physical activity that addresses these problems, is quick, and engages them. Frequent PA offers major benefits for both physical and mental health, especially in childhood and adolescence (Bangsbo et al., 2016). Few studies find that kids, who are physically active as children, have a higher likelihood of remaining active as adults (Telama, Yang, Laakso, & Viikari, 1997; Malina, 2001a; Malina, 2001b).

Football is the most popular sport in the world, it is hardly unexpected that numerous organizations have employed football-related activities to address and raise awareness of health issues globally (Fuller, Junge, DeCelles, Donald, Jankelowitz et al., 2010). Small-sided games, regardless of the body mass index, degree of fitness, or previous football experience causes high heart rates, a lot of intense actions coupled with high engagement, technical success rates, and training effects in both boys and girls (Bendiksen, et al., 2014; Krustrup, et al., 2014). According to Krustrup et al. (2014), recreational football has shown to be a useful weapon in the fight against childhood obesity prevention. Furthermore, for obese children, this kind of physical activity is a suitable substitute for continuous-practice exercises like jogging, cycling, swimming, or other activities that enhance the cardiorespiratory system over a brief training period (Castagna et al., 2007). Recreational football has positive effects on the development of the cardiorespiratory system as well as body fat reduction and oxidation (Nybo et al., 2010; Krustrup et al., 2010). Recreational football is typified by a lot of twists, hops, and quick sprints that help

players build their bone density and muscle mass (Krustrup, Rollo, Nielsen, & Krustrup, 2007; Andersson, Ekblom, & Krustrup, 2008). Additionally, because recreational football is so widely utilized, has a lot of incentive features, and is simple to use, it should be used to promote health. Hansen, et al. (2021) showed short-term recreational football training is suitable for positive structural and functional cardiovascular adaptations in overweight children. However, the short-term effects of recreational football on physical fitness in overweight and obese children are still unclear. Also, we do not have more information on additional classes on recreational football and its benefits regarding muscular fitness demands and cardiorespiratory fitness in schoolchildren.

In this context, the purpose of the present study was to provide a review of the evidence about muscular fitness demands and cardiorespiratory fitness during recreational football according to the duration and frequency of training interventions in schoolchildren.

METHODS

Study Design

The literature review adhered to the PRISMA guidelines for systematic reviews and meta-analyses (Moher et al., 2009). A literature search was conducted using the following bases: MEDLINE, Google Scholar, PubMed, Scopus, DOAJ. For the collection and review of previous research, the descriptive method was used parallel with the theoretical analysis. The study included “11 for health”, “physical activity”, “motor ability”, “physical fitness” studies closely associated with the physical fitness of schoolchildren who were carefully analyzed and also met all the criteria for selection. The initial literature search identified 67 references which fulfilled some of the criteria of the study. However, 55 were disqualified based on the selection and additional standards (Figure 1). Only studies in which the participants were schoolchildren 9 to 13 years old. The study was limited to research papers published in the period from 2010 to 2023. In addition, to identify further studies with the same or comparable research challenges, the references of every study were examined.

Study selection and data collection

Using the Population, Intervention, Comparator, and Outcome (PICO) criteria (see Table 1), the participants' ages were the most crucial factor in the selection process, and at the same time represented the primary aim. The second requirement for accepting a study was that it was related to football activity and physical fitness. After the study selection, two sets of studies were chosen according to their content: muscular fitness and cardiorespiratory fitness. The frequency was two times per week with a minimum of 45 minutes per session. Also, this research included a study with an experimental design with a minimum of one experimental and control group. Every category is shown in the table separately because it is better visibility.

Table 1 PICO Criteria

Population	Recreational football (schoolchildren)
Intervention	Measuring muscular fitness and cardiorespiratory fitness before and after the recreational football
Comparator	Observational group
Outcome	CMJ: countermovement jump; HJ: Horizontal jump; PB: Postural balance; SLJ: Standing Long Jump; Yo-Yo: intermittent recovery children's running test; AAT: arrowhead agility test; SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate

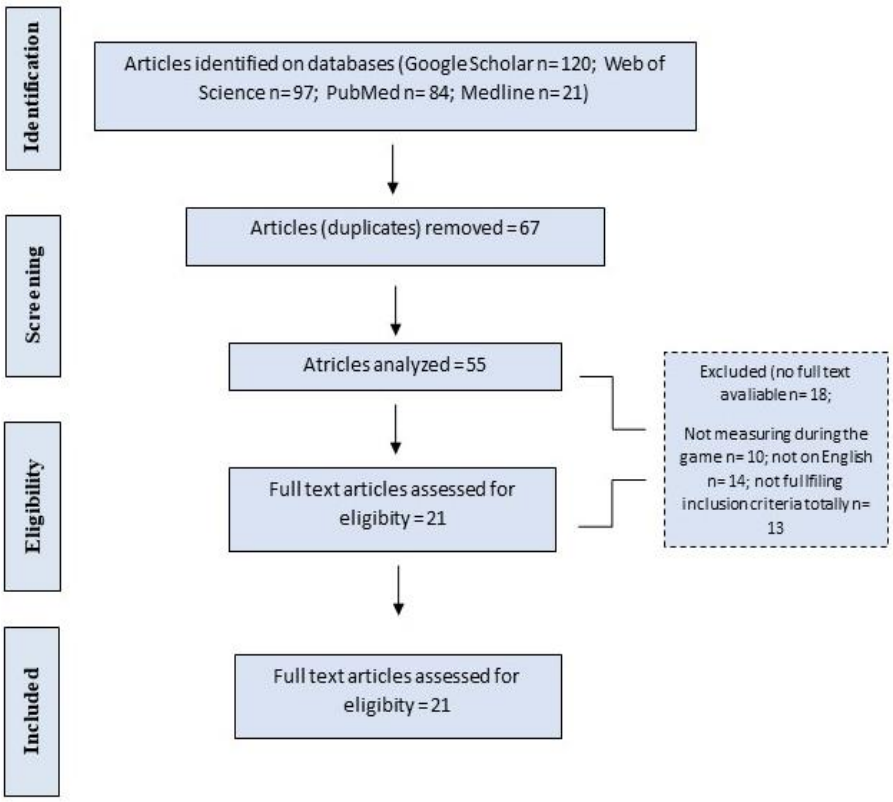

Fig. 1 PRISMA flow chart of article selection process

The collected and analyzed studies are shown in Table 2. Each study is shown with the following parameters: years of research, gender, sample size, muscular fitness (countermovement jump; CMJ with arm swing; standing long jump, Agility, sprint) and cardiorespiratory fitness parameters (intermittent recovery children's running test, systolic blood pressure, diastolic blood pressure, heart rate).

The number of participants varied from study to study so that the minimum number of participants (14) was found in study conducted by (Cvetković et al., 2018a; Cvetković, Stojanović, Stojiljković, Nikolić & Milanović, 2018b) and the largest number of participants (944) in the study conducted by Ørntoft et al. (2016). As for the sample, it could not be

strictly separated into categories of men or women because it mainly included studies involving both sexes.

RESULTS

Table 2 Research findings

Study	Age	Number and sex	Programs	Weeks/ Time per weeks X Minutes	Muscular fitness	Cardio-respiratory fitness	Results
Krustrup et al., 2014	9 to 10	M and F CG = 51 IFG = 46	CG IFG = Play football	10/2x45		Resting HR, SBP, DBP	SBP = ↔, DBP = ↔, Resting HR = ↔
Ørntoft et al., 2016	11	M and F CG = 140 IFG = 386	CG IFG = Play football (11 for Health)	11/2x60	Sprint 20m, Flamingo, HJ	YoYo, Resting HR, SBP, DBP	Sprint 20m[a] = ↓, Flamingo[a] = ↑, YoYo[a] = ↑, SBP[b] = ↓, DBP[b] = ↓
Skoradal et al., 2018	10 to 12	M and F CG = 100 IFG = 292	CG IFG = Play football	11/ 2x45	HJ; PB	YoYo; Resting HR, SBP, DBP	HJ[a] = IFG↑ vs CG↓ PB[a] = IFG↑ vs CG↓ YoYo ↔ Resting HR ↔ SBP[a] = IFG↓ vs CG↑ DBP ↔
Cvetković et al., 2018a	11 to 13	M CG = 14 IFG = 14 HIIT = 14	CG IFG = Play football HIIT = Work/rest = 100:0% MAS	12/3x60	CMJ; T-test; Sit and reach	YoYo; Resting HR, Maximal HR, SBP, DBP	Resting HR[a] = IFG, HIIT↓vs CG ↑, Maximal HR[a] = IFG, HIIT↓vs CG ↓; YoYo [b] = IFG, HIIT↑vs CG ↔; T-test[b] = IFG, HIIT↑vs CG ↔
Cvetković et al., 2018b	11 to 13	M CG = 14 IFG = 14 HIIT = 14	CG IFG = Play football HIIT = Work/rest = 100:0% MAS	12/3x60	CMJ; Sprint 10m and 30m		CMJ = IFG, HIIT↔vs CG ↔, Sprint 10m and 30m = IFG, HIIT↔vs CG ↔
Ryom et al., 2021	10 to 12	M and F CG = 178 IFG = 944	CG IFG = Play football (11 for Health)	11/2x45	SLJ; Balance	YoYo, Resting HR, SBP, DBP	SLJ = ↔, Balance = ↔, YoYo[a] = ↑, Resting HR = ↔, SBP = ↔, DBP = ↔
Larsen et al., 2023	10 to 12	M and F CG = 47 IFG = 61	CG IFG = Play football (11 for Health)	11/2x45	SLJ; PB		PB[a] = IFG↑ vs CG↓ SLJ = ↔
Lilic et al., 2023	9 to 11	M and F IFG = 39	IFG = Play football (11 for Health)	11/2x45	Sprint 20m, AAT, SLJ, Balance	YoYo	Sprint 20m[b] = ↓, AAT[b] = ↓, SLJ[b] = ↑, Balance = ↔, YoYo = ↔

Legend: CG: Control group; IFG: Intervention football group; MAS: Maximal aerobic speed; CMJ: countermovement jump; HJ: Horizontal jump; PB: Postural balance; SLJ: Standing Long Jump; Yo-Yo: intermittent recovery children's running test; AAT: arrowhead agility test; SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate; [a] = Significant between-group difference; [b] = Significant between initial and final; ↔ = there are no significant differences; ↑ = values are higher; ↓ = values are smaller;

DISCUSSION

This study aimed to provide a review of evidence about muscular fitness demands and cardiorespiratory fitness during recreational football according to the duration and frequency of training interventions in schoolchildren. In their study, Ørntoft et al. (2016) showed that additional recreational football programs influence better results on muscular fitness demands on the 20m sprint ($p \leq 0.05$) and the Flamingo test ($p \leq 0.05$). Similar results indicated (Cvetković et al., 2018a) that children were better on only the T-test between the initial and final results, but there were no differences between groups. Meanwhile, Cvetković et al. (2018b) showed that additional recreational football or additional HIIT training did not show significant effects on muscular fitness demands. From the presented studies (Ørntoft et al., 2016; Cvetković et al., 2018a; Cvetković et al., 2018b) it can be seen that there are discrepancies in the results. Although the programs had a greater volume (60 minutes per session) and frequency (3 times per week) of programs, there were still no significant changes in muscular fitness demands.

On the other hand, when we talk about cardiorespiratory fitness during recreational football, Ørntoft et al. (2016) showed that an additional program of recreational football has a positive effect on cardiorespiratory fitness. In the endurance test (yo-yo) there are significant differences between the groups at the final test ($p \leq 0.05$), while the SBP and DBP values were lower in the experimental group at the initial measurement. Similar results were also obtained by Cvetković et al. (2018a), where there is a statistically significant difference between the experimental group that participated in an additional recreational football program and the control group at the initial and final measurement in Resting HR and Maximal HR parameters. Krustrup et al. (2017) explained recreational football is superior to other forms of exercise in lowering DBP through improved muscle capillarization, decreased arterial stiffness, and increased cardiac relaxation time. In addition, short-term recreational football intervention was related to increased left ventricular posterior wall diameter, isovolumetric relaxation time, and tricuspid annular plane systolic excursion in overweight and obese children (Hansen et al., 2013). Based on the works that had a greater volume and frequency of programs in their content, we can see that this type of program has an easier effect on cardiorespiratory fitness.

Studies with a standard additional protocol 2 times per week and 45 minutes per session also had different results on muscular and cardiorespiratory fitness. Skoradal et al. (2018) results showed that muscular fitness demands indicated statistically significant differences between groups in the initial and final results on the horizontal jump ($p \leq 0.05$) and postural balance ($p \leq 0.05$). However, cardiorespiratory fitness parameters did not have statistical differences except in systolic blood pressure. Improved postural balance could have resulted from adaptive changes in the somatosensory system and stronger bone and muscle in the lower limbs (Jakobsen, Sundstrup, Krustrup, & Aagaard, 2011; Helge et al., 2010). Similar results (Ryom et al., 2021) showed no statistical differences between groups for muscular fitness. In cardiorespiratory fitness parameters, they displayed differences only in the intermittent recovery children's running test ($p \leq 0.05$) in favor of improving the results of the experimental group. Studies have shown that high-intensity football training is associated with aerobic intermittent high-intensity exercise capacity, and that high-intensity training can be efficient at improving aerobic exercise in adolescents and adults (Póvoas et al., 2016; Hansen et al., 2013; Krustrup, Dvorak, & Bangsbo, 2016). Larsen et al. (2023) studied only muscular fitness demands

and they showed that postural balance indicated differences between groups ($p \leq 0.05$) but not in the standing long jump. Muscular fitness demands in the study of Lilic et al. (2023) indicated statistical differences only between initial and final testing, but not in groups. They showed that children improved and the results were better at the final testing than initial. Krustrup et al. (2014), who only studied cardiorespiratory fitness parameters, showed that there were no differences between the groups. There are several limitations that needs to be acknowledged. Firstly, the small number of studies should be noted, since including large number of studies could enable the generalisation of the results. Furthermore, the vast heterogeneity of the outcome variables prevented us from performing a meta-analysis.

CONCLUSION

In summary, the present study's findings supported the theory that the recreation football program would enhance children's physical health in schoolchildren. Although we studied the differences according to the duration and frequency of training interventions in schoolchildren, researchers showed significant differences and improved muscular fitness demands and cardiorespiratory fitness in children with additional recreation programs, regardless of the duration and frequency of the program. Therefore, this kind of training with recreational football is recommended to be included in the syllabus of the schools in all groups to enhance physical well-being and lower the likelihood of acquiring non-communicable diseases. Future studies should include more tests and more participation because some studies showed discrepancies in the results.

REFERENCES

Andersen, L. B., Mota, J., & Di Pietro, L. (2016). Update on the global pandemic of physical inactivity. *The Lancet*, 388(10051), 1255-1256.

Andersson, H., Ekblom, B., & Krustrup, P. (2008). Elite football on artificial turf versus natural grass: movement patterns, technical standards, and player impressions. *Journal of Sports Sciences*, 26(2), 113-122.

Bangsbo, J., Krustrup, P., Duda, J., Hillman, C., Andersen, L. B., Weiss, M., et al. (2016). The Copenhagen Consensus Conference 2016: children, youth, and physical activity in schools and during leisure time. *British Journal of Sports Medicine*, *50*(19), 1177-1178.

Bendiksen, M., Williams, C. A., Hornstrup, T., Clausen, H., Kloppenborg, J., Shumikhin, D., et al. (2014). Heart rate response and fitness effects of various types of physical education for 8-to 9-year-old schoolchildren. *European Journal of Sport Science*, *14*(8), 861-869.

Burtscher, J., Millet, G. P., & Burtscher, M. (2023). Pushing the Limits of Strength Training. *American Journal of Preventive Medicine*, 64(1), 145-146.

Castagna, C., Belardinelli, R., Impellizzeri, F. M., Abt, G. A., Coutts, A. J., & D'Ottavio, S. (2007). Cardiovascular responses during recreational 5-a-side indoor-soccer. *Journal of Science and Medicine in Sport*, 10(2), 89-95.

Cvetković, N., Stojanović, E., Stojiljković, N., Nikolić, D., & Milanović, Z. (2018b). Effects of a 12 week recreational football and high-intensity interval training on physical fitness in overweight children. *Facta Universitatis, Series: Physical Education and Sport*, 16(2), 435-450.

Cvetković, N., Stojanović, E., Stojiljković, N., Nikolić, D., Scanlan, A. T., & Milanović, Z. (2018a). Exercise training in overweight and obese children: Recreational football and high-intensity interval training provide similar benefits to physical fitness. *Scandinavian Journal of Medicine & Science in Sports*, 28, 18-32.

Freedman, D. S., Khan, L. K., Serdula, M. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2005). The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics*, 115(1), 22-27.

Freedman, D.S., Mei, Z., Srinivasan, S.R., Berenson, G.S., & Dietz, W.H. (2007). Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. The Journal of Pediatrics, 150(1), 12-17.

Fuller, C. W., Junge, A., DeCelles, J., Donald, J., Jankelowitz, R., & Dvorak, J. (2010). 'Football for Health'—a football-based health-promotion programme for children in South Africa: a parallel cohort study. *British Journal of Sports Medicine*, *44*(8), 546-554.

Hansen, P. R., Andersen, L. J., Rebelo, A. N., Brito, J., Hornstrup, T., Schmidt, J. F., et al. (2013). Cardiovascular effects of 3 months of football training in overweight children examined by comprehensive echocardiography: a pilot study. *Journal of Sports Sciences*, *31*(13), 1432-1440.

Hansen, P. R., Andersen, L. J., Rebelo, A. N., et al. (2013). Cardiovascular effects of 3 months of football training in overweight children examined by comprehensive echocardiography: A pilot study. *Journal of Sports Sciences, 31*(13), 1432-1440. https://doi.org/10.1080/02640414.2013.796061

Helge, E. W., Aagaard, P., Jakobsen, M. D., et al. (2010). Recreational football training decreases risk factors for bone fractures in untrained premenopausal women. *Scandinavian Journal of Medicine & Science in Sports*, *20*(Suppl 1), 31-39. https://doi.org/10.1111/j.1600-0838.2010.01111.x

Jakobsen, M. D., Sundstrup, E., Krustrup, P., & Aagaard, P. (2011). The effect of recreational soccer training and running on postural balance in untrained men. *European Journal of Applied Physiology*, *111*(3), 521-530. https://doi.org/10.1007/s00421-010-1669-2

Kirkham-King, M., Brusseau, T. A., Hannon, J. C., Castelli, D. M., Hilton, K., & Burns, R. D. (2017). Elementary physical education: A focus on fitness activities and smaller class sizes are associated with higher levels of physical activity. *Preventive Medicine Reports, 8*, 135-139.

Krustrup, B.R., Rollo, I., Nielsen, J.N., & Krustrup, P. (2007). Effects on training status and health profile of prolonged participation in recreational football: heart rate response to recreational football training and match-play. *Journal of Sports Science & Medicine*, 6(10), 116-117.

Krustrup, P., Christensen, J. F., Randers, M. B., Pedersen, H., Sundstrup, E., Jakobsen, M. D., et al. (2010). Muscle adaptations and performance enhancements of soccer training for untrained men. *European Journal of Applied Physiology*, 108(6), 1247-1258.

Krustrup, P., Dvorak, J., & Bangsbo, J. (2016). Small-sided football in schools and leisure-time sport clubs improves physical fitness, health profile, well-being, and learning in children. *British Journal of Sports Medicine*, *50*(20), 1166-1167. https://doi.org/10.1136/bjsports-2016-096328

Krustrup, P., Hansen, P. R., Nielsen, C. M., Larsen, M. N., Randers, M. B., Manniche, V., et al. (2014). Structural and functional cardiac adaptations to a 10-week school-based football intervention for 9–10-year-old children. *Scandinavian Journal of Medicine and Science in Sports*, 24(S1), 4-9.

Krustrup, P., Hansen, P. R., Nielsen, C. M., Larsen, M. N., Randers, M. B., Manniche, V., Hansen, L., Dvorak, J. & Bangsbo, J. (2014). Structural and functional cardiac adaptations to a 10-week school-based football intervention for 9–10-year-old children. *Scandinavian Journal of Medicine & Science in Sports*, *24*, 4-9.

Krustrup, P., Skoradal, M. B., Randers, M. B., et al. (2017). Broad-spectrum health improvements with one year of soccer training in inactive mildly hypertensive middle-aged women. *Scandinavian Journal of Medicine & Science in Sports, 25*(12), 1282–1289.

Larsen, M. N., Terracciano, A., Møller, T. K., Aggestrup, C. S., Buono, P., Krustrup, P., & Castagna, C. (2023). An 11-week school-based "health education through football" programme improves musculoskeletal variables in 10–12-yr-old Danish school children. *Bone Reports*, *18*, 101681.

Lilić, A., Stojiljković, N., Pavlović, Lj., & Milanović, Z. (2023). "11 for Health" in the serbia: effects on physical fitness parameters in primary schoolchildren. In: Pišot, S., & Teraž, K. (Ed.), *The 12th International Scientific and Professional Conference "A Child in Motion"* (pp.73-74). Oktobar, 2-4, 2023. Portorož, Science and research centre Koper, Annales ZRS, Slovenia.

Malina, R. M. (2001a). Adherence to physical activity from childhood to adulthood: a perspective from tracking studies. *Quest*, *53*(3), 346-355.

Malina, R. M. (2001b). Physical activity and fitness: pathways from childhood to adulthood. *American Journal of Human Biology: The Official Journal of the Human Biology Association*, *13*(2), 162-172.

McMurray, R.G., & Andersen, L. B. (2010). The influence of exercise on metabolic syndrome in youth: A review. American Journal of Lifestyle Medicine, 4(2), 176-186

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). The PRISMA Group. Reprint-Preferred reporting items for systematic reviews and meta- analyses: The PRISMA statement. *Annals of Internal Medicine*, *151*(4), 264-269.

Nettlefold, L., McKay, H. A., Warburton, D. E. R., McGuire, K. A., Bredin, S. S., & Naylor, P. J. (2011). The challenge of low physical activity during the school day: at recess, lunch and in physical education. *British Journal of Sports Medicine*, *45*(10), 813-819.

Nybo, L., Sundstrup, E., Jakobsen, M. D., Mohr, M., Hornstrup, T., Simonsen, L., et al. (2010). High-intensity training versus traditional exercise interventions for promoting health. *Medicine and Science in Sports and Exercise*, 42(10), 1951-1958.

Ørntoft, C., Fuller, C. W., Larsen, M. N., Bangsbo, J., Dvorak, J., & Krustrup, P. (2016). 'FIFA 11 for Health'for Europe. II: effect on health markers and physical fitness in Danish schoolchildren aged 10–12 years. *British Journal of Sports Medicine*, *50*(22), 1394-1399.

Póvoas, S. C., Castagna, C., Soares, J. M., Silva, P. M., Lopes, M. V., & Krustrup, P. (2016). Reliability and validity of Yo-Yo tests in 9- to 16-year-old football players and matched non-sports active schoolboys. *European Journal of Sport Science*, *16*(7), 755-764. https://doi.org/10.1080/17461391.2015.1119191

Ryom, K., Christiansen, S. R., Elbe, A. M., Aggestrup, C. S., Madsen, E. E., Madsen, M., Larsen, M. N. & Krustrup, P. (2022). The Danish "11 for Health" program raises health knowledge, well-being, and fitness in ethnic minority 10-to 12-year-olds. *Scandinavian Journal of Medicine & Science in sports*, *32*(1), 138-151.

Skinner, A.C., Perrin, E.M., Moss, L.A., & Skelton, J.A. (2015). Cardiometabolic risks and severity of obesity in children and young adults. New England Journal of Medicine, 373(14), 1307-1317.

Skoradal, M. B., Purkhús, E., Steinholm, H., Olsen, M. H., Ørntoft, C., Larsen, M. N., Dvorak, J., Mohar, M. & Krustrup, P. (2018). "FIFA 11 for Health" for Europe in the Faroe Islands: Effects on health markers and physical fitness in 10-to 12-year-old schoolchildren. *Scandinavian Journal of Medicine & Science in Sports*, *28*, 8-17.

Telama, R., Yang, X., Laakso, L., & Viikari, J. (1997). Physical activity in childhood and adolescence as predictor of physical activity in young adulthood. *American Journal of Preventive Medicine*, *13*(4), 317-323.

World Health Organization. (2018). WHO global coordination mechanism on the prevention and control of noncommunicable diseases: final report: WHO GCM/NCD working group on the alignment of international cooperation with national NCD plans (Working Group 3.2, 2016–2017).

EFEKTI DODATNOG REKREATIVNOG FUDBALSKOG PROGRAMA NA FIZIČKU SPREMNOST DECE – PREGLED

Fudbal je najpopularniji sport na svetu, stoga su brojne organizacije angažovale aktivnosti vezane za fudbal kako bi se bavile i podigle svest o zdravstvenim problemima na globalnom nivou. Rekreativni fudbal se pokazao kao korisno oružje u borbi protiv prevencije gojaznosti kod dece poboljšanje fizičkog fitnesa. Cilj ove studije bio je da pruži pregled dokaza o zahtevima za mišićnu kondiciju i kardiorespiratornoj kondiciji tokom rekreativnog fudbala prema trajanju i učestalosti trenažnih intervencija kod školske dece. Pregled literature je bio u skladu sa smernicama PRISMA. Ručna pretraga baze podataka je takođe izvršena korišćenjem sledećih ključnih pojmova, pojedinačno ili u kombinaciji: 11 za zdravlje, fizičku aktivnost, motoričku sposobnost, fizičku spremnost. Nakon izbora studija, izabrana su dva skupa istraživačkih studija prema njihovom sadržaju: mišićni fitnes i kardiorespiratorni fitnes. Nalazi ove studije podržavaju teoriju da bi fudbalski trening i rekreativni fudbalski program poboljšao fizičko zdravlje dece kod školaraca. Studija je pokazala da dodatni rekreativni fudbalski programi utiču na bolje rezultate na zahteve za mišićnu kondiciju na sprintu 20m ($p \leq 0,05$) i flamingo testu ($p \leq 0,05$). Takođe, postoji statistički značajna razlika između eksperimentalne grupe koja je radila dodatni rekreativni fudbalski program i kontrolne grupe na inicijalnom i finalnom merenju u parametrima srčane frekvence u mirovanju i maksimalne srčane frekvence. Rekreativni fudbal se preporučuje da se uključi u nastavni plan i program škola u svim grupama kako bi se poboljšalo fizičko blagostanje i smanjila verovatnoća dobijanja nezaraznih bolesti.

Ključne reči: *fudbal, škola, Yo Yo: interminentno trčanje za decu, krvni pritisak, puls*