

# Book of Summaries



**16 MEĐUNARODNA  
KONFERENCIJA  
"SPORTSKE NAUKE I  
ZDRAVLJE"**  
*16<sup>th</sup> INTERNATIONAL  
CONFERENCE ON "SPORTS  
SCIENCE AND HEALTH"*

suorganizatori:



KAZAKH NATIONAL PEDAGOGICAL  
UNIVERSITY ABAI



FAKULTET ZA SPORT I TURIZAM

„Idem tamo gde je lepota... i gde je tesko.“  
Clark Little

**JA SAM DRUGACJI**

**Nikon**



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## FAKTORI MOTIVACIJE ZA REKREACIJSKO RONJENJE SA BOCAMA

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### SAŽETAK:

Sportska rekreacija je slobodno izabrana, individualna ili organizirana aktivnost, koja sredstvima fizičkog vježbanja omogućava ljudima aktivan odmor, zdravu zabavu i razonodu. Kada govorimo o tome zašto i koji ljudi dolaze na rekreaciju te kako i koliko se bave pojedinim rekreacijskim aktivnostima, dolazimo do pitanja šta ih to zapravo motivira. Cilj ovog istraživanja bio je analizirati razloge motivacije za rekreacijsko ronjenje sa bocama (Scuba diving), globalno i prema spolnim karakteristikama. Na uzorku od 80 punoljetnih ispitanika oba spola (35 ženskih i 45 muška ispitanika), izvršeno je istraživanje o razlozima motivacije za učesće u aktivnostima rekreacijskog ronjenja sa bocama. Podaci su prikupljeni primjenom upitnika The Motives for Physical Activity Measure – Revised, MPAM-R (Ryan, Frederick, Lepas, Rubio i Sheldon, 1997). Kao što se u dobijenim rezultatima vidi, emocije imaju iznimno važnu ulogu koja motivira osobu za ovaj vid aktivnosti. Muški ispitanici imaju drugačiji pogled motivacije za rekreacijsko ronjenje u odnosu na ženske. Također, iskusne ronioce mnogo više motivira ronjenje zbog uživanja u morskim dubinama u odnosu na početnike i neiskusne.

## MOTIVATIONAL FACTORS FOR RECREATIONAL SCUBA DIVING

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### ABSTRACT:

Sports recreation is a freely chosen, individual or organized activity which, through physical exercise, enables people to engage in active rest, healthy entertainment, and leisure. When discussing why and which individuals participate in recreational activities, as well as how and to what extent they engage in specific recreational forms, we arrive at the question of what actually motivates them. The aim of this study was to analyze the motivational reasons for recreational scuba diving (SCUBA diving), both globally and in relation to gender characteristics. The study was conducted on a sample of 80 adult participants of both genders (35 female and 45 male participants) and examined the reasons for motivation to participate in recreational scuba diving activities. Data were collected using the questionnaire The Motives for Physical Activity Measure – Revised (MPAM-R) (Ryan, Frederick, Lepas, Rubio, & Sheldon, 1997). As indicated by the obtained results, emotions play an extremely important role in motivating individuals to engage in this type of activity. Male participants demonstrate different motivational perspectives for recreational scuba diving compared to female participants. Furthermore, experienced divers are significantly more motivated by the enjoyment of exploring underwater depths than beginners and less experienced divers.

## OSOBITOSTI RANOG RAZVOJA GRUBE MOTORIKE DJECE S POREMEĆAJEM IZ SPEKTRA AUTIZMA

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### APSTRAKT:

Poremećaj iz spektra autizma razvojna je teškoća koja bilježi stalni porast i čija etiologija nije poznata. Dominantni pokazatelji poremećaja iz spektra autizma jesu teškoće socijalnih odnosa, jezično-govornoga razvoja, stereotipna i repetitivna ponašanja i ograničeni, uski ili atipični interesi što utječe na relativno kasno prepoznavanje njegove kliničke slike (iza 4. godine života). Motorički razvoj djece rijetko se u istraživanjima adresira kao jedan od mogućih potencijalnih ranih pokazatelja poremećaja iz spektra autizma. Kako bi se dobio uvid u osobitosti ranog razvoja grube motorike djece kojoj je dijagnostički i diferencijalno-dijagnostički potvrđeno postojanje poremećaja iz spektra autizma, analizirane su edukacijsko-rehabilitacijske anamneze temeljene na intervjuu roditelja. Analizirano je ukupno 77 anamneza, a kriterij odabira je bilo utvrđeno postojanje poremećaja iz spektra autizma ADOS-2 opservacijskim protokolom, bez prisutnog komorbiditeta i uz isključenje višestrukih teškoća u razvoju. Analizirani su podatci o odizanju glave, pronaciji i supinaciji, puzanju te vertikalizaciji i hodanju. Uredno odizanje glave prezentiralo je 51,94 % djece, dok je odstupanja bilo kod 48,05 % djece. Pronacija i supinacija su bile uredne kod većine djece. Uredno se puzanje javilo kod manje od polovice djece, a 15,58 % djece nije uopće puzalo. Većina djece je počela hodati oko 1. rođendana neovisno jesu li prije toga puzali ili nisu. Dobiveni rezultati ukazuju kako postoje pojedini motorički miljkazi koje je potrebno pratiti, posebice ako postoje prenatalni ili perinatalni rizici, pri čemu se ključnim pokazalo puzanje. Disharmoničan rani razvoj grube motorike može se uzeti kao temelj praćenju ostalih područja razvoja i kao relevantan kriterij za uključivanje djeteta u ranu intervenciju.

**Ključne riječi:** poremećaj iz spektra autizma, rani razvoj grube motorike, disharmoničan motorički razvoj, rana intervencija

## CHARACTERISTICS OF EARLY GROSS MOTOR DEVELOPMENT OF CHILDREN WITH AUTISM SPECTRUM DISORDER

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### **ABSTRACT:**

Autism spectrum disorder is a developmental disability that is constantly increasing, and whose etiology is still unknown. The dominant symptoms of autism spectrum disorder are difficulties in social relationships, delayed language and speech development, stereotyped and repetitive behaviors, and limited, narrow or atypical interests, which affects the relatively late recognition of its clinical presentation (usually after the age of four). Motor development of children is rarely addressed in research as one of the possible potential early indicators of autism spectrum disorders. In order to get an insight into the characteristics of early gross motor development in children with autism spectrum disorder, confirmed by diagnostic and differential diagnostic procedures, a rehabilitation anamnesis based on parent interviews was analyzed. A total of 77 case histories were analyzed, and the selection criterion was the presence of an autism spectrum disorder as indicated by the ADOS-2 observational protocol, without the presence of comorbidities and with the exclusion of multiple developmental disabilities. Data on head lifting, pronation and supination, crawling, and verticalisation and walking were analyzed. Proper head raising was presented by 51.94% of children, while developmental abnormalities were present in 48.05% of children. Pronation and supination were orderly in most children. Orderly crawling occurred in less than half of the children, and 15.58% of children didn't crawl at all. Most children started walking around their 1<sup>st</sup> birthday, regardless of previously crawling quality. The obtained results indicate that there are certain gross motor milestones that need to be monitored, especially if there are prenatal or perinatal risks, crawling proving to be key one. Disharmonious early gross motor development can be taken as a basis for monitoring other areas of development, and as a relevant criterion for including a child in early intervention.

**Key words:** autism spectrum disorder, early gross motor development, disharmonious motor development, early childhood intervention.

## TIPOVI PROCJENA STRESNOSTI SITUACIJA MLADIH TENISAČA

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### SAŽETAK:

Cilj ove studije je bio utvrditi tipove procjena stresnosti situacija u tenisu mladih tenisača, utvrditi karakteristična obilježja i učestalost pojedinih tipova procjena u uzorku ispitanika, te utvrditi povezanost između varijable pripadnosti tipu procjena i varijable sportskog postignuća (teniske uspješnosti na prvenstvu) U sklopu projekta 137 ispitanika, mladi tenisači (65Ž i 72M) su dan prije početka dvostrukog prvenstva ispunili Upitnik za primarnu procjenu stresnosti situacija u tenisu (Milavić, Pezelj i Milat-Kožul, 2025). Upitnik PASS-Tn ima 9 ljestvica i opću mjeru procjene stresnosti situacija. Sve analize su provedene zasebno za U14 i U16 poduzorku ispitanika. Na oba poduzorka, klaster analizom su utvrđena po tri tipa procjena stresnosti situacija. U skupini U14 tenisača: vrlo niski tip (34,9% poduzorka), srednji tip (44,6%) te visoki tip procjene stresnosti (20,5%). U skupini U16 tenisača: vrlo niski tip (29,6%), srednji tip (42,6%) te visoki tip procjene stresnosti (27,8%). Opća struktura tipova procjenitelja U14 i U16 dobnih skupina je vrlo slična, ali su izraženosti procjena i učestalosti različite. U oba poduzorka tenisača nije utvrđena povezanost između pripadnosti tipu procjena i situacijske teniske uspješnosti. Mjere PASS-Tn ne razlikuju u U14 skupini igrače s različitom razinom situacijske teniske uspješnosti, ali za U16 skupinu utvrđena je značajna diskriminativna funkcija. Igrače niske teniske uspješnosti karakteriziraju ekstremno niske procjene u mjerama ja serviram i protivnik servira, te vrlo niska procjena mjere promašeni udarci. Autori studije smatraju kako su procjene stresnosti situacija mladih tenisača ipak visoke, te preporučaju provedbu intervencija od strane trenera (razvoj racionalnih stavova i razvoj situacijskog samopouzdanja tenisača).

**Ključne riječi:** spoznajna procjena, PASS-Tn upitnik, primarna procjena, stres, tenis

## TYPES OF SITUATIONS STRESSFULNESS ASSESSMENT IN YOUTH TENNIS

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### ABSTRACT:

The aim of this study was to determine the types of situations stressfulness assessment in youth tennis with their characteristic features and frequency, and to determine the association between the variable type membership and the variable tennis achievement (successfulness in the championship). 137 young tennis players (65F and 72M) completed Primary Appraisal of Situation Stressfulness in Tennis (PASS-Tn) questionnaire, the day before the start of the indoor championship. The PASS-Tn has 9 scales and general measure of the stressfulness assessment. Cluster analysis identified three types of the stressfulness assessment. In the U14 group: very low type (34.9% of the subsample), moderate type (44.6%) and high type (20.5%). In the U16 group: very low type (29.6%), moderate type (42.6%) and high type (27.8%). The general structure of the stressfulness assessment types in the U14 and U16 groups was similar, but the expressiveness of the assessments and type's frequency were different. In both groups of players, no association was found between type membership variable and tennis achievement variable on the championship. The PASS-Tn scales did not discriminate between groups of players with different tennis achievement in the U14 group, but a significant discriminative function was determined for the U16 group. Players with low tennis achievement were characterized by extremely low assessments of I am serving and opponent serves scales, and by very low assessments of missed shots scale. Authors of the study consider that the stressfulness assessments in youth tennis were too high, and recommend the implementation of coach's interventions (development of rational attitudes and self-confidence of players).

**Keywords:** cognitive appraisal, PASS-Tn questionnaire; primary appraisal, stress, tennis players

## DŽUDO U SLOBODNOM VREMENU I RAZVOJ MOTORIČKIH SPOSOBNOSTI DJECE PREDŠKOLSKOG UZRASTA

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### APSTRAKT:

Predškolski period predstavlja ključnu razvojnu fazu u kojoj se, kroz planski osmišljene i pedagoški vođene aktivnosti, oblikuju motoričke sposobnosti, zdravlje i osnovni obrasci kretanja. Savremena predškolska pedagogija naglašava značaj kretanja i igre kao sredstva učenja, socijalizacije i razvoja samoregulacije, pri čemu organizovane sportske aktivnosti u slobodnom vremenu mogu dopuniti svakodnevni vaspitno-obrazovni rad. Takve aktivnosti pružaju strukturisano i stimulatивно okruženje u kojem se, pored motoričkog razvoja, oblikuju disciplina, poštovanje pravila i saradnja sa vršnjacima, što doprinosi cjelovitom razvoju djeteta. Cilj ovog rada je ispitivanje povezanosti između učestalosti bavljenja džudoom i nivoa motoričkih sposobnosti, kao i navika fizičke aktivnosti djece predškolskog uzrasta. Istraživanje je sprovedeno kao korelacijska pilot-studija na uzorku od 15 djece uzrasta 4–6 godina, koja pohađaju džudo treninge u istom sportskom klubu, prema jedinstvenom, razvojno i pedagoški prilagođenom programu rada. Nezavisne varijable obuhvatile su učestalost treninga sedmično i dužinu bavljenja džudoom, dok su zavisne varijable procijenjene pomoću testova ravnoteže, koordinacije, fleksibilnosti i snage, te kratkog upitnika za roditelje o navikama kretanja i korišćenju slobodnog vremena. Podaci su analizirani primjenom deskriptivne statistike i Spearmanovog koeficijenta korelacije. Rezultati ukazuju na pozitivne povezanosti između veće učestalosti džudo treninga i boljih postignuća u motoričkim sposobnostima, kao i povoljnijih obrazaca fizičke aktivnosti. Dobijeni nalazi ističu pedagoški značaj strukturisanih sportskih aktivnosti u slobodnom vremenu, pružajući predškolskim vaspitačima i roditeljima informacije koje mogu biti korisne za planiranje aktivnosti u cilju podrške cjelovitom razvoju djece.

**Ključne riječi:** predškolski uzrast, džudo, motoričke sposobnosti, fizička aktivnost, pilot-studija

## JUDO IN LEISURE TIME AND THE DEVELOPMENT OF MOTOR SKILLS IN PRESCHOOL CHILDREN

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### **ABSTRACT:**

The preschool period represents a critical stage of development during which motor skills, health, and basic movement patterns are shaped through carefully planned and pedagogically guided activities. Contemporary early childhood pedagogy emphasizes the importance of movement and play as means of learning, socialization, and the development of self-regulation. In this context, organized sports activities during leisure time can complement daily educational and care activities by providing a structured and stimulating environment. In addition to supporting motor development, such activities contribute to the cultivation of discipline, adherence to rules, and cooperation with peers, thereby fostering the holistic development of the child. The aim of this study was to examine the association between the frequency of participation in judo and the level of motor skills, as well as physical activity habits, in preschool-aged children. The research was conducted as a correlational pilot study on a sample of 15 children aged 4–6 years, all attending judo training in the same sports club according to a uniform, developmentally and pedagogically adapted program. Independent variables included weekly training frequency and duration of engagement in judo, while dependent variables were assessed using tests of balance, coordination, flexibility, and strength, as well as a brief parent questionnaire regarding movement habits and leisure time use. Data were analyzed using descriptive statistics and Spearman's rank correlation coefficient. The results indicate positive associations between higher judo training frequency and improved motor skill performance, as well as more favorable patterns of physical activity. These findings highlight the pedagogical significance of structured sports activities during leisure time, providing early childhood educators and parents with valuable information for planning activities that support the holistic development of children.

**Keywords:** preschool age, judo, motor skills, physical activity, pilot study

## ULOGA DIMENZIJA LIČNOSTI (GLOBALNE I KONTEKSTUALIZOVANE) U PREDIKCIJI SINDROMA SAGOREVANJA TRENERA

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### SAŽETAK:

Cilj istraživanja je bio ispitivanje prediktivnog doprinosa dimenzija globalne i kontekstualizovane ličnosti fudbalskih trenera u objašnjenju varijanse sagorevanja na treninzima i utakmicama. Prosečna starost prigodnog uzorka ispitanika Mozart Bet Super lige Srbije iznosila je ( $M_{\text{godine}} = 37,12$ ,  $SD = 1.12$ ). Primenjena su dva merna instrumenta: Petofaktorski upitnik ličnosti i Upitnik sagorevanja na poslu. Rezultati multiple regresione analize sagorevanja trenera na poslu pokazuju da prediktorska varijabla globalne ličnosti – savesnost statistički značajno objašnjava kriterijum narušeno emocionalno funkcionisanje trenera na poslu ( $\beta = -0,30$ ,  $p \leq 0,01$ ). Osim toga, dimenzije kontekstualizovane ličnosti prijetnost ( $\beta = -0,30$ ,  $p \leq 0,01$ ) i ekstraverzija ( $\beta = -0,19$ ,  $p \leq 0,05$ ) reprezentuju negativne determinante kriterijuma distanciranosti, dok je osobina savesnost u regresionoj jednačini signifikantan negativan parcijalna determinanta kriterijumske varijable narušeno kognitivno funkcionisanje ( $\beta = -0,29$ ,  $p \leq 0,01$ ). Korišćeni upitnici su validni za merenje konstrukata globalne i kontekstualizovane ličnosti i sagorevanja trenera na poslu u fudbalskoj populaciji. Definitivno, u radu se raspravlja o metodološkim ograničenjima, teorijskim i praktičnim implikacijama dobijenih rezultata, kao i o budućim smerovima ovog psihološkog istraživanja.

**Ključne reči:** ekstraverzija, prijetnost, savesnost, distanciranost, kognitivno funkcionisanje, emocionalno funkcionisanje

## THE ROLE OF PERSONALITY DIMENSIONS (GLOBAL AND CONTEXTUALIZED) IN PREDICTING COACH BURNOUT SYNDROME

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### ABSTRACT:

The aim of the study was to examine the predictive contribution of dimensions of global and contextualized personality of football coaches in explaining the variance of burnout during training sessions and matches. The average age of the pertinent sample of respondents from the Mozart Bet Serbian Super League was ( $M_{\text{age}} = 37.12$ ,  $SD = 1.12$ ). Two measurement instruments were used: the Big Five Inventory and the Burnout Assessment Tool. The results of the multiple regression analysis of coach burnout at work show that the predictor variable of global personality conscientiousness statistically significantly explains the criterion of impaired emotional functioning of coaches at work ( $\beta = -0.30$ ,  $p \leq 0.01$ ). In addition, the dimensions of contextualized personality, agreeableness ( $\beta = -0.30$ ,  $p \leq 0.01$ ) and extraversion ( $\beta = -0.19$ ,  $p \leq 0.05$ ), represent negative determinants of the criterion of detachment, while the trait of conscientiousness in the regression equation is a significant negative partial determinant of the criterion variable impaired cognitive functioning ( $\beta = -0.29$ ,  $p \leq 0.01$ ). The questionnaires used are valid for measuring the constructs of global and contextualized personality and coach burnout at work in the football population. Finally, the paper discusses methodological limitations, theoretical and practical implications of the obtained results, as well as future directions of this psychological research.

**Keywords:** extraversion, agreeableness, conscientiousness, detachment, cognitive functioning, emotional functioning

# POREMEĆAJI SPAVANJA I SUBJEKTIVNA KVALITETA SNA KOD NOGOMETAŠA: EKSPLOLATIVNA PILOT STUDIJA

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## SAŽETAK:

Kvaliteta sna (KS) ključna je za oporavak nogometaša, no obrasci i odrednice specifičnih poremećaja spavanja (PS) nedovoljno su opisani u primijenjenim uvjetima. Cilj ove eksplorativne pilot studije bio je opisati simptome PS i ukupnu KS kod hrvatskih nogometaša oba spola te identificirati prediktore dobre KS. Provedeno je presječno online istraživanje u razdoblju od siječnja do ožujka 2025. godine. Podaci su uključivali demografske karakteristike, antropometriju (BMI), pokazatelje treninga i aktivnosti u slobodno vrijeme, trajanje dnevnog odmora (bez spavanja) te odabrane stavke iz upitnika *Pittsburgh Sleep Quality Index* (PSQI). Rezultat PS izračunat je kao zbroj devet PSQI-izvedenih stavki o poremećajima spavanja, dok je ukupna KS analizirana odvojeno. Razlike između skupina i povezanosti varijabli ispitane su neparametrijskim testovima. Unutarnja konzistencija procijenjena je McDonaldovim koeficijentom omega i Cronbachovim alfa koeficijentom, a prediktori dobre KS identificirani su binarnom logističkom regresijom. Od 113 ispitanika, analizirano je 94 nogometaša (33 muškarca, 61 žena; dob  $23,1 \pm 5,6$  godina; BMI  $22,46 \pm 2,22$  kg/m<sup>2</sup>). Rezultat PS pokazao je prihvatljivu unutarnju konzistenciju ( $\omega=0,722$ ;  $\alpha=0,690$ ) te je bio značajno povezan s ukupnom KS ( $\rho=0,491$ ;  $p<0,001$ ). Viši rezultat PS bio je neovisno povezan s nižim izgledima za dobru KS (OR=0,516; 95% CI 0,401–0,663;  $p<0,001$ ), dok su dob (OR=1,345; 95% CI 1,110–1,630;  $p=0,003$ ) i muški spol (OR=15,059; 95% CI 2,118–107,071;  $p=0,007$ ) bili povezani s većim izgledima za dobru KS. Ovi preliminarni nalazi podupiru važnost PS za KS u nogometaša; međutim, zbog pilot dizajna i samoprijavljenih presječnih podataka potrebno ih je potvrditi u većim konfirmatornim istraživanjima.

**Ključne riječi:** kvaliteta sna, poremećaji spavanja, nogomet, sportaši, logistička regresija

## SLEEP DISTURBANCES AND PERCEIVED SLEEP QUALITY IN FOOTBALL PLAYERS: AN EXPLORATORY PILOT STUDY

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### ABSTRACT:

Sleep quality (SQ) is vital for recovery in football players, yet patterns and determinants of specific sleep disturbances (SDs) are insufficiently described in applied settings. This exploratory pilot study aimed to characterise SD symptoms and overall SQ in Croatian male and female football players, and to identify predictors of good SQ. A cross-sectional online survey was conducted between January and March 2025. Data included demographics, anthropometrics (BMI), training and leisure activity indicators, daily rest duration (excluding sleep), and selected items from the Pittsburgh Sleep Quality Index (PSQI). An SD score was calculated as the sum of nine PSQI-derived disturbance items, while overall SQ was analysed separately. Group differences and associations were examined using non-parametric tests. Internal consistency was assessed using McDonald's omega and Cronbach's alpha, and predictors of good SQ were identified using binomial logistic regression. Of 113 respondents, 94 football players (33 males, 61 females; age  $23.1 \pm 5.6$  years; BMI  $22.46 \pm 2.22$  kg/m<sup>2</sup>) were analysed. The SD score showed acceptable internal consistency ( $\omega=0.722$ ;  $\alpha=0.690$ ) and was significantly associated with overall SQ ( $\rho=0.491$ ,  $p<0.001$ ). Higher SD score was independently associated with lower odds of good SQ (OR=0.516, 95% CI 0.401–0.663,  $p<0.001$ ), whereas age (OR=1.345, 95% CI 1.110–1.630,  $p=0.003$ ) and male sex (OR=15.059, 95% CI 2.118–107.071,  $p=0.007$ ) were associated with higher odds of good SQ. These preliminary findings support the relevance of SDs for SQ in football players; however, given the pilot design and self-reported cross-sectional data, they should be validated in larger confirmatory studies.

**Keywords:** sleep quality, sleep disturbances, football, athletes, logistic regression

## TJELESNA AKTIVNOST I KVALITETA ŽIVOTA LARINGEKTOMIRANIH OSOBA

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### SAŽETAK:

Totalna laringektomija je mutilirajući kirurški zahvat odstranjenja grkljana uz koji je potrebno učiniti traheotomiju i disekciju vrata što ostavlja višestruke posljedice na operiranu osobu. Neke od posljedica laringektomije su disanje na traheostomu, smanjen opseg pokreta vrata i ramenog obruča, kronična bol vrata i ramena te nemogućnost fonacije. Cilj istraživanja bio je utvrditi učestalost i vrstu tjelesne aktivnosti nakon laringektomije te njenu ulogu u kvaliteti života operiranih osoba. Provedeno je istraživanje na uzorku od 36 laringektomiranih osoba medijana životne dobi 62 godine u Klubu laringektomiranih osoba Osijek. Podatci su prikupljeni upitnikom Tjelesna aktivnost i kvaliteta života nakon laringektomije konstruiranim za potrebe ovog istraživanja po uzoru na WHOQOL-BREF i prilagođenu verziju IPAQ upitnika. Statistička obrada učinjena je u programu JASP (ver. 0.95.4, Amsterdam), a podatci su analizirani deskriptivnim i neparametrijskim statističkim metodama. Umjerenom tjelesnom aktivnošću nakon operacije bavi se 66,7% ispitanika, od kojih se 44,4% bavi hodanjem, dok 33,3% ispitanika nisu tjelesno aktivna. Prosječno 5 sati dnevno 33,3% ispitanika provodi sjedeći, dok 25% ispitanika prosječno sjedi 8 sati dnevno. Rezultati pokazuju pozitivnu korelaciju između bavljenja sportom prije i nakon operacije te statistički značajnu korelaciju između tjelesne aktivnosti i doživljaja fizičkog zdravlja i zadovoljstva sobom nakon laringektomije. Dobiveni rezultati pružaju uvid u životni stil laringektomiranih osoba koji ima značajnu ulogu u daljnjem zdravlju osobe i naglašavaju važnost dostupnosti pravovaljanih informacija i edukacije pacijenata od strane stručnjaka te važnost stvaranja mogućnosti za primjerenu i pravilnu tjelesnu aktivnost specifičnih i ranjivih skupina društva.

**Cljučne riječi:** kvaliteta života; laringektomija; sport; tjelesna aktivnost

## PHYSICAL ACTIVITY AND QUALITY OF LIFE OF LARYNGECTOMIZED PERSONS

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### ABSTRACT:

Laryngectomy is a mutilating surgery which requires tracheotomy and lymph node dissection and leaves multiple consequences. The consequences are tracheostomy breathing, reduced range of motion of the neck and shoulder, chronic pain and phonatory inability. The aim was to determine the frequency and type of physical activity after laryngectomy and its role in the quality of life. Research was conducted on a sample of 36 laryngectomees with a median age of 62 years in Osijek Laryngectomees Club. The data were collected with the questionnaire Physical activity and quality of life after laryngectomy constructed for the purposes of this study based on WHOQOL-BREF and an adapted version of the IPAQ questionnaire. Statistical processing was performed in the JASP (ver. 0.95.4, Amsterdam). The data were analyzed using descriptive and non-parametric methods. Physical activity after surgery was performed by 66.7% of the subjects, of whom 44.4% walked, while 33.3% were not physically active. On average, 33.3% of the subjects spent 5 hours a day sitting, while 25% sat of 8 hours a day. The results show a positive correlation between sports before and after surgery and a statistically significant correlation between physical activity and the experience of physical health and self-satisfaction after laryngectomy. The results provide insight into the lifestyle of laryngectomees, which plays a significant role in the person's future health and emphasize the importance of the availability of valid information and patient's education by experts and importance of creating opportunities for appropriate physical activity for vulnerable social groups.

**Keywords:** Laryngectomy; Physical Activity; Sport; Quality of Life

## DIFFERENCES IN THE PERCEPTION OF THE IMPORTANCE OF ALPINE SKIING TECHNIQUES AMONG SKI INSTRUCTORS

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### **ABSTRACT:**

The aim of this study was to analyse differences in the perception of the importance of alpine skiing techniques among ski instructors of different professional ranks. The study was conducted on a sample of 360 licensed ski instructors using a structured online questionnaire. The perception of the importance of skiing techniques was analysed using the Friedman non-parametric ranking test. The results revealed statistically significant differences ( $\chi^2 = 12,674,500$ ;  $df = 177$ ;  $p < 0.001$ ), indicating that instructors of higher professional ranks attributed greater importance to advanced techniques requiring higher biomechanical efficiency and dynamic control, whereas instructors of lower ranks emphasised basic techniques oriented towards stability and safety in the initial phases of instruction. The obtained results have important implications for structuring training methodology and for the education of ski instructors.

**Keywords:** alpine skiing; ski instructors; perception; methodology; skiing techniques

## UČINCI HRVAČKI-SPECIFIČNOG UMORA NA STISAK ŠAKE KOD NATJECATELJSKIH MLADIH HRVAČA

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### SAŽETAK:

Snaga stiska šake (HGS) ključna je komponenta hrvačke izvedbe jer doprinosi uspješnom izvođenju ofenzivnih i defenzivnih tehnika. Iako se najčešće procjenjuje u uvjetima odmora, učinci hrvački-specifičnog umora na snagu stiska šake još uvijek nisu dovoljno istraženi. Cilj ovog istraživanja bio je ispitati promjene apsolutne i relativne snage stiska šake u tri vremenske točke: prije (PRE), nakon prvog kruga (R1) i nakon drugog kruga (R2) protokola hrvački-specifičnog umora. U istraživanju je sudjelovalo dvadeset i devet natjecateljskih mladih hrvača grčko-rimskog stila (dob: 17,6 ± 1,9 godina). Protokol je uključivao dva izvođenja Specifičnog hrvačkog fitness testa (SWFT), razdvojena standardiziranim odmorom od 7 minuta. Snaga stiska šake mjerena je digitalnim dinamometrom prije testiranja, nakon R1 i nakon R2. Relativna snaga stiska šake izračunata je normalizacijom na tjelesnu masu. Za analizu promjena kroz vrijeme primijenjena je analiza varijance za ponovljena mjerenja (ANOVA) uz razinu značajnosti  $p < 0,05$ . Statistički značajno smanjenje apsolutne snage stiska šake zabilježeno je od PRE (49,00 ± 7,85 kg) do R1 (46,73 ± 9,02 kg), uz djelomičan oporavak u R2 (47,05 ± 7,79 kg). Relativna snaga stiska šake pokazala je sličan obrazac: PRE (0,62 ± 0,10 kg/kg), R1 (0,59 ± 0,09 kg/kg), R2 (0,59 ± 0,07 kg/kg). Hrvački-specifični umor uzrokuje mjerljiva smanjenja snage stiska šake kod mladih hrvača. Testiranje snage stiska šake nakon umora pruža vrijedan uvid u neuromuskularnu spremnost te može unaprijediti praćenje izvedbe u boričkim sportovima.

**Ključne riječi:** borički sportovi, umor, snaga, neuromuskularna izvedba, mladi sportaši

## EFFECTS OF WRESTLING-SPECIFIC FATIGUE ON HANDGRIP STRENGTH IN COMPETITIVE YOUTH WRESTLERS

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### ABSTRACT:

Handgrip strength (HGS) is essential in wrestling performance, contributing to successful execution of offensive and defensive techniques. Although commonly assessed in rested conditions, the impact of wrestling-specific fatigue on HGS remains insufficiently explored. To examine changes in absolute and relative handgrip strength across three time points: before (PRE), after the first round (R1), and after the second round (R2) of a wrestling-specific fatigue protocol. Twenty-nine competitive youth Greco-Roman wrestlers (age: 17.6 ± 1.9 years) participated in the study. The protocol included two bouts of the Specific Wrestling Fitness Test (SWFT), separated by a standardized 7-minute rest. HGS was measured using a digital hand dynamometer before, after R1, and after R2. Relative HGS was calculated by normalizing to body mass. Repeated measures ANOVA was used to analyze performance across time points ( $p < .05$ ). A statistically significant decrease in absolute HGS was observed from PRE (49.00 ± 7.85 kg) to R1 (46.73 ± 9.02 kg), with a partial recovery at R2 (47.05 ± 7.79 kg). Relative HGS followed a similar pattern: PRE (0.62 ± 0.10 kg/kg), R1 (0.59 ± 0.09 kg/kg), R2 (0.59 ± 0.07 kg/kg). Wrestling-specific fatigue induces measurable reductions in handgrip strength among youth wrestlers. Post-fatigue HGS testing offers valuable insight into neuromuscular readiness and may enhance performance monitoring in combat sports.

**Keywords:** combat sports, fatigue, strength, neuromuscular performance, youth athletes

## SUPPORTIVNA ULOGA PRIMJENE KINEZIOLOŠKIH OPERATORA U TERAPIJI DJECE S BRZOPLETOŠĆU

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### SAŽETAK:

Brzopletost je heterogeni poremećaj tečnosti i razumljivosti govora. Segmenti brzog ili neregularnog govora popraćeni su pretjeranim normalnim netečnostima, skraćivanjima ili ispuštanjima slogova te abnormalnim pauzama, naglascima i ritmom. Simptomatologija brzopletosti uočava se na komunikacijskom, jezičnom, govornom i motoričkom planu. Govor, ritam i pokret su neurološki usko povezani procesi, a kod djece s brzopletošću su, između ostaloga, prisutne teškoće i u vremensko-motoričkom planiranju. Upravo na tom planu značajan doprinos mogu dati kineziološki operatori koji obuhvaćaju ciljane motoričke aktivnosti. Cilj ovog preglednog rada je prikazati na koji način kineziološki operatori mogu doprinijeti supportivnom ulogom nadopunjujući i pojačavajući učinke logopedске terapije. Klinički učinkovitim dosad se pokazalo izvođenje *Brain Gym*<sup>®</sup> vježbi koje poboljšavaju bilateralnu integraciju moždanih funkcija. Integracija kinezioloških operatora s logopedskim postupcima povećava učinkovitost terapije i motivaciju djece te omogućuje bolju generalizaciju terapijskih učinaka.

**Ključne riječi:** brzopletost, tečnost govora, kineziološki operatori, logopedska terapija, bilateralna integracija

## THE SUPPORTIVE ROLE OF APPLYING KINESIOLOGICAL OPERATORS IN THE THERAPY OF CHILDREN WITH CLUTTERING

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### ABSTRACT:

Cluttering is a heterogeneous disorder of speech fluency and intelligibility. Segments of rapid or irregular speech are accompanied by excessive normal disfluencies, shortening or omissions of syllables, and abnormal pauses, accents, and rhythm. The symptomatology of cluttering manifests across the domains of communication, language, speech, and motor functioning. Speech, rhythm, and movement are neurologically closely interconnected processes, and in children with cluttering, difficulties are present, among other aspects, in temporal-motor planning. A significant contribution in this domain can be provided by kinesiological operators encompassing structured and targeted motor activities. The aim of this review is to demonstrate how kinesiological operators can contribute in a supportive role by complementing and enhancing the effects of speech-language therapy. *Brain Gym*<sup>®</sup> exercises that improve bilateral integration of brain functions have so far proven to be clinically effective. The integration of kinesiological operators with speech-language therapy procedures increases the effectiveness of therapy and children's motivation, while also facilitating better generalization of therapeutic outcomes.

**Keywords:** cluttering, fluency, kinesiological operators, speech-language therapy, bilateral integration

## KVALITETA GLASA BUDUĆIH ODGOJITELJA: ODNOS SAMOPROCJENE I LOGOPEDSKE PROCJENE

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### SAŽETAK:

Odgojitelji su vokalni profesionalci koji se u svakodnevnom radu intenzivno oslanjaju na glas kao osnovno sredstvo komunikacije, a njihova kvaliteta glasa važna je u kontekstu mogućeg utjecaja na dječju jezično – govornu obradu. Cilj ovog istraživanja bio je utvrditi kako studenti diplomskog studija ranog i predškolskog odgoja i obrazovanja procjenjuju kvalitetu svoga glasa i njegovu važnost u profesionalnom radu te usporediti njihovu samoprocjenu s logopedskom procjenom kvalitete glasa. Provedeno je presječno istraživanje u kojem je sudjelovalo 47 studenata diplomskog studija Ranog i predškolskog odgoja i obrazovanja na Fakultetu za odgojne i obrazovne znanosti u Osijeku. Podaci o samoprocjeni kvalitete glasa prikupljeni su pomoću Upitnika Indeksa vokalnih teškoća (VHI-HR) te dodatnih tvrdnji na Likertovoj skali, dok je logopedska procjena provedena perceptivnom analizom prema GRBAS skali. Statistička analiza učinjena je primjenom odgovarajućih metoda u programu IBM SPSS Statistics. Ispitanici u većini slučajeva navode prisutnost blagih do umjerenih glasovnih poteškoća, dok logopedska procjena pokazuje da kod većine ispitanika nisu zabilježena odstupanja u kvaliteti glasa. Studenti iskazuju visoku razinu svijesti o profesionalnoj važnosti glasa i njegovoj ulozi u radu s djecom. Nije utvrđena značajna povezanost između studentske samoprocjene i logopedske procjene kvalitete glasa. Dobiveni rezultati upućuju na potrebu za većom zastupljenošću sadržaja usmjerenih na vokalno zdravlje i svjesnu uporabu glasa u obrazovanju budućih odgojitelja radi očuvanja glasovne funkcije i stvaranja kvalitetnog komunikacijskog okruženja za djecu.

**Glavne riječi:** kvaliteta glasa, odgojitelji, logopedska procjena, samoprocjena, vokalno zdravlje

## VOICE QUALITY IN FUTURE EDUCATORS: SELF- ASSESSMENT AND SPEECH- LANGUAGE PATHOLOGISTS' EVALUATION

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### ABSTRACT:

Early childhood educators are professional voice users who rely heavily on their voice as the primary means of communication in everyday work, and voice quality is important in the context of its potential influence on children's language and speech processing. The aim of this study was to examine how graduate students of early and preschool education assess the quality of their own voice and its importance in professional practice, and to compare their self-assessment with speech-language pathologists' evaluation of voice quality. A cross-sectional study was conducted with 47 graduate students of Early and preschool education at the Faculty of education in Osijek. Data on self-perceived voice quality were collected using the Voice Handicap Index (VHI-HR) and additional Likert-scale statements, while perceptual voice evaluation was performed using the GRBAS scale. Statistical analyses were conducted using appropriate methods in IBM SPSS Statistics. In most cases, participants reported mild to moderate voice difficulties, whereas perceptual evaluation indicated that no deviations in voice quality were observed in the majority of participants. Students demonstrated a high level of awareness of the professional importance of voice and its role in working with children. No significant association was found between students' self-assessment and speech-language pathologists' evaluation of voice quality. The findings highlight the need for greater inclusion of content focused on vocal health and conscious voice use within teacher education programs in order to preserve vocal function and promote the creation of a high-quality communicative environment for children.

**Keywords:** voice quality, educators, speech-language pathologists' evaluation, self-assessment, vocal health

## BENEFITI BORAVKA DECE NA OTVORENOM PROSTORU

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### APSTRAKT:

Savremeni način života, obeležen urbanizacijom i prezasićenošću digitalnim tehnologijama, sve više ograničava prilike dece za slobodno istraživanje i boravak na otvorenom prostoru. Cilj rada je da, kroz sintezu savremene literature, analizira višedimenzionalne benefite boravka dece predškolskog uzrasta u prirodi i na kvalitetno osmišljenom otvorenom prostoru, te da izvede praktične implikacije za predškolsku praksu i širu zajednicu. Rad sistematizuje naučne dokaze u tri ključna domena. Fizički i fiziološki, boravak na otvorenom podstiče motorički razvoj, jača imunitet i nudi jedinstvene prednosti poput sinteze vitamina D i smanjenja izloženosti zagađenju. Kognitivno i emocionalno, prirodno okruženje deluje restauraciono: poboljšava pažnju i koncentraciju, smanjuje stres i anksioznost, te podstiče kreativnost i razvoj samopouzdanja kroz prevazilaženje izazova. Socijalno, otvoreni prostor promovise saradnju, pregovaranje i razvoj empatije kroz nestrukturiranu igru, dok istovremeno jača porodične i zajedničke veze. Ostvarivanje ovih benefita nije spontano, već zahteva svestan i koordinisan napor. Predškolska ustanova ima centralnu ulogu kroz transformaciju svog dvorišta u bogato, podsticajno okruženje i kroz osmišljavanje aktivnosti koje integrišu igru, istraživanje i učenje. Međutim, njen uspeh zavisi od podrške porodice, koja treba da promovise aktivne porodične rutine u prirodi, i od angažmana lokalne zajednice u kreiranju bezbednih, zelenih javnih prostora. Reintegracija prirode u svakodnevnicu dece temeljni je imperativ, neophodan za razvoj zdrave, kompetentne i ekološki svesne generacije.

**Ključne reči:** predškolsko dete, otvoreni prostor, fizička aktivnost, integralni razvoj, predškolska praksa

## BENEFITS OF CHILDREN'S STAY OUTDOOR

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### ABSTRACT:

Modern lifestyle, marked by urbanization and digital overload, increasingly limits children's opportunities to freely explore and spend time outdoors. The aim of this review paper is to analyze, through a synthesis of contemporary literature, the multidimensional benefits of outdoor and nature-based experiences for preschool children, and to derive practical implications for preschool practice and the wider community. The paper systematizes scientific evidence into three key domains. Physically and physiologically, outdoor stay promotes motor development, strengthens immunity, and offers unique advantages such as vitamin D synthesis and reduced exposure to pollution. Cognitively and emotionally, the natural environment has a restorative effect: it improves attention and concentration, reduces stress and anxiety, and stimulates creativity and self-confidence through overcoming challenges. Socially, outdoor space promotes cooperation, negotiation, and the development of empathy through unstructured play, while simultaneously strengthening family and community bonds. The conclusion emphasizes that realizing these benefits is not spontaneous but requires a conscious and coordinated effort. The preschool institution plays a central role by transforming its yard into a rich, stimulating environment and by designing activities that integrate play, exploration, and learning. However, its success depends on family support, which should promote active family routines in nature, and on the engagement of the local community in creating safe, green public spaces. The paper concludes that reintegrating nature into children's daily lives is a fundamental educational and public health imperative, necessary for raising a healthy, competent, and ecologically aware generation.

**Keywords:** preschool child, outdoor space, physical activity, holistic development, preschool practice

## SENZORNI I MOTORNI NEURONI I SPINALNI REFLEKSI: NARATIVNI PREGLED

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### SAŽETAK:

Neuroni su specijalizirane, polarizirane stanice koje prenose električne i hemijske signale, podupirući i jednostavne reflekse i složena motorička ponašanja. Senzorni (afarentni) neuroni prenose periferne informacije u centralni nervni sistem (CNS), dok motorički (eferentni) neuroni prenose komandu skeletnim mišićima. Interneuroni unutar kičmene moždine integrišu ove signale, omogućavajući koordinisan motorički izlaz. Dorzalni, ventralni i lateralni rogovi kičmene moždine podržavaju senzornu obradu, motoričko izvršenje i integraciju uzlaznih i silaznih puteva. Spinalni refleksi su brzi, stereotipni odgovori posredovani organiziranim neuronskim krugovima. Monosinaptički refleksi, poput miotatičkog (istezajućeg) refleksa, uključuju direktnu senzorno-motoričku komunikaciju, regulisanu  $\gamma$ -motoneuronima i recipročnom inhibicijom kako bi se održala dužina i tonus mišića. Polisinaptički refleksi, uključujući refleks povlačenja fleksora, angažuju interneurone da koordiniraju sinergističku i antagonističku aktivnost mišića, prilagođavajući se položaju udova, lokaciji stimulusa i kontekstualnim faktorima. Inverzni miotatički refleks, posredovan Golgijevim tetivnim organima, štiti mišiće i ligamente moduliranjem sile tokom kontrakcije. Ovi refleksi koriste recipročne, nerecipročne, presinaptičke i rekurentne inhibitorne mehanizme, zajedno ojezbjeđujući preciznu, prilagodljivu i stabilnu motoričku kontrolu. Detaljno razumijevanje organizacije senzornih i motornih neurona te dinamike spinalnih refleksa ključno je za razjašnjavanje ljudskog pokreta, informisanje kliničke procjene i vođenje neuromuskularne rehabilitacije.

**Ključne riječi:** senzorni neuroni, motorni neuroni, spinalni refleksi

## SENSORY AND MOTOR NEURONES AND SPINAL REFLEXES: A NARRATIVE REVIEW

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### ABSTRACT:

Neurons are specialised, polarised cells that transmit electrical and chemical signals, underpinning both simple reflexes and complex motor behaviours. Sensory (afferent) neurones relay peripheral information to the central nervous system (CNS), while motor (efferent) neurones convey commands to skeletal muscles. Interneurones within the spinal cord integrate these signals, enabling coordinated motor output. The spinal cord's dorsal, ventral, and lateral horns support sensory processing, motor execution, and the integration of ascending and descending pathways. Spinal reflexes are rapid, stereotyped responses mediated by organised neural circuits. Monosynaptic reflexes, such as the myotatic (stretch) reflex, involve direct sensory-motor communication, regulated by  $\gamma$ -motoneurons and reciprocal inhibition to maintain muscle length and tone. Polysynaptic reflexes, including the flexor withdrawal reflex, engage interneurons to coordinate synergistic and antagonistic muscle activity, adapting to limb posture, stimulus location, and contextual factors. The inverse myotatic reflex, mediated by Golgi tendon organs, safeguards muscles and ligaments by modulating force during contraction. These reflexes employ reciprocal, non-reciprocal, presynaptic, and recurrent inhibitory mechanisms, collectively ensuring precise, adaptable, and stable motor control. A detailed understanding of sensory and motor neurone organisation and spinal reflex dynamics is essential for elucidating human movement, informing clinical assessment, and guiding neuromuscular rehabilitation.

**Key words:** sensory neurons, motor neurons, spinal reflexes

## KROSKULTURALNA VALIDACIJA I MJERNA SVOJSTVA UPITNIKA PASIPD: PREGLED LITERATURE UTEMELJEN NA COSMIN SMJERNICAMA

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### SAŽETAK:

Mjerenje tjelesne aktivnosti kod osoba s tjelesnim invaliditetom predstavlja metodološki izazov zbog specifičnih obrazaca kretanja i funkcionalnih ograničenja. Physical Activity Scale for Individuals with Physical Disabilities (PASIPD) razvijen je kao samoprocjenski instrument prilagođen ovoj populaciji, no njegova mjerna svojstva razlikuju se ovisno o kliničkom i kulturnom kontekstu. Cilj ovog rada bio je kritički analizirati pouzdanost, valjanost i strukturne karakteristike PASIPD-a u skladu s COSMIN (Consensus-based Standards for the selection of health Measurement Instruments) smjernicama. Pregled literature proveden je u bazi PubMed/MEDLINE bez vremenskog ograničenja, a uključeno je osam validacijskih studija. Analizirani su pokazatelji unutarnje konzistentnosti, test–retest pouzdanosti, konstruktne, konvergentne i kriterijske valjanosti te kroskulturalne prilagodbe. PASIPD je uspoređivan s instrumentima poput International Physical Activity Questionnaire (IPAQ), SF-36, Functional Independence Measure (FIM), Craig Handicap Assessment and Reporting Technique (CHART), Nottingham Health Profile (NHP), Human Activity Profile (HAP), kao i s objektivnim mjerama tjelesne aktivnosti (akcelerometrija). Rezultati pokazuju zadovoljavajuću do dobru stabilnost ukupnog rezultata (ICC najčešće 0,75–0,85; Cronbach  $\alpha$  oko 0,70), uz varijabilnu faktorsku strukturu. Povezanosti s navedenim instrumentima bile su umjerene, dok je povezanost s akcelerometrijom bila niska do umjerena, uz tendenciju precjenjivanja razine aktivnosti. Responsivnost nije se mogla procijeniti zbog nedostatka longitudinalnih istraživanja. Prema COSMIN kriterijima, PASIPD se može smatrati valjanim i dovoljno pouzdanim instrumentom za procjenu tjelesne aktivnosti na grupnoj razini, uz preporuku primarne interpretacije ukupnog rezultata.

**Ključne riječi:** PASIPD, tjelesna aktivnost, osobe s tjelesnim invaliditetom, pouzdanost, valjanost, COSMIN, kroskulturalna prilagodba

## CROSS-CULTURAL VALIDATION AND MEASUREMENT PROPERTIES OF PASIPD: A COSMIN-ORIENTED LITERATURE REVIEW

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### ABSTRACT:

Measuring physical activity in individuals with physical disabilities presents methodological challenges due to specific movement patterns and functional limitations. The Physical Activity Scale for Individuals with Physical Disabilities (PASIPD) was developed as a self-report instrument tailored to this population; however, its measurement properties vary across clinical and cultural contexts. The aim of this review was to critically examine the reliability, validity, and structural characteristics of PASIPD in accordance with the COSMIN (Consensus-based Standards for the selection of health Measurement Instruments) framework. A literature search was conducted in PubMed/MEDLINE without time restrictions, and eight validation studies were included. Internal consistency, test–retest reliability, structural validity, convergent validity, criterion validity, and cross-cultural adaptation were analyzed. PASIPD was compared with instruments such as the International Physical Activity Questionnaire (IPAQ), SF-36, Functional Independence Measure (FIM), Craig Handicap Assessment and Reporting Technique (CHART), Nottingham Health Profile (NHP), Human Activity Profile (HAP), and objective measures of physical activity (accelerometry). The total score demonstrated acceptable to good stability (ICC most commonly 0.75–0.85; Cronbach's  $\alpha$  around 0.70), although factor structures varied across populations. Correlations with the aforementioned instruments were generally moderate, whereas associations with accelerometry were low to moderate, with a tendency toward overestimation of activity levels. Responsiveness could not be evaluated due to the lack of longitudinal studies. According to the COSMIN criteria, PASIPD can be considered a valid and sufficiently reliable instrument for group-level assessment of physical activity, with primary interpretation at the total score level.

**Keywords:** PASIPD, physical activity, individuals with physical disabilities, reliability, validity, COSMIN, cross-cultural adaptation

## RAZLIKE U KARDIORESPIRATORNOM KAPACITETU I MORFOLOŠKIM KARAKTERISTIKAMA UČENIKA U DOBI OD 10 I 14 GODINA

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### SAŽETAK:

Cilj rada je utvrditi postojanje razlika u kardiorespiratornom kapacitetu i morfološkim karakteristikama učenika u dobi 10 godina i 14 godina. Niska razina maksimalnog primitka kisika ( $VO_2max$ ) u dječjoj populaciji povezana je s višim indeksom tjelesne mase (BMI) i većim rizikom razvoja pretilosti gdje djeca s najnižim vrijednostima  $VO_2max$ -a imaju dvostruko veći rizik od razvoja pretilosti u odnosu na vršnjake s višim kardiorespiratornim kapacitetom. U istraživanju je sudjelovalo 117 učenika osnovnih škola iz kontinentalnog dijela Republike Hrvatske, 64 učenika četvrtog i 53 učenika osmoga razreda prosječne dobi  $12,05 \pm 2,03$  godina. Za procjenu maksimalne potrošnje kisika ( $VO_2max$ ) koristio se 20-metarski Shuttle Run test. Za procjenu morfoloških karakteristika ispitivani su tjelesna visina, tjelesna masa, indeks tjelesne mase (BMI), opseg struka i bokova te omjer struka i visine – WHtR. U deskriptivnoj statistici izračunane su aritmetičke sredine (M), standardne devijacije (SD), minimalne (Min) i maksimalne (Max) vrijednosti te koeficijenti zakrivljenosti (eng. skewness) i spljoštenosti distribucije (eng. kurtosis). Za analizu razlika između dobnih skupina korištena je jednosmjerna ANOVA. Kod varijabli koje su imale značajan Levenov test s narušenom homogenosti varijanci za provjeru se koristio Welch F test uz veličinu učinka ( $Eta^2$ ). Učenici osmoga razreda u dobi 14 godina bili su viši, teži i imali su viši BMI ( $p < 0,001$ ;  $Eta^2 = 0,128-0,548$ ), dok razlike u WHtR nisu bile statistički značajne ( $p = 0,17$ ). Učenici četvrtog razreda u dobi 10 godina postigli su više vrijednosti  $VO_2max$  ( $42,55 \pm 4,59$  ml/kg/min) u odnosu na učenike osmoga razreda u dobi 14 godina ( $39,26 \pm 1,21$  ml/kg/min;  $p < 0,001$ ;  $Eta^2 = 0,182$ ). Rezultati ukazuju da biološki rast i porast mišićne mase nisu dovoljni za porast kardiorespiratorne izdržljivosti i da se  $VO_2max$  smanjuje između 10. i 14. godine. Ovime se naglašava važnost ciljano strukturiranih programa tjelesne aktivnosti aerobne aktivnosti u višim razredima osnovne škole radi očuvanja kardiorespiratorne izdržljivosti i prevencije sjedilačkog ponašanja.

**Ključne riječi:** aerobni kapacitet, maksimalan primitka kisika, pretilost, tjelesna aktivnost, učenici

## DIFFERENCES IN CARDIORESPIRATORY CAPACITY AND MORPHOLOGICAL CHARACTERISTICS OF STUDENTS AGED 10 AND 14

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### ABSTRACT:

The objective of this paper is to determine the existence of differences in cardiorespiratory capacity and morphological characteristics between students 10 and 14 years old. Low levels of maximal oxygen uptake ( $\text{VO}_2\text{max}$ ) in the pediatric population are associated with a higher body mass index (BMI) and a greater risk of developing obesity; children with the lowest  $\text{VO}_2\text{max}$  values have twice the risk of developing obesity compared to peers with higher cardiorespiratory capacity. The study included 117 elementary school students from the continental part of the Republic of Croatia, consisting of 64 fourth-grade students and 53 eighth-grade students, with an average age of  $12.05 \pm 2.03$  years. The 20-meter Shuttle Run test was used to assess maximal oxygen uptake ( $\text{VO}_2\text{max}$ ). To assess morphological characteristics, body height, body mass, body mass index (BMI), waist and hip circumference, and waist-to-height ratio (WHtR) were measured. In descriptive statistics, arithmetic means (M), standard deviations (SD), minimum (Min) and maximum (Max) values, as well as coefficients of skewness and kurtosis, were calculated. One-way ANOVA was used to analyze differences between age groups. For variables with a significant Levene's test indicating violated homogeneity of variances, the Welch F test was used for verification, along with effect size ( $\text{Eta}^2$ ). Eighth-grade students (aged 14) were taller, heavier, and had a higher BMI ( $p < 0.001$ ;  $\text{Eta}^2 = 0.128-0.548$ ), while differences in WHtR were not statistically significant ( $p = 0.17$ ). Fourth-grade students (aged 10) achieved higher  $\text{VO}_2\text{max}$  values ( $42.55 \pm 4.59$  ml/kg/min) compared to eighth-grade students (aged 14) ( $39.26 \pm 1.21$  ml/kg/min;  $p < 0.001$ ;  $\text{Eta}^2 = 0.182$ ). The results indicate that biological growth and the increase in muscle mass are not sufficient for an increase in cardiorespiratory endurance and that  $\text{VO}_2\text{max}$  decreases between the ages of 10 and 14. This emphasizes the importance of targeted, structured physical activity programs focusing on aerobic activity in the upper grades of elementary school to maintain cardiorespiratory endurance and prevent sedentary behavior.

**Keywords:** aerobic capacity, maximal oxygen uptake, obesity, physical activity, students

## UTICAJ FIZIČKE AKTIVNOSTI NA RAZVOJ DECE PREDŠKOLSKOG UZRASTA

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### SAŽETAK:

Fizička aktivnost predstavlja značajan faktor za zdrav i sveobuhvatan razvoj dece predškolskog uzrasta, period koji se karakteriše intenzivnim promenama u fizičkom, motoričkom, kognitivnom i psiho-socijalnom razvoju. Cilj ovog rada je, kroz sistematski pregled relevantne naučne i stručne literature, da se analizira uticaj fizičke aktivnosti na motorički, kognitivni i psiho-socijalni razvoj dece uzrasta od 3 do 6 godina, kao i da se istakne značaj njene primene u predškolskim vaspitno-obrazovnim praksama. Analiza istraživanja ukazuje da redovna i adekvatno strukturisana fizička aktivnost pozitivno utiče na razvoj osnovnih motoričkih veština, fizičku spremnost i motoričku kompetenciju, koje predstavljaju osnovu za dalje aktivno učešće u sportu i fizičkoj aktivnosti. Pored toga, fizička aktivnost doprinosi poboljšanju kognitivnih funkcija, kao što su pažnja, samoregulacija i izvršne funkcije, kao i pripremljenost za školu. Pozitivni efekti se primećuju i u psiho-socijalnoj sferi, kroz unapređenje socijalnih veština, emocionalnu stabilnost i smanjenje problematičnog ponašanja. Rezultati naglašavaju potrebu za sistematskim i kontinuiranim uključivanjem fizičke aktivnosti, prilagođene uzrastu i razvojnim karakteristikama dece, kao suštinski element u predškolskom obrazovanju.

**Ključne reči:** Fizička aktivnost, predškolska deca, motorički razvoj, kognitivni razvoj

## EFFECTS OF PHYSICAL ACTIVITY ON THE DEVELOPMENT OF PRESCHOOL CHILDREN

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### ABSTRACT:

Physical activity is a crucial factor for the healthy and holistic development of preschool-aged children, a period characterized by rapid changes in physical, motor, cognitive, and psychosocial domains. The aim of this study is to systematically review relevant scientific and professional literature to analyze the impact of physical activity on motor, cognitive, and psychosocial development in children aged 3 to 6 years, and to highlight its importance in early childhood education practice. Evidence from research indicates that regular and appropriately structured physical activity positively influences the development of fundamental motor skills, physical fitness, and motor competence, which form the foundation for continued participation in sports and physical activity. In addition, physical activity contributes to improvements in cognitive functions, including attention, self-regulation, and executive functions, as well as school readiness. Positive effects are also observed in the psychosocial domain, through the enhancement of social skills, emotional stability, and reduction of problematic behaviors. The findings emphasize the need for systematic and continuous integration of age-appropriate physical activity into preschool programs as a key component of early childhood education.

**Keywords:** Physical activity, preschool children, motor development, cognitive development

## ELEMENTI TRENING PLANA KAO PREDIKTORI MOTIVACIJE ZA VJEŽBANJE

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Novom Sadu, Novi Sad, Srbija

### SAŽETAK:

Motivacija predstavlja ključnu determinantu dugoročnog fizičkog vježbanja; međutim, uticaj elemenata trening plana na specifične dimenzije motivacije još uvijek nije dovoljno razjašnjen. Cilj ovog istraživanja bio je ispitati uticaj elemenata trening plana na motivaciju za vježbanje. Dvomjesečna studija presjeka sprovedena je na ukupnom uzorku od 1.087 ispitanika iz fitness centara na području banjalučke regije. Primijenjena su dva seta varijabli: prvi set činio je samokonstruisani upitnik korišćen za opisivanje elemenata trening plana, kao što su nivo treninga, režim treninga, struktura treninga, propisani plan treninga, tip treninga, pauze u treningu, učestalost i obim treninga, uključujući i ličnu varijablu pol, dok je drugi set obuhvatao EMI-2 skalu (Markland i Ingledew, 1997), koja sadrži 14 podskala: socijalno priznanje, zdravstvene pritiske, takmičenje, kontrolisanje tjelesne težine, pripadnost, izazov, izgled, kontrolisanje stresa, odsustvo bolesti, kretanje, uživanje, snagu i izdržljivost, revitalizaciju i pozitivno zdravlje. Za ispitivanje uticaja elemenata trening plana na podskale EMI-2 primijenjena je multipla regresiona analiza. Rezultati su pokazali da su tip treninga i režim treninga konzistentni pozitivni prediktori, dok nivo treninga djeluje kao negativan prediktor, što ukazuje na kompleksan i višesmjernan odnos između elemenata plana treninga i motivacije za vježbanje.

**Ključne riječi:** trening plan, vježbanje, motivacija, fitness

## TRAINING PLAN ELEMENTS AS PREDICTORS OF EXERCISE MOTIVATION

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### ABSTRACT:

Motivation is a key determinant of sustained engagement in physical exercise; however, the influence of training plan elements on specific motivational dimensions remains insufficiently understood. This study aimed to examine the influence of training plan elements on motivation to exercise. A two-month cross-sectional study was conducted on a total sample of 1,087 participants from fitness centres in the Banja Luka region. Two sets of variables were applied: the first set, a self-developed questionnaire, was used to describe training plan elements such as training level, training mode, training structure, prescribed training plan, training type, training breaks, training frequency, and training volume, including the personal variable of gender; and the second set consisted of the EMI-2 questionnaire (Markland & Ingledew, 1997). The EMI-2 scale comprises 14 subscales: Social Recognition, Health Pressures, Competition, Weight Management, Affiliation, Challenge, Appearance, Stress Management, Ill-Health Avoidance, Nimbleness, Enjoyment, Strength and Endurance, Revitalisation, and Positive Health. Multiple regression analysis was performed to examine the predictive influence of training plan elements on the EMI-2 subscales. Overall, training type and training mode emerged as consistent positive predictors, whereas training level functioned as a negative predictor, highlighting the complex and multidirectional relationship between training plan elements and exercise motivation.

**Keywords:** training plan, exercise, motivation, fitness

## TRANSFORMACIJSKI EFEKTI VJEŽBANJA NA TRENAŽERIMA I SLOBODNIM UTEZIMA NA RAZVOJ DINAMIČKE SNAGE I STATIČKE SILE RUKOMETASA

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### SAŽETAK:

Rad sa mladim rukometašima je izazov, ali i ve-  
lika odgovornost. Ključ uspjeha leži u balansu  
između igre, discipline, psihološke pripreme i  
modernih metoda treninga. Moderni rukomet  
od igrača zahtjeva iznimnu fizičku spremnost  
na što utjecaj ima njihova tjelesna masa, brzina i  
snaga. Kroz godine razvoja rukometne igre većina  
vrhunskih ekipa teži većoj brzini, agilnosti, izdr-  
žljivosti i većem kapacitetu fizičke sna Takav nivo  
intenziteta aktivnosti zahtjeva od igrača visoko  
razvijene bazične i specifične motoričke sposob-  
nosti. Danas se fizička priprema ne svodi samo  
na beskrajne krugove oko terena. Nauka nam je  
pokazala da razvoj mladih igrača treba biti funk-  
cionalan i prilagođen njihovom uzrastu. Osnovni  
cilj ovog istraživanja je utvrđivanje transformacij-  
skih efekata vježbanja na trenazerima i slobod-  
nim utezima na razvoj dinamičke snage i statičke  
sile rukometaša uzrasta 15-16 godina. Na uzor-  
ku od 85 ispitanika primjenjeno je 20 testova za  
procjenu dinamičke snage i statičke sile. Rezulta-  
ti T- testa nam ukazuju da je došlo do statistički  
značajnih parcijalnih kvantitativnih promjena u  
istraživanim varijablama kod ispitivanog uzorka  
sportaša. Dobijeni rezultati predstavljaju potvrdu  
kvaliteta primjenjenog eksperimentalnog progra-  
ma rada u trenaznom procesu, to jest potvrdu  
odabira adekvatnih operatora, kao i volumena i  
intenziteta rada.

**Ključne riječi:** trening, dinamička snaga, statička  
sila, sportaši, transformacijski proces.

## TRANSFORMATION EFFECTS OF TRAINING EXERCISES AND FREE WEIGHTS ON THE DEVELOPMENT OF DYNAMIC STRENGTH AND STATIC STRENGTH OF HANDBALLERS

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### ABSTRACT:

Working with young handball players is a challenge,  
but also a great responsibility. The key to success  
lies in the balance between the game, discipline,  
psychological preparation and modern training  
methods. Modern handball requires exceptional  
physical fitness from players, which is influenced by  
their body mass, speed and strength. Through the  
years of development of the handball game, most  
top teams strive for greater speed, agility, endurance  
and a greater capacity for physical sleep. This level  
of intensity of activity requires the players to have  
highly developed basic and specific motor skills.  
Today, physical preparation is not only limited to  
endless laps around the field. Science has shown us  
that the development of young players should be  
functional and adapted to their age. The main goal  
of this research is to determine the transformational  
effects of exercising on trainers and free weights on  
the development of dynamic strength and static  
strength of handball players aged 15-16 years. On  
a sample of 85 subjects, 20 tests were applied to  
assess dynamic strength and static strength. The  
results of the T-test indicate that there were statis-  
tically significant partial quantitative changes in the  
researched variables in the examined sample of ath-  
letes. The obtained results confirm the quality of the  
applied experimental work program in the training  
process, that is, the selection of adequate operators,  
as well as the volume and intensity of work.

**Key words:** training, dynamic strength, static  
strength, athletes, transformation process.

## ULOGA SPORTA I REKREATIVNIH AKTIVNOSTI U PREVENCIJI I SMANJENJU ANKSIOZNOSTI KROZ ŽIVOTNI CIKLUS: ZNAČAJ VITAMINA D I MAGNEZIJA

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### SAŽETAK:

Anksioznost predstavlja jedan od najčešćih poremećaja mentalnog zdravlja današnjice i pogađa populaciju svih uzrasnih skupina. Savremeni stil života, obilježen smanjenom fizičkom aktivnošću, povećanim nivoom stresa, nepravilnom ishranom i nedovoljnom izloženosti sunčevoj svjetlosti, doprinosi porastu anksioznih simptoma. U tom kontekstu, sport i rekreativne aktivnosti sve više se prepoznaju kao značajan faktor očuvanja psihofizičkog zdravlja, dok nutritivni status, posebno nivo vitamina D i magnezija, ima važnu ulogu u regulaciji funkcije nervnog sistema. Cilj ovog rada je da se ispita uloga sporta i rekreativnih aktivnosti u prevenciji i smanjenju anksioznosti kroz različite faze životnog ciklusa, te da se analizira značaj vitamina D i magnezija u održavanju mentalne stabilnosti i emocionalne ravnoteže. Istraživanje je zasnovano na analizi i sintezi relevantne naučne literature iz oblasti psihologije, sportske medicine i nutricionizma. Primijenjen je deskriptivno-analitički pristup, uz pregled empirijskih studija koje su ispitivale povezanost fizičke aktivnosti, mikronutrijenata i mentalnog zdravlja u različitim dobnim skupinama. Rezultati ukazuju da redovna, umjerena fizička aktivnost doprinosi smanjenju nivoa kortizola, povećanju lučenja endorfina i serotonina, poboljšanju kvaliteta sna i jačanju samopouzdanja. Kod djece i adolescenata sport podstiče razvoj socijalnih vještina i emocionalne stabilnosti, dok kod odraslih i starijih osoba smanjuje stres, osjećaj usamljenosti i rizik od anksioznih poremećaja. Takođe, nedostatak vitamina D i magnezija povezan je sa pojačanom nervnom napetošću, razdražljivošću i većom učestalošću anksioznih simptoma. Zaključno, integrisani pristup koji uključuje redovnu fizičku aktivnost i adekvatan unos vitamina D i magnezija predstavlja efikasnu, dostupnu i dugoročno održivu strategiju prevencije i smanjenja anksioznosti kroz cijeli životni ciklus.

**Ključne riječi:** anksioznost, fizička aktivnost, sport, vitamin D, magnezij

## THE ROLE OF SPORT AND RECREATIONAL ACTIVITIES IN THE PREVENTION AND REDUCTION OF ANXIETY ACROSS THE LIFE CYCLE: THE SIGNIFICANCE OF VITAMIN D AND MAGNESIUM

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### **ABSTRACT:**

Anxiety represents one of the most prevalent mental health disorders of contemporary society, affecting individuals across all age groups. Modern lifestyles, characterized by reduced physical activity, increased stress levels, unhealthy dietary patterns, and insufficient exposure to sunlight, contribute significantly to the growing incidence of anxiety symptoms. In this context, sport and recreational activities are increasingly recognized as important determinants of psychophysical well-being, while nutritional status—particularly levels of vitamin D and magnesium—plays a crucial role in the regulation of nervous system function. The aim of this study was to examine the role of sport and recreational activities in the prevention and reduction of anxiety across different stages of the life cycle and to analyze the significance of vitamin D and magnesium in maintaining mental stability and emotional balance. The research was based on the analysis and synthesis of relevant scientific literature in the fields of psychology, sports medicine, and nutrition. A descriptive-analytical approach was employed, including a review of empirical studies examining the relationship between physical activity, micronutrients, and mental health across different age groups. The findings indicate that regular moderate physical activity contributes to reduced cortisol levels, increased secretion of endorphins and serotonin, improved sleep quality, and enhanced self-confidence. In children and adolescents, sport promotes the development of social skills and emotional stability, whereas in adults and older individuals it reduces stress, loneliness, and the risk of anxiety disorders. Furthermore, deficiencies in vitamin D and magnesium are associated with increased nervous tension, irritability, and a higher prevalence of anxiety symptoms. In conclusion, an integrated approach that combines regular physical activity with adequate intake of vitamin D and magnesium represents an effective, accessible, and long-term sustainable strategy for the prevention and reduction of anxiety throughout the life cycle.

**Keywords:** anxiety, physical activity, sport, vitamin D, magnesium

## TEHNIKE MENTALNOG TRENINGA U INDIVIDUALNIM SPORTOVIMA

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### SAŽETAK:

Ovaj rad se bavi analizom psihološke pripreme sportaša u individualnim sportovima, sa posebnim fokusom na stolni tenis, tenis i badminton, sportove sa reketom, koji sami po sebi pred igrače postavljaju specifične mentalne zahtjeve. Individualni sportovi stavljaju sportaše u jedinstven položaj gdje su u potpunosti sami odgovorni za ishod takmičenja, čime pritisak za ostvaranje rezultata raste, što dodatno potencira važnost mentalne stabilnosti i psihološke pripremljenosti. Cilj rada je pružiti sistematičan i sveobuhvatan pregled metoda mentalnog treninga koje se najčešće primjenjuju u sportskoj psihologiji, a posebno u individualnim sportovima, među kojima su tehnike mentalne vizualizacije, pozitivnog samogovora, progresivne mišićne relaksacije, kontrole disanja, postavljanja ciljeva, kao i strategije usmjeravanja i održavanja pažnje. U radu su analizirani brojni naučni izvori i empirijska istraživanja koja potvrđuju efikasnost ovih metoda, posebno u kontekstu poboljšanja koncentracije, emocionalne kontrole, motivacije i samopouzdanja kod sportaša, što su neki od ključnih segmenata sportskog uspjeha. Posebna pažnja je posvećena razlikama u primjeni mentalnog treninga u individualnim sportovima, kao i specifičnostima koje ti sportovi nose sa sobom. Detaljno su prezentirane tehnike pogodne za primjenu u individualnim sportovima, sa praktičnim primjerima za njihovu provedbu i integraciju u svakodnevni trenažni proces. Rad naglašava da mentalni trening nije zamjena za fizički i tehnički trening, već njegov komplementarni segment, te da njegovo sistematsko uključivanje u trenažni proces, može dovesti do značajnog unapređenja sportskih performansi.

**Ključne riječi:** mentalni trening, poboljšanje sportske izvedbe, individualni sportovi, sportske performanse.

## MENTAL TRAINING TECHNIQUES IN INDIVIDUAL SPORTS

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### ABSTRACT:

This paper deals with the analysis of the psychological preparation of athletes in individual sports, with a special focus on table tennis, tennis and badminton, racket sports, which in themselves place specific mental demands on the players. Individual sports place athletes in a unique position where they are fully responsible for the outcome of the competition, which increases the pressure to achieve results, which further emphasizes the importance of mental stability and psychological preparedness. The aim of the paper is to provide a systematic and comprehensive overview of the mental training methods most commonly used in sports psychology, and especially in individual sports, including techniques of mental visualization, positive self-talk, progressive muscle relaxation, breathing control, goal setting, as well as strategies for directing and maintaining attention. The paper analyzes numerous scientific sources and empirical research that confirm the effectiveness of these methods, especially in the context of improving concentration, emotional control, motivation and self-confidence in athletes, which are some of the key segments of sports success. Special attention is paid to the differences in the application of mental training in individual sports, as well as the specificities that these sports bring with them. Techniques suitable for application in individual sports are presented in detail, with practical examples for their implementation and integration into the everyday training process. The paper emphasizes that mental training is not a substitute for physical and technical training, but its complementary segment, and that its systematic inclusion in the training process can lead to significant improvement in sports performance.

**Key words:** mental training, improving sports performance, individual sports, sports performance.

## GLOBALNE KVANTITATIVNE PROMJENE POD UTICAJEM PRIMJENJENOG PROGRAMA NASTAVE ODBOJKE NA MOTORIČKI I SITUACIONOMOTORIČKI STATUS UČENIKA

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### SAŽETAK:

U kojoj mjeri programirana nastava odbojke u okviru redovnog nastavnog programa tjelesnog i zdravstvenog vaspitanja u osnovnoškolskim ustanovama doprinosi kvantitativnoj transformaciji motoričkog i specifično-motoričko statusa učenika, osnovni je problem ovog istraživanja. Cilj ovog istraživanja jeste utvrđivanje prisutnosti i nivoa kvantitativnih transformacionih efekata, motoričkog i situaciono-motoričkog statusa učenika uzrasta od 12 do 15 godina, pod uticajem primjenjenog programa nastave odbojke u okviru redovne nastave tjelesnog i zdravstvenog vaspitanja u osnovnoj školi. Na uzorku od 118 učenika primijenjena je baterija od 19 testova motoričkih sposobnosti i 5 testova situaciono motoričkih sposobnosti odbojkaške igre. Da bi se utvrdile globalne kvantitativne promjene unutar istraživanih prostora, primijenjena je diskriminativna analiza u manifestnom prostoru. Rezultati diskriminativne analize u motoričkom i situaciono motoričkom prostoru, ukazuju da je primjenjeni program nastave odbojke, pozitivno uticao na globalne kvantitativne promjene, istraživanih prostora odabranog uzorka ispitanika.

**Ključne riječi:** Kvantitativni efekti, nastava odbojke, učenici, motorički status, situacionomotorički status.

## GLOBAL QUANTITATIVE CHANGES UNDER THE INFLUENCE OF THE APPLIED VOLLEYBALL CURRICULUM ON THE MOTOR AND SITUATIONAL MOTOR STATUS OF STUDENTS

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### ABSTRACT:

The basic problem of this research is to what extent programmed volleyball lessons within the regular curriculum of physical and health education in elementary schools contribute to the quantitative transformation of the motor and specific-motor status of students. The aim of this research is to determine the presence and level of quantitative transformational effects, motor and situational-motor status of students aged 12 to 15, under the influence of the adopted volleyball teaching program within the regular physical and health education classes in primary school. A battery of 19 tests of motor abilities and 5 tests of situational motor abilities of the volleyball game was applied to a sample of 118 students. In order to determine the global quantitative changes within the investigated areas, a discriminative analysis was applied in the manifest space. The results of the discriminative analysis in the motor and situational motor areas indicate that the applied volleyball teaching program had a positive effect on global quantitative changes in the investigated areas of the selected sample of respondents.

**Keywords:** Quantitative effects, volleyball lessons, students, motor status, situational motor status.

## RAZLIKE IZMEĐU INDIVIDUALNIH I TIMSKIH SPORTOVA U RAZINI PSIHOLOŠKOG PRITISKA I NJEGOVOM DJELOVANJU NA SPORTAŠA

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### SAŽETAK:

Vrhunski takmičarski sport sa sobom nosi ogroman psihološki pritisak, a timski i pojedinačni sportovi se u mnogo čemu razlikuju, pa tako i u razini pritiska i njegovom djelovanju na sportaša. Osnovni cilj ovog rada je utvrđivanje razlike između individualnih i timskih sportova u razini psihološkog pritiska i njegovog djelovanja na sportaša. Moramo razumjeti različitu prirodu odgovornosti, dinamike takmičenja, kao i načina donošenja odluka sa kojima se susreću igrači u timskim i pojedinačnim sportovima. Posebno do izražaja dolazi psihološka priprema sportaša u individualnim sportovima, poput tenisa, stolnog, tenisa, badmintona i sl., koji zahtijevaju visoku razinu koncentracije, mentalne izdržljivosti i sposobnosti upravljanja emocijama, jer sportaši nemaju podršku tima tijekom natjecanja, te se oslanjaju isključivo na svoju mentalnu snagu. Mentalno snažni sportaši su izuzetno natjecateljski nastrojeni, vole pritisak koji donosi natjecanje, dobro kanaliziraju osjećaj nivoze, lako se prilagođavaju na bilo kakvu promjenu u okruženju, donose prave odluke i biraju opcije koje će im osigurati dobar nastup u situacijama kada se nalaze pod pritiskom.

**Ključne riječi:** psihološka priprema, sportaši, individualni i timski sportovi, razlike.

## DIFFERENCES BETWEEN INDIVIDUAL AND TEAM SPORTS IN THE LEVEL OF PSYCHOLOGICAL PRESSURE AND ITS EFFECT ON THE ATHLETE

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### ABSTRACT:

Top competitive sport brings with it enormous psychological pressure, and team and individual sports differ in many ways, including the level of pressure and its effect on the athlete. The main goal of this paper is to determine the difference between individual and team sports in the level of psychological pressure and its effect on the athlete. We need to understand the different nature of responsibilities, competition dynamics, and decision-making styles that players face in team and individual sports. The psychological preparation of athletes comes to the fore in individual sports, such as tennis, table tennis, badminton, etc., which require a high level of concentration, mental endurance and the ability to manage emotions, because athletes do not have the support of the team during the competition, and rely solely on their mental strength. Mentally strong athletes are extremely competitive, they like the pressure of competition, they channel nervousness well, they easily adapt to any change in the environment, they make the right decisions and choose options that will ensure a good performance in situations when they are under pressure.

**Keywords:** psychological preparation, athletes, individual and team sports, differences.

## UTJECAJ EKSPLOZIVNE SNAGE DONJIH EKSTREMITETA NA IZVEDBU SPRINTA

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### SAŽETAK:

Cilj ovog istraživanja bio je utvrditi utjecaj pokazatelja eksplozivne snage donjih ekstremiteta na sprintersku izvedbu u akceleracijskoj fazi, uz analizu prema spolu. U istraživanju je sudjelovalo 49 studenata kineziologije (22 žene i 27 muškaraca;  $19 \pm 0.8$  godina). Eksplozivna snaga procijenjena je vertikalnim (skok s predpripremom, dubinski skok) i horizontalnim skokovima (skok u dalj iz mjesta, troskok iz mjesta), dok je sprint izvedba mjerena na 5 m, 10 m i 20 m. U analizi rezultata primjenjena je regresijska analiza koja kod muškaraca nije utvrđen statistički značajan utjecaj ni vertikalnih ni horizontalnih skokova na rezultatsku izvedbu sprinta ( $p > 0.05$ ). Kod žena je regresijski model vertikalnih skokova bio statistički značajan na svim dionicama (5 m:  $R^2 = 0.38$ ;  $p = 0.01$ ; 10 m:  $R^2 = 0.53$ ;  $p = 0.001$ ; 20 m:  $R^2 = 0.48$ ;  $p = 0.002$ ), pri čemu je skok s predpripremom ostvario značajan individualni doprinos ( $p < 0.02$ ). Nalazi istraživanja ukazuju da vertikalna eksplozivna snaga, procijenjena putem skok s predpripremom, predstavlja značajan prediktor sprinterske akceleracije kod sportašica, dok kod sportaša takav odnos nije potvrđen.

**Ključne riječi:** pliometrija, akceleracija, vertikalni skok, horizontalni skok

## THE INFLUENCE OF LOWER LIMB EXPLOSIVE STRENGTH ON SPRINT PERFORMANCE

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### ABSTRACT:

The aim of this study was to determine the influence of lower limb explosive strength indicators on sprint performance in the acceleration phase, with analysis by gender. The study involved 49 kinesiology students (22 women and 27 men;  $19 \pm 0.8$  years). Explosive power was assessed by vertical (preparatory jump, depth jump) and horizontal jumps (standing long jump, standing triple jump), while sprint performance was measured at 5 m, 10 m and 20 m. In the analysis of the results, a regression analysis was applied, which in men did not establish a statistically significant influence of either vertical or horizontal jumps on the resulting sprint performance ( $p > 0.05$ ). In women, the regression model of vertical jumps was statistically significant in all sections (5 m:  $R^2 = 0.38$ ;  $p = 0.01$ ; 10 m:  $R^2 = 0.53$ ;  $p = 0.001$ ; 20 m:  $R^2 = 0.48$ ;  $p = 0.002$ ), whereby the jump with pre-preparation made a significant individual contribution ( $p < 0.02$ ). The research findings indicate that vertical explosive power, assessed by the jump with preparation, is a significant predictor of sprint acceleration in female athletes, while such a relationship has not been confirmed in male athletes.

**Keywords:** plyometrics, acceleration, vertical jump, horizontal jump

## OBRAZOVNA EFIKASNOST INTEGRATIVNOG MODELA NASTAVE MUZIČKE KULTURE - POKRET U FUNKCIJI PREPOZNAVANJA MUZIČKE FORME

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### **APSTRAKT:**

U radu su predstavljeni rezultati eksperimentalne primjene integrativnog modela nastave muzičke kulture u petom razredu osnovne škole. U istraživanju su učestvovala dva odjeljenja učenika petog razreda. Cilj istraživanja je ispitivanje efikasnosti integrativnog modela nastave muzičke kulture na unutarpredmetnom nivou integracije u nastavi Muzičke kulture s obzirom na muzička znanja (dvodjelna i trodjelna forma) u odnosu na tradicionalni način rada. U istraživanje je uveden slobodan plesni pokret u funkciji vizualizacije i opažanja muzičke forme (dvodjelna i trodjelna pjesma). Pokret u najširem značenju se u istraživanju pokazao kao moćan podsticajni medij/sredstvo kreativnom izražavanju učenika ali i istovremeno i efikasno sredstvo u percepciji muzičkih pojava i izražajnih elemenata muzike. Korišten je eksperimentalni metod sa paralelnim grupama i deskriptivni metod. Rezultati su dobijeni usmenim testiranjem putem i poređenjem dobijenih aritmetičkih sredina eksperimentalne i kontrolne grupe. Razlika aritmetičkih sredinana na svim testovima ide u prilog učenika eksperimentalne grupe što govori o pozitivnom djelovanju eksperimentalnog faktora. Statistički značajna razlika upućuje na zaključak da integrisanje pokreta može pozitivno uticati na efikasnije prepoznavanje muzičke forme i kreativno ispoljavanje učenika u odnosu na tradicionalni način rada. **Ključne riječi:** integrativni model, pokret, nastava muzičke kulture, forma dvodjelne i trodjelne pjesme.

## EDUCATIONAL EFFICIENCY OF AN INTEGRATIVE MODEL IN MUSIC EDUCATION: MOVEMENT AS A FUNCTION OF MUSICAL FORM RECOGNITION

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### **ABSTRACT:**

This paper presents the results of an experimental application of an integrative model in music education for fifth-grade elementary school students. Two classes of fifth-grade students participated in the study. The objective of the research was to examine the efficiency of an integrative model of music education at an intra-disciplinary level regarding musical knowledge (binary and ternary form) compared to the traditional teaching method. Free dance movement was introduced into the research to facilitate the visualization and perception of musical forms (binary and ternary songs). Movement, in its broadest sense, proved to be a powerful stimulative medium for students' creative expression, as well as an effective tool for the perception of musical phenomena and expressive elements. The study utilized an experimental method with parallel groups and a descriptive method. Results were obtained through oral testing and by comparing the arithmetic means of the experimental and control groups. The difference in arithmetic means across all tests favored the students in the experimental group, indicating a positive impact of the experimental factor. The statistically significant difference suggests that integrating movement can positively influence more efficient recognition of musical form and the creative expression of students compared to traditional teaching methods.

**Keywords:** integrative model, movement, music education, binary and ternary song form.

## RAZLIKE U MORFOLOŠKIM KARAKTERISTIKAMA I STEPENU DEFORMITETA STOPALA UČENIKA I UČENICA OSNOVNE ŠKOLE

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### **SAŽETAK:**

Osnovni cilj ovog istraživanja bio je utvrđivanje razlika u dimenzionalnosti morfoloških karakteristika i deformiteta stopala učenika i učenica prvog razreda osnovne škole. Istraživanje je provedeno na uzorku od 80 učenika i 86 učenica prvog razreda osnovne škole. U ovom istraživanju primjenjeno je dvanaest (12) varijabli morfoloških karakteristika i osam (8) varijable za procjenu posturalnog statusa stopala. Multivarijantnom i univarijantnom analizom varijanse (MANOVA i ANOVA) utvrđene su statistički značajne razlike među ispitivanim grupama učenika i učenica u istraživanim varijablama, kao i doprinos istraživanih varijabli razlikovanju ispitivanih grupa. Pokazalo se da dječaci imaju izraženije longitudinalne i transverzalne dimenzionalnosti, a djevojčice veću voluminoznost i veći procenat potkožnog masnog tkiva što je u skladu sa biološkim zakonitostima razvoja djeteta ovog uzrasnog perioda. Primjenom kontigencijskih tablica prikazane su frekvencije i pripadajući postotci pojave deformiteta stopala. Primjenom Hi-kvadrat testa utvrđena je zastupljenost i statistička značajnost razlika deformiteta stopala između spolova (učenici i učenice). Dobijeni rezultati istraživanja ukazuju na relativno veći procenat deformiteta uzdužnog i poprečnog svoda stopala s tim da učenici imaju češće ravno stopalo u odnosu na učenice. Promjene na svodovima stopala su uglavnom u prvom i drugom stepenu, što omogućava popravljjanje stanja uz primjenu korektivnih vježbi u radu sa djecom ovog uzrasta.

**Ključne riječi:** razlike, morfološke karakteristike, deformiteti stopala, učenici, učenice.

## DIFFERENCES IN MORPHOLOGICAL CHARACTERISTICS AND DEGREE OF FOOT DEFORMITY IN ELEMENTARY SCHOOL MALE AND FEMALE STUDENTS

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### **ABSTRACT:**

The main objective of this study was to determine the difference in the dimensionality of morphological characteristics and foot deformity pupils of the first grade. The study was conducted on a sample of 80 students and 86 female students of the first grade. In this study applied the twelve (12) variables of morphological characteristics and eight (8) variables to assess posture status of the foot. Multivariate and univariate analysis of variance (MANOVA and ANOVA) revealed significant differences between the two groups of pupils in the studied variables, as well as the contribution of the studied variables distinguishing between the groups. It turned out that boys have pronounced longitudinal and transversal dimensionality and girls greater volume and a higher percentage of body fat that is in accordance with the biological laws of the child's development of this calendar age period. Applying kontigencijskih table shows the frequency and the corresponding percentages of occurrence of foot deformity. By using Chi-square test was determined representation and statistical significance of differences between the sexes foot deformity (pupils and students). The results point to a relatively higher percentage of deformities longitudinal and transverse arch of the foot with it that students often have flat feet compared to female students. Changes to the arches of the foot are mostly in first and second instance, which allows correcting the situation with the use of corrective exercises to work with children of this age.

**Keywords:** differences, morphological characteristics, foot deformities, pupils, students, first.

## PARENTS' PERCEPTIONS OF PHYSICAL AND HEALTH EDUCATION IN THE EXPERIMENTAL ALL-DAY SCHOOL PROGRAM IN THE REPUBLIC OF CROATIA

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### ABSTRACT:

The aim of the study was to examine parents' attitudes toward the effects of the experimental all-day school (CDS) program on children's physical activity and psychosocial well-being, and to evaluate satisfaction with Physical and Health Education (TZK) taught by a master's-level kinesiologist in classroom teaching. The sample included  $N = 67$  parents, and data were collected via an online questionnaire (Likert 1–5). Measures of central tendency and dispersion, scale reliability (Cronbach  $\alpha$ ), thematic components (principal components method), and one-sample  $t$ -tests relative to the neutral scale value (3) were analyzed. The results show high mean values for all items ( $M = 4.49$ – $4.67$ ) with negative skewness of the distributions, indicating an extremely positive parental perception. The subscales showed good to excellent internal consistency ( $\alpha = .78$ – $.84$ ), while the total scale had  $\alpha = .89$ . One-sample  $t$ -tests show that the means of all items are statistically significantly higher than the neutral value ( $p < .001$ ), with large effects (Cohen  $d = 2.39$ – $3.34$ ). In the discussion, the findings are interpreted in relation to existing knowledge about the importance of school-based physical activity for health, mental well-being, and school functioning. In conclusion, parents strongly support CDS and the role of the kinesiologist in early school age, with the note that future research should include objective measures of physical activity and a longitudinal design.

Keywords: all-day school; physical and health education; parental perception; descriptive statistics; factor analysis

ТЕОРИЈА СПОРТСКЕ  
ДУХОВНОСТИ У ПРАКТИЧНОМ  
СМИСЛУ ДИГИТАЛНЕ  
СПОРТСКЕ СФЕРЕ

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THEORY OF SPORTS  
SPIRITUALITY IN THE  
PRACTICAL SENSE OF THE  
DIGITAL SPORTS SPHERE

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**АПСТРАКТ.**

Ресакрализација спортске активности захтева другачију методологију за филозофско проучавање спорта и позива на потребу покретања дискусија о примени потенцијала православне спортске духовности ради ефикасног решавања питања приоритета вредносних. Постоји брз развој у организацији и структурирању теоријске научне активности, као и прогресивног практичног рада, у области дигиталног спорта. Урађен је покушај теолошког осмишљавања дигиталног спорта у оквиру теоријског концепта спортске духовности. Стога, аутор позива на размишљање и дијалог у вези са дигиталним спортским технологијама и духовним простором који ову појаву окружује, што захтева даљи развој теоријских и практичних приступа у овој области.

**Кључне речи:** спортска духовност, црква и спорт, дигитални спорт, духовно образовање; теологија спорта.

**ABSTRACT.**

The re-sacralization of sports activity requires a different methodology for the philosophical study of sports and calls for the need to initiate discussions on the application of the potential of Orthodox sports spirituality in order to effectively resolve the issue of value priorities. There is a rapid development in the organization and structuring of theoretical scientific activity, as well as progressive practical work, in the field of digital sports. An attempt has been made to theologially conceptualize digital sports within the theoretical concept of sports spirituality. Therefore, the author calls for reflection and dialogue regarding digital sports technologies and the spiritual space surrounding this phenomenon, which requires further development of theoretical and practical approaches in this area.

**Keywords:** sports spirituality, church and sport, digital sport, spiritual education; theology of sport.

## STAVOVI I MIŠLJENJA LIJEČNIKA O PLESU I ZDRAVSTVENIM UČINCIMA PLESA NA ORGANIZAM

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### SAŽETAK:

S kineziološkog i medicinskog stajališta postoje brojni pozitivni učinci plesa na zdravlje čovjeka, a među najvažnijima su učinci na motoričke sposobnosti koordinaciju, brzinu, agilnost, fleksibilnost, snagu i ravnotežu kao i pri liječenju mnogih kroničnih bolesti. Cilj istraživanja bio je istražiti stavove liječnika prema plesu i njihova mišljenja o primjeni plesa kao metode dodatnog liječenja u određenim granama medicine. U istraživanju je sudjelovalo 60 liječnika specijalista medicine rada i sporta, od čega 49 žena (81,7 %) i 11 muškaraca (18,3 %) dobi 30–65 godina. Liječnici su ispunili upitnik za procjenu stavova prema plesu i odgovarali na znanstveno utemeljene tvrdnje o zdravstvenim učincima plesa s da, ne i možda. Rezultati su pokazali da je 92 % liječnika pozitivnog stava prema plesu, 6 % negativnog, a samo 2% njih imalo je neutralan stav prema plesu. Najviše pozitivnih mišljenja liječnika o zdravstvenim dobrobitima plesa odnosio se na učinke kod neuroloških bolesti (91,7 %) i na mišljenja o unaprjeđenju pokretljivosti u starijoj životnoj dobi (86,7 %). Navedeno govori u prilog mogućoj promociji rekreativne aktivnosti plesanja u liječenju pojedinih bolesti. Time će se otvoriti mogućnost korištenja plesnih aktivnosti u primarnoj i sekundarnoj prevenciji mnogobrojnih kroničnih bolesti.

**Ključne riječi:** rekreativna tjelesna aktivnost; prevencija; kronične bolesti; zdravlje; kvaliteta života

## PHYSICIANS' ATTITUDES AND OPINIONS ABOUT DANCE AND ITS HEALTH EFFECTS ON THE BODY

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### ABSTRACT:

From a kinesiological and medical perspective, numerous positive effects of dance on human health have been identified. Among the most important are its effects on motor abilities, including coordination, speed, agility, flexibility, strength, and balance, as well as its impact on the treatment of various chronic diseases. The aim of this study was to investigate physicians' attitudes toward dance and their opinions on the use of dance as an adjunct therapeutic method in specific branches of medicine. The study included 60 specialists in occupational and sports medicine, of whom 49 were women (81.7%) and 11 were men (18.3%), aged 30–65 years. The physicians completed a questionnaire assessing their attitudes toward dance and responded to scientifically grounded statements about the health effects of dance with "yes," "no," or "maybe." The results showed that 92% of physicians held a positive attitude toward dance, 6% a negative attitude, and only 2% expressed a neutral attitude. The highest proportion of positive opinions regarding the health benefits of dance referred to its effects in neurological diseases (91.7%) and its role in improving mobility in older adults (86.7%). These findings support the potential promotion of recreational dance activities as part of the treatment of certain diseases. This opens the possibility for incorporating dance-based activities into the primary and secondary prevention of numerous chronic conditions.

**Keywords:** recreational physical activity; prevention; chronic diseases; health; quality of life

## PREDŠKOLSKO OBRAZOVANJE KAO PODSTICAJNO OKRUŽENJE ZA INKLUZIJU I RAZVOJ DJECE SA SMETNJAMA U RAZVOJU: ZNAČAJ SPORTSKIH AKTIVNOSTI

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### SAŽETAK:

Predškolsko vaspitanje i obrazovanje predstavlja temeljnu razvojnu fazu u životu djeteta, u kojoj se oblikuju ključne kognitivne, socio-emocionalne i motoričke kompetencije. U savremenom inkluzivnom kontekstu, posebna pažnja usmjerena je na djecu sa smetnjama u razvoju, čije puno učešće u vaspitno-obrazovnom procesu zahtijeva sistemsku podršku, ranu intervenciju i podsticajno okruženje. Rad ima za cilj da prikaže značaj predškolskog vaspitanja kao inkluzivnog razvojnog prostora, sa posebnim naglaskom na ulogu sportskih aktivnosti u podsticanju cjelovitog razvoja djece sa smetnjama u razvoju. Polazeći od teorijskih postavki o uticaju socijalnog okruženja na razvoj djeteta, analiziraju se principi inkluzije, zakonski okvir i koncept rane intervencije, kao i funkcionalni aspekti različitih razvojnih smetnji u skladu sa ICD-10 i MFK/ICF klasifikacijom. Posebno se ističe da sport i motoričke aktivnosti u predškolskom uzrastu predstavljaju integralni dio vaspitno-obrazovnog rada, a ne njegov dodatak. Kroz planski osmišljene, individualno prilagođene i timski realizovane sportske aktivnosti podstiču se motoričke sposobnosti, senzomotorička integracija, samoregulacija, socijalna interakcija i osjećaj pripadnosti grupi. Sport ima snažan inkluzivni potencijal jer omogućava djeci različitih sposobnosti ravnopravno učešće u zajedničkim aktivnostima, čime se smanjuje rizik od socijalne izolacije i jača pozitivna slika o sebi. Zaključno, sistemski i kontinuirana primjena sportskih aktivnosti u predškolskim ustanovama predstavlja strateški važan element inkluzivne pedagoške prakse i doprinosi ostvarivanju jednakih mogućnosti, dobrobiti i optimalnog razvoja svakog djeteta. **Ključne riječi:** predškolsko obrazovanje, inkluzija, djeca sa smetnjama u razvoju, sportske aktivnosti, rana intervencija.

## PRESCHOOL EDUCATION AS A STIMULATING ENVIRONMENT FOR INCLUSION AND DEVELOPMENT OF CHILDREN WITH DEVELOPMENTAL DISABILITIES: THE IMPORTANCE OF SPORTS ACTIVITIES

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### ABSTRACT:

Preschool education represents a fundamental developmental stage in a child's life, during which key cognitive, socio-emotional, and motor competencies are formed. Within the contemporary inclusive framework, particular attention is directed toward children with developmental disabilities, whose full participation in the educational process requires systemic support, early intervention, and a stimulating environment.

The aim of this paper is to highlight the significance of preschool education as an inclusive developmental setting, with special emphasis on the role of sports activities in fostering the holistic development of children with developmental disabilities. Drawing on theoretical perspectives regarding the influence of the social environment on child development, the paper analyzes the principles of inclusion, the legal framework, and the concept of early intervention, as well as the functional aspects of various developmental disabilities in accordance with the ICD-10 and the ICF classification system. Particular emphasis is placed on the understanding that sports and motor activities in early childhood constitute an integral component of educational practice rather than a supplementary addition. Through systematically planned, individually adapted, and team-based sports activities, children's motor skills, sensorimotor integration, self-regulation, social interaction, and sense of belonging are enhanced. Sports possess strong inclusive potential, as they enable children of diverse abilities to participate equally in shared activities, thereby reducing the risk of social isolation and strengthening positive self-perception.

In conclusion, the systematic and continuous implementation of sports activities in preschool institutions represents a strategically important element of inclusive pedagogical practice and contributes to ensuring equal opportunities, well-being, and the optimal development of every child.

**Keywords:** preschool education, inclusion, children with developmental disabilities, sports activities, early intervention

## KONDICIJSKA PRIPREMA U FUTSALU KROZ SPECIFIČNE I SITUACIJSKE VJEŽBE

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### SAŽETAK:

Futsal je sport koji je fizički jako zahtjevan. U modernom futsalu kondicijska priprema jedan je od najvažnijih aspekata sporta. Komponente kondicijske pripreme koje dominiraju u futsalu su aerobna i anaerobna izdržljivost te agilnost i brzina, a poseban naglasak bio bi na anaerobnoj izdržljivosti i agilnosti. S obzirom da je riječ o sportu koji se igra sa loptom, situacije na terenu se mijenjaju u svakome trenutku. Igrači se ne mogu pripremiti na zadatke i zahtjeve koji ih čekaju na terenu ukoliko uz treninge za razvoj funkcionalnih i motoričkih sposobnosti (AE-AN izdržljivost, jakost, brzina, snaga, agilnost) ne prolaze kroz razne specifične i situacijske vježbe koje će ih čekati na utakmicama. To su uglavnom vježbe sa loptom u kojima se može manipulirati intenzitetom i vremenom rada, radi unaprjeđenja funkcionalnih i motoričkih sposobnosti koje zahtjeva futsal.

**Ključne riječi:** Futsal, kondicijska priprema, specifične i situacijske vježbe

## FUTSAL FITNESS TRAINING THROUGH SPECIFIC AND SITUATIONAL EXERCISES

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### ABSTRACT:

Futsal is a highly physically demanding sport, and in the modern game, physical conditioning is one of the key determinants of performance. The main components of fitness that predominate in futsal are aerobic and anaerobic endurance, agility, and speed, with particular emphasis on anaerobic endurance and agility. Because it is a ball sport, game situations on the court change constantly. Players cannot be fully prepared for the tasks and demands they will face in matches if, in addition to general running-based conditioning, they do not regularly perform a variety of specific and game-like drills. These are primarily ball-based exercises in which both intensity and duration can be precisely controlled, to improve the functional and motor abilities required in futsal.

**Key words:** Futsal, fitness training, specific and situational exercises

## MOŽE LI CJELODNEVNA ŠKOLA UBLAŽITI SEZONSKI PAD TJELESNE AKTIVNOSTI DJECE?

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### SAŽETAK:

Cjelodnevna škola je projekt koji se u provodi u Hrvatskoj u prva četiri razreda osnovne škole, kojem je cilj kroz produljeni boravak djece u školi osigurati uvjete za kvalitetnije iskorištavanje radnog dana, uključujući i povećanu tjelesnu aktivnost (TA). Cilj ovog rada bio je istražiti efekte cjelodnevne škole na TA djece u Splitsko-Dalmatinskoj županiji. Analizirano je 114 učenika rane školske dobi (9–11 godina) učenici 3. i 4. razreda osnovne škole podijeljeni u eksperimentalnu grupu (E, 50 učenika, cjelodnevna škola) i kontrolnu grupu (K, 64 učenika, standardni školski program). TA procijenjena je primjenom objektivnih (mjereno akcelerometrima) i subjektivnih mjera (PAQ-C upitnik) na početku školske godine (rujan) i nakon tri mjeseca (prosinac). Kako bi se utvrdile promjene u varijablama, primijenjen je t-test za zavisne uzorke, posebno za svaku grupu, a izračunati su i postotci promjena za analizirane varijable. Kod K grupe zabilježen je značajan pad u mjerama TA (smanjen broj koraka, porast sedentarnog ponašanja i pad jake TA uz porast umjerene do jake TA). Kod E grupe vidljiv je značajan porast umjerenoj do visokoj TA, a značajan pad uočeno je kod visoke TA. Pozitivni efekt E programa vidljiv je u jakoj TA (pad od 29% u odnosu na 12% kod E skupine). Rezultati ukazuju na potencijal programa cjelodnevne škole na ublažavanje sezonalnog pada u TA kod djece. Buduća istraživanja trebala bi ispitati dugoročne efekte na fitness status djece.

**Ključne riječi:** cjelodnevna škola; tjelesna aktivnost; sezonalnost; osnovnoškolska djeca; školske intervencije

## CAN THE WHOLE-DAY SCHOOL PROGRAM MITIGATE THE SEASONAL DECLINE IN CHILDREN'S PHYSICAL ACTIVITY?

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### ABSTRACT:

The Whole-Day School is a project implemented in Croatia in the first four grades of primary school, aiming to provide better conditions for the effective use of the school day through extended student stay at school, including increased physical activity (PA). The aim of this study was to examine the effects of the Whole-Day School program on PA levels among children in the Split-Dalmatia County. A total of 114 early school-aged children (9–11 years), students in the 3rd and 4th grades of primary school, were analyzed. Participants were divided into an experimental group (50 students, Whole-Day School) and a control group (64 students, standard school program). PA was assessed using both objective measures (accelerometers) and subjective measures (PAQ-C questionnaire) at the beginning of the school year (September) and after three months (December). To determine changes in variables, paired-samples t-tests were applied separately for each group, and percentage changes were calculated for all analyzed variables. In the control group, a significant decline in PA measures was observed (reduced number of steps, increased sedentary behavior, and decreased vigorous PA, alongside changes in moderate-to-vigorous PA). In the experimental group, a significant increase in moderate-to-vigorous PA was recorded, while a significant decline was observed in vigorous PA. The positive effect of the experimental program was particularly evident in vigorous PA, with a decline of 12% compared to a 29% decrease in the control group. The results indicate the potential of the Whole-Day School program to mitigate the seasonal decline in children's physical activity. Future research should investigate the long-term effects on children's fitness status.

**Key words:** whole-day school; physical activity; seasonality; primary school children; school-based interventions

# POVEZANOST ANTROPOMETRIJSKIH INDEKSA I SPECIFIČNIH MOTORIČKIH SPOSOBNOSTI KOD JUNIORA U VATERPOLU

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## SAŽETAK:

Vaterpolo je diskontinuirani sport izmjeničnih aktivnosti različitog intenziteta u kojem morfološke karakteristike sportaša mogu imati važnu ulogu u izvedbi eksplozivnih elemenata, poput šuta. Cilj istraživanja bio je utvrditi povezanost antropometrijskih indeksa s maksimalnim šutom te šutom izvedenim nakon kompleksnog vaterpolskog poligona. U istraživanju je sudjelovalo deset juniora Vaterpolo kluba Jadran ( $15,6 \pm 1,1$  godina). Antropometrijski podaci prikupljeni su segmentnom analizom sastava tijela pomoću Tanita uređaja. Sportska izvedba procijenjena je mjerenjem maksimalnog šuta te šuta nakon poligona koji je uključivao rad nogu približno 70% maksimalnog intenziteta i plivački sprint. Statistička obrada provedena je u programu Statistica primjenom korelacijske i regresijske analize. Utvrđene su statistički značajne pozitivne povezanosti maksimalnog šuta s varijablama mišićne mase ekstremiteta, ukupne mišićne mase te pojedinim varijablama masne mase segmenata. Koeficijent determinacije ukazao je na umjeren do relativno visok udio objašnjene varijance maksimalnog šuta antropometrijskim varijablama. Šut izveden nakon poligona nije pokazao statistički značajne povezanosti s analiziranim indeksima. Maksimalni šut u kontroliranim uvjetima odražava morfološki i biomehanički potencijal za generiranje sile kroz kinetički lanac. Izostanak povezanosti u poligonu može se objasniti prethodnim neuromuskularnim i metaboličkim opterećenjem, djelomičnom deplecijom fosfagenih zaliha i smanjenjem eksplozivnosti. Antropometrijske karakteristike imaju važnu ulogu u izvedbi maksimalnog šuta, dok šut nakon opterećenja predstavlja pokazatelj očuvanja eksplozivnosti pod utjecajem umora. Rezultati naglašavaju potrebu kombiniranja izoliranih i situacijskih testova te uključivanja šuta nakon opterećenja u trenajni proces.

**Ključne riječi:** vaterpolo; antropometrijske karakteristike; maksimalni šut; eksplozivna snaga, umor

## CORRELATION BETWEEN ANTHROPOMETRIC INDICES AND SPECIFIC MOTOR INDICES ABILITIES IN JUNIORS IN WATER POLO

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### ABSTRACT:

Water polo is an intermittent high-intensity sport in which morphological characteristics may influence the performance of explosive actions such as shooting. The aim of this study was to determine the relationship between anthropometric indices and maximal shot velocity, as well as shot velocity performed after a water polo-specific circuit. Ten junior players from Water Polo Club Jadran ( $15.6 \pm 1.1$  years) participated in the study. Anthropometric data were obtained using segmental body composition analysis (Tanita). Performance was assessed through maximal shot velocity and shot velocity following a circuit including leg work at  $\sim 70\%$  maximal intensity and a swimming sprint. Statistical analysis was conducted in Statistica using correlation and regression models. Significant positive correlations were found between maximal shot velocity and limb muscle mass, total muscle mass, and selected segmental fat mass variables. The coefficient of determination indicated a moderate to relatively high proportion of explained variance. No significant associations were found between anthropometric indices and shot velocity after the circuit. Maximal shot performance reflects morphological and biomechanical potential for force production through the kinetic chain. The absence of significant associations after the circuit may be explained by neuromuscular and metabolic fatigue, including partial phosphagen depletion. Anthropometric characteristics contribute to maximal shot performance, while post-load shooting reflects the ability to maintain explosiveness under fatigue.

**Keywords:** water polo; anthropometric characteristics; maximal shot; explosive power; fatigue

## MOTORIČKI I MORFOLOŠKI STATUS MLADIH STONOTENISERA REPUBLIKE SRPSKE

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### SAŽETAK:

Cilj rada je utvrđivanje motoričkih i morfoloških obeležja mladih stonotenisera iz Republike Srpske BIH, kao i utvrđivanje eventualnih razlika određenih motoričkih sposobnosti u odnosu na pol i uzrasnu kategoriju igrača što može da doprinese kvalitetnijem trenajznom procesu. Istraživanje je sprovedeno na uzorku od 17 stonotenisera i 15 stonoteniserki, prosečne starosti  $14,99 \pm 1,89$  godina koji su učestvovali na Ljetnjoj školi sporta u Trebinju 2025. godine. Prosečna telesna visina mladih stonotenisera iznosila je  $171,47 \pm 11,41$  cm, telesna masa  $61,79 \pm 14,43$  kg, dok je prosečna vrednost indeksa telesne mase bila  $20,82 \pm 3,36$  kg/m<sup>2</sup>. Statistički značajne razlike između dečaka i devojčica registrovane su, te mladi stonoteniseri su postigli bolje rezultate u odnosu na mlade stonoteniserke, što ukazuje na izraženiju agilnost, sprintersku brzinu, eksplozivnu snagu donjih ekstremiteta, statičku snagu pregibača šake i repetitivnu snagu trbušne muskulature kod mladih stonotenisera muškog pola. Rezultati istraživanja takođe pokazuju da se stonoteniseri juniori statistički značajno razlikuju i postižu bolje rezultate u odnosu na kadete u testovima brzine frekvencije pokreta dominantne ruke (9,94s/11,85s), eksplozivne snage donjih ekstremiteta (206,00cm/178,80cm) i statičke snage pregibača šake (52,26 kg/33,55kg). Kod stonoteniserki juniorskog uzrasta je utvrđena statistički značajno veća statička snaga pregibača šake u odnosu na kadetkinje (30,43kg/26,67kg), dok su i u ostalim motoričkim sposobnostima juniorke ostvarile bolje rezultate, ali bez statistički značajne razlike.

**Ključne reči:** motoričke sposobnosti, stoni tenis, razlike, mladi sportisti

## MOTOR AND MORPHOLOGICAL STATUS OF YOUNG TABLE TENNIS PLAYERS OF THE REPUBLIC OF SRPSKA

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### ABSTRACT:

The aim of this study was to determine the motor and morphological characteristics of young table tennis players from the Republic of Srpska (Bosnia and Herzegovina), as well as to identify potential differences in specific motor abilities in relation to gender and age category, which could contribute to improving the quality of the training process. The research was conducted on a sample of 17 male and 15 female table tennis players, with a mean age of  $14.99 \pm 1.89$  years, who participated in the Summer Sports School in Trebinje in 2025. The average body height of the young table tennis players was  $171.47 \pm 11.41$  cm, body mass was  $61.79 \pm 14.43$  kg, while the mean body mass index (BMI) was  $20.82 \pm 3.36$  kg/m<sup>2</sup>.

Statistically significant differences between boys and girls were recorded. Young male table tennis players achieved better results compared to their female counterparts, indicating greater agility, sprint speed, explosive strength of the lower extremities, static strength of hand flexors, and repetitive strength of the abdominal muscles among male players.

The results also showed that, among male players, juniors differed statistically significantly and achieved better results than cadets in tests of dominant hand movement frequency speed (9.94 s / 11.85 s), explosive strength of the lower extremities (206.00 cm / 178.80 cm), and static strength of hand flexors (52.26 kg / 33.55 kg). Among female players, junior athletes demonstrated statistically significantly greater static strength of hand flexors compared to cadets (30.43 kg / 26.67 kg). Although junior female players also achieved better results in other motor abilities, these differences were not statistically significant.

**Keywords:** motor abilities, table tennis, differences, young athletes

## KVALITATIVNE PROMJENE MOTORIČKIH SPOSOBNOSTI POD UTICAJEM PROGRAMA ODBOJKE

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### SAŽETAK:

Istraživanje je provedeno na uzorku koji je činilo 50 ispitanica – mladih odbojkašica uzrasne dobi 10-12 godina s ciljem utvrđivanja kvalitativnih promjena pod uticajem šestomjesečnog programa odbojke na transformaciju (promjene) motoričkih sposobnosti mladih odbojkašica koje redovno treniraju u OK „Modriča – Novoprom“ iz Modriče. U istraživanju je primijenjen set od 18 varijabli za procjenu motoričkih sposobnosti. Mjerenje motoričkih sposobnosti ispitanica izvršeno je u dvije vremenske tačke, prije realizacije eksperimentalnog programa (inicijalno) i poslije realizacije eksperimentalnog programa (finalno).

U cilju utvrđivanja kvalitativnih promjena odabranih motoričkih sposobnosti nastalih pod uticajem šestomjesečnog eksperimentalnog programa odbojke na transformaciju (promjene) motoričkih sposobnosti mladih odbojkašica primijenjen je komponentni model faktorske analize gdje je prva glavna komponenta matrica korelacija razlika analizirana u ortogonalnoj i kosoj (oblimin) soluciji.

Dobiveni rezultati faktorske analize pokazuju da je pod uticajem šestomjesečnog programa odbojke došlo do značajnih kvalitativnih promjena odabranih motoričkih sposobnosti kod tretiranog uzorka ispitanica. Na inicijalnom mjerenju izolovano je šest a na finalnom mjerenju pet faktora. Promjene motoričkih sposobnosti su vidljive na finalnom mjerenju u promjeni broja, položaja i strukture izolovanih faktora u odnosu na inicijalno mjerenje.

Dobiveni rezultati istraživanja ukazuju da dobro osmišljen i definisan eksperimentalni program rada može efikasno doprinjeti željenim promjenama motoričkih sposobnosti značajnim za uspjeh u odbojkaškoj igri.

**Ključne riječi:** faktorska analiza, mlade odbojkašice, eksperimentalni program, transformacija

## QUALITATIVE CHANGES IN MOTOR SKILLS UNDER THE INFLUENCE OF THE VOLLEYBALL PROGRAM

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### ABSTRACT:

The research was conducted on a sample of 50 participants – young female volleyball players aged 10-12 years, with the aim of determining the qualitative changes under the influence of a six month volleyball program on the transformation (changes) of motor skills in young female volleyball players who regularly train at OK "Modriča – Novoprom" from Modriča. The study applied a set of 18 variables to assess motor skills. The measurement of motor skills was carried out at two time points: before the implementation of the experimental program (initial) and after the completion of the experimental program (final).

To determine the qualitative changes in selected motor skills resulting from the six-month experimental volleyball program, a component model of factor analysis was applied, where the first principal component of the correlation matrix of differences was analyzed in both orthogonal and oblique (oblimin) solutions.

The results obtained from the factor analysis show that the six-month volleyball program led to significant qualitative changes in the selected motor skills in the treated sample. Six factors were isolated in the initial measurement, and five factors in the final measurement. Changes in motor skills are visible in the final measurement through changes in the number, position, and structure of the isolated factors compared to the initial measurement.

The results of the study suggest that a well designed and defined experimental training program can effectively contribute to the desired changes in motor skills that are significant for success in volleyball.

**Keywords:** factor analysis, young female volleyball players, experimental program, transformation.

## BUSINESS INTELLIGENCE IN A SPORTS ORGANIZATION – A CONCEPTUAL APPROACH

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### **ABSTRACT:**

The modern business environment is characterized by a high degree of dynamism, complexity, and uncertainty, driven by accelerated technological development, market globalization, and growing competition. In such conditions, organizations are faced with the need to make decisions quickly, accurately, and based on reliable information. Traditional management models, which relied on limited data sets and the experiential judgment of managers, are becoming insufficient for effective functioning in contemporary market circumstances. It is precisely from this need that the concept of business intelligence emerges as a systematic approach to collecting, processing, analyzing, and interpreting data to support business decision-making. In an era of digitalization and increased competition in the sports sector, sports organizations striving to develop high business performance and top sports results are increasingly beginning to apply the concept of business intelligence as a strategic tool for performance optimization, resource management, and the development of competitive advantages. The aim of this paper is focused on the theoretical-conceptual analysis and explication of the role and importance of business intelligence in sports organizations, with a special focus on its key components, functional application models, and implications for management processes. It is concluded that the conceptually grounded application of business intelligence represents a key factor in the modernization of sports organization management and the basis for developing models based on data and knowledge, which enable more efficient planning, control, and evaluation of sports and business results.

**Keywords:** sports organization, business intelligence, knowledge

## SIGNIFICANCE OF DIFFERENCES IN MORPHOLOGICAL CHARACTERISTICS IN STUDENTS BETWEEN INITIAL AND FINAL MEASUREMENT

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<sup>3</sup>Independent researcher

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### ABSTRACT:

Physical education, sports and health, is an important segment of children's growth and development, especially during the period of puberty, which is characterized by intense morphological changes. Accordingly, a sample of 388 students from three primary schools in Pristina participated in this study. The subjects were male students from the seventh, eighth and ninth grades, aged 12 to 14 years  $\pm$  6 months, who attended physical education, sports and health classes. The primary objective of this study was to determine the progress of students during the testing period by calculating the significance of the differences between the initial and final assessment. The set of morphological characteristics sample consisted of 6 variables. Appropriate statistical software was used to process the results of the study. To meet the research requirements, basic descriptive statistics of morphological variables were calculated, and the t-test for dependent samples was used to determine the significance of differences in the subjects between the initial and final measurements. The results obtained from the research show that only in one of all the examined variables there is no difference (first\_ANABTR - second\_ANABTR), while in all other variables a statistically significant difference at the level of  $p < 0.01$  is observed between the initial and final measurements. The scientifically obtained data from this research directly contribute to the improvement and refinement of teaching curricula in the context of monitoring and developing morphological abilities in this age group.

**Keywords:** male students, initial and final measurements, morphological characteristics, physical education, sports and health

## ANALYSIS OF DAVID VILLA'S GOALS IN LA LIGA

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### **ABSTRACT:**

David Villa was one of the most prominent strikers of his generation, renowned for his finishing ability, technical skill, and tactical versatility. Over 11 seasons in La Liga, he scored 185 goals. This study examined the method of execution (right foot, left foot, or head), shooting location (inside the goal area, inside the penalty area, and outside the penalty area), and type of action preceding the goal (organized play, positive transition, individual play, and set pieces). Data were collected from official La Liga sources and video analysis using a notational method. Descriptive statistics and paired sample t-tests were applied to evaluate differences between goals from organized attacks and positive transitions. The results show that Villa scored the majority of his goals with his right foot (128 goals), inside the penalty area (139 goals), and most frequently following organized play (72 goals). Although the difference between goals from organized play and positive transitions was not statistically significant ( $p=0.134$ ), the findings highlight Villa's technical proficiency, spatial intelligence, and adaptability to different tactical systems. His ability to position himself optimally, finish efficiently, and contribute effectively in both structured and transitional attacks demonstrates the qualities that made him a consistent and versatile forward. The study provides a comprehensive analysis of an elite striker's goal-scoring patterns.

**Keywords:** Attacking efficiency, Finishing, Tactical adaptability, Statistical analysis

## EMPIRICAL ANALYSIS OF LM-47 STUDENTS' EDUCATIONAL PERCEPTIONS IN INFORMAL LEARNING CONTEXTS AT FOOTBALL ACADEMIES

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### **ABSTRACT:**

Youth sport is increasingly recognised as an informal educational setting that contributes to children's motor, emotional and social development, particularly in the 8-10 age group. In this perspective, football academies represent fundamental learning environments, where the educational role of adults plays a decisive role in shaping children's sporting experiences. However, empirical evidence on the educational perceptions of university students in training, particularly those enrolled in the LM-47 master's degree programme, remains limited. This study aimed to analyse the educational perceptions of LM-47 students working in informal football academy settings, focusing on the importance of movement, motivational factors, operational difficulties and the perceived quality of the educational environment. A sample of 120 LM-47 students completed a structured questionnaire consisting of 14 closed-ended questions. Descriptive statistics and chi-square tests were used to analyse the distribution of responses and associations between the role held and key educational variables ( $p < .05$ ). 80% of participants considered movement to be essential, while 73.3% emphasised the need for a balance between fun and technical learning. Fun games emerged as the main motivational factor (65%), while repetitive or overly difficult activities were identified as the main cause of demotivation (50.8%). Two significant associations were found between the role held and the perceived causes of demotivation ( $p = 0.049$ ,  $V = 0.242$ ) and the evaluation of the football academy environment ( $p = 0.048$ ,  $V = 0.243$ ). The results highlight a shared pedagogical orientation among LM-47 students and confirm the educational value of football academies as informal learning contexts.

**Key words:** Youth sport education; Football academies; Educational perceptions.

## SUBJEKTIVNI I OBJEKTIVNI OSJEĆAJ KVALITETA UGLJENIH HIDRATA KOD REKREATIVNIH SPORTISTA

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### SAŽETAK:

Ugljeni hidrati predstavljaju primarni izvor energije u ishrani sportista, a njihov kvalitet značajno utiče na sportske performanse, oporavak i očuvanje zdravlja. Cilj ovog istraživanja bio je da se ispita odnos između subjektivne percepcije i objektivne nutritivne vrijednosti ugljenih hidrata kod rekreativnih sportista. Istraživanje je sprovedeno na uzorku od 30 rekreativaca (18 muškaraca i 12 žena), starosne dobi od 20 do 45 godina, koji redovno treniraju u teretani. Kao instrument korišćen je strukturirani upitnik sa tri tematske cjeline: lične i trenažne navike, subjektivna procjena kvaliteta ugljenih hidrata i znanje o objektivnim nutritivnim parametrima. Rezultati pokazuju da ispitanici najčešće biraju izvore ugljenih hidrata na osnovu ličnih senzacija, ukusa i navika, dok je nivo znanja o glikemijskom indeksu, nutritivnoj gustini i stepenu prerade hrane ograničen. Utvrđena je diskrepancija između subjektivnih preferencija i naučno potvrđenih kriterijuma nutritivne vrijednosti. Zaključuje se da sistematska edukacija i stručno planiranje ishrane mogu doprinijeti usklađivanju subjektivnog doživljaja sportista sa objektivnim nutritivnim standardima, čime se unapređuje nutritivna pismenost i optimizuju energetske potrebe rekreativaca. Ključne riječi: ugljeni hidrati, sportska ishrana, rekreativni sportisti, subjektivna percepcija, glikemijski indeks

## SUBJECTIVE AND OBJECTIVE PERCEPTION OF CARBOHYDRATE QUALITY AMONG RECREATIONAL ATHLETES

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### ABSTRACT:

Carbohydrates are the primary source of energy in athletes' diets, and their quality significantly influences sports performance, recovery, and overall health. The aim of this study was to examine the relationship between subjective perception and objective nutritional value of carbohydrates among recreational athletes. The study was conducted on a sample of 30 recreational exercisers (18 men and 12 women), aged 20 to 45, who regularly train at the gym. A structured questionnaire was used as the research instrument, comprising three thematic sections: personal and training habits, subjective assessment of carbohydrate quality, and knowledge of objective nutritional parameters. Results indicate that participants most often select carbohydrate sources based on personal sensations, taste, and habits, while knowledge of glycemic index, nutrient density, and degree of food processing is limited. A discrepancy was observed between subjective preferences and scientifically established criteria of nutritional value. It is concluded that systematic education and professional dietary planning can help align athletes' subjective experiences with objective nutritional standards, thereby improving nutritional literacy and optimizing the energy needs of recreational exercisers.

**Keywords:** carbohydrates, sports nutrition, recreational athletes, subjective perception, glycemic index

## DEVELOPMENT OF A KARATE SPORTS TRAINING MODEL FOR CHILDREN AGE 9-11 YEARS

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<sup>3</sup>INTI International University

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### ABSTRACT:

The problem in this study is the lack of enthusiasm of children to participate in training due to boring and uninteresting training programs. The development model used is the Borg and Gall development model with research subjects of Plush Lillah Padang Elementary School Extracurricular Participants and AL AMIN Elementary School Extracurricular Participants. The data collection instrument uses expert validation questionnaires, documentation, and basic karate technique tests. The data analysis technique uses independent sample t-test analysis and Aiken rater scores. The results of this study are, the completion of the questionnaire by karate experts on the game-based training model is 0.778 which is in the valid criteria. In the t-test obtained th  $232.087 > t_{\alpha} 2.009$  then, it can be concluded that there is a significant difference between the experimental class and the control class where using a game-based training model has a greater influence on the ability of basic karate techniques compared to not using a play training model for karate sports.

**Keywords:** Practice Model, Play, Basic Karate.

## PROMJENE U MOTORIČKIM SPOSOBNOSTIMA STUDENATA NAKON PROVEDBE GIMNASTIČKE INTERVENCIJE

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### SAŽETAK:

Motoričke sposobnosti temelj su učinkovite izvedbe pokreta i imaju ključnu ulogu u svakodnevnom i sportskim aktivnostima. Među njima se koordinacija ističe kao složena sposobnost koja omogućuje usklađivanje pokreta različitih dijelova tijela u prostoru i vremenu, dok fleksibilnost doprinosi pravilnom izvođenju pokreta i smanjenju rizika od ozljeda. Cilj ovog istraživanja bio je ispitati utjecaj četverotjedne gimnastičke intervencije s elementima ritmičke i sportske gimnastike na motoričke sposobnosti studenata. U istraživanju je sudjelovalo 50 studenata Kineziološkog fakulteta u Osijeku, podijeljenih u eksperimentalnu i kontrolnu skupinu. Eksperimentalna skupina sudjelovala je u nastavi ritmičke gimnastike dva puta tjedno, uključujući osnovne i složenije elemente sportske i ritmičke gimnastike, s naglaskom na koordinaciju, fleksibilnost i preciznost pokreta. Mjerenja su obuhvatila testove fleksibilnosti i koordinacije, a razlike između inicijalnog i finalnog mjerenja analizirane su t-testom za zavisne uzorke. Rezultati pokazuju da je eksperimentalna skupina postigla značajno poboljšanje koordinacije i fleksibilnosti, dok kontrolna skupina nije. Zaključuje se da čak i kratkotrajne, strukturirane gimnastičke intervencije mogu učinkovito poboljšati motoričke sposobnosti studenata početnika, pružajući čvrstu osnovu za daljnje motoričko usavršavanje i sigurnije izvođenje pokreta.

**Ključne riječi:** gimnastika, koordinacija, motoričke sposobnosti

## CHANGES IN STUDENTS' MOTOR SKILLS AFTER IMPLEMENTATION OF GYMNASTICS INTERVENTION

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### ABSTRACT:

Motor skills are the basis for effective movement performance and play a key role in everyday and sports activities. Among them, coordination stands out as a complex ability that enables the coordination of movements of different parts of the body in space and time, while flexibility contributes to the correct execution of movements and the reduction of the risk of injuries. The aim of this study was to examine the impact of a four-week gymnastics intervention with elements of rhythmic and sports gymnastics on students' motor skills. 50 students of the Faculty of Kinesiology in Osijek participated in the study, divided into an experimental and a control group. The experimental group participated in rhythmic gymnastics classes twice a week, including basic and more complex elements of sports and rhythmic gymnastics, with an emphasis on coordination, flexibility and precision of movements. The measurements included tests of flexibility and coordination, and the differences between the initial and final measurements were analyzed by a t-test for dependent samples. The results show that the experimental group achieved significant improvements in coordination and flexibility, while the control group did not. It is concluded that even short-term, structured gymnastics interventions can effectively improve the motor skills of novice students, providing a solid foundation for further motor development and safer movement performance.

**Keywords:** gymnastics, coordination, motor skills

## FIZIČKA AKTIVNOST KAO DETERMINANTA POSTURALNOG STATUSA PREDŠKOLSKE DJECE

**Olivera Krivokapić**

*JU OŠ "Ratko Žarić", Nikšić, Crna Gora*

### **SAŽETAK:**

Predškolski uzrast predstavlja razvojno najosjetljiviji period u formiranju motoričkih sposobnosti, tjelesne strukture i posturalnih obrazaca. U savremenim uslovima života, koje karakteriše smanjena fizička aktivnost i produženo zadržavanje u statičkim položajima, sve češće se registruju posturalni poremećaji već u ranom djetinjstvu. Pravilno držanje tijela rezultat je skladnog funkcionisanja mišićnog, koštanog i nervnog sistema, a fizička aktivnost predstavlja ključni stimulans za njihovo usklađeno djelovanje. Cilj rada je da se, na osnovu relevantne literature, analizira uloga fizičke aktivnosti kao determinante posturalnog statusa predškolske djece, kao i da se ukaže na značaj preventivnog i korektivnog djelovanja u okviru predškolskih ustanova.

**Ključne reči:** fizička aktivnost, posturalni status, predškolski uzrast, motorika, deformiteti, prevencija

## PHYSICAL ACTIVITY AS A DETERMINANT OF THE POSTURAL STATUS OF PRESCHOOL CHILDREN

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### **ABSTRACT:**

Preschool age represents the most developmentally sensitive period in the formation of motor skills, body structure and postural patterns. In modern living conditions, which are characterized by reduced physical activity and prolonged staying in static positions, postural disorders are increasingly registered already in early childhood. Correct posture is the result of the harmonious functioning of the muscular, skeletal and nervous systems, and physical activity represents the key stimulants for their coordinated action. The aim of the paper is to analyze, based on the relevant literature, the role of physical activity as a determinant of the postural status of preschool children, as well as to point out the importance of preventive and corrective action within preschool institutions.

**Key words:** physical activity, postural status, preschool age, motor skills, deformities, prevention

## INKLUZIVNI SPORTSKI PROGRAMI SPECIJALNE OLIMPIJADE BOSNE I HERCEGOVINE KAO FAKTOR FUNKCIONALNOG RAZVOJA I SOCIJALNE INTEGRACIJE OSOBA S INTELKTUALNIM TEŠKOĆAMA

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### SAŽETAK:

Inkluzivni sport osoba s intelektualnim teškoćama predstavlja značajan segment savremenih javnozdravstvenih i socijalnih politika. U savremenom društvu sport se sve više posmatra kao mehanizam funkcionalnog razvoja, prevencije zdravstvenih rizika i smanjenja socijalne izolacije ranjivih populacija. Cilj ovog istraživanja bio je analizirati strukturne i razvojne karakteristike sistema rada Specijalne olimpijade Bosne i Hercegovine te procijeniti njegov doprinos funkcionalnom razvoju i socijalnoj integraciji osoba s intelektualnim teškoćama. Istraživanje je provedeno kao deskriptivno-analitička studija presječnog karaktera, zasnovana na obradi podataka Censusa 2025. godine i analizi institucionalne dokumentacije. Uzorak obuhvata 11.514 registrovanih sportista i 868 certificiranih trenera uključenih u sistem rada. Rezultati pokazuju dominantnu zastupljenost djece i adolescenata uzrasta 6–15 godina (78%), što potvrđuje snažnu razvojnu i preventivnu orijentaciju sistema. Profesionalna struktura trenerskog kadra i odnos sportista i trenera (13:1) predstavljaju indikatore institucionalne stabilnosti i kvaliteta rada. Analitička interpretacija ukazuje da organizovani i akreditirani inkluzivni sportski programi doprinose unapređenju motoričkih sposobnosti, razvoju samopouzdanja, jačanju socijalnih kompetencija i smanjenju stigmatizacije osoba s intelektualnim teškoćama. Zaključuje se da Specijalna olimpijada Bosne i Hercegovine predstavlja održiv model inkluzivnog sporta sa značajnim razvojnim i društveno-političkim implikacijama.

**Ključne riječi:** inkluzivni sport, intelektualne teškoće, funkcionalni razvoj, socijalna integracija, akreditacija

## INCLUSIVE SPORTS PROGRAMS OF SPECIAL OLYMPICS BOSNIA AND HERZEGOVINA AS A FACTOR OF FUNCTIONAL DEVELOPMENT, SOCIAL INTEGRATION, AND PUBLIC POLICY DEVELOPMENT

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### ABSTRACT:

Inclusive sport for persons with intellectual disabilities represents an important component of contemporary public health and social inclusion policies. Sport is increasingly recognized as a mechanism for functional development, health promotion, and reduction of social isolation among vulnerable populations. The aim of this study was to analyze the structural and developmental characteristics of the Special Olympics Bosnia and Herzegovina system and to assess its contribution to functional development and social integration of persons with intellectual disabilities. The research was conducted as a descriptive-analytical cross-sectional study based on Census 2025 data and institutional documentation. The sample included 11,514 registered athletes and 868 certified coaches. Results indicate dominant participation of children and adolescents aged 6–15 years (78%), reflecting strong developmental and preventive orientation. The coach-to-athlete ratio (13:1) confirms institutional stability and professional capacity. Findings suggest that structured and accredited inclusive sport programs contribute to motor skill development, enhanced self-confidence, improved social competencies, and reduced stigmatization. The study concludes that Special Olympics Bosnia and Herzegovina represents a sustainable inclusive sport model with significant developmental and policy implications.

**Keywords:** inclusive sport, intellectual disability, functional development, social integration, accreditation

## UTJECAJ POLOŽAJA OČIJU ISPITANIKA NA REZULTATE MJERENJA RAVNOTEŽE BIODEX BALANCE SISTEMOM

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### SAŽETAK:

Biodex Balance System pokazao se kao pouzdan uređaj za testiranje ravnoteže. Neki konstruktivni nedostaci vezani uz sami uređaj, kao na primjer minimalna i maksimalna visina položaja ekrana, mogli bi utjecati na točnost izmjerenih parametara ravnoteže. Ovim istraživanjem pokušalo se utvrditi postoji li razlika između rezultata testova ravnoteže kada je ekran Biodex Balance sistema moguće dovesti u razinu očiju ispitanika i rezultata testova ravnoteže kada to nije moguće napraviti zbog konstrukcijskih nedostataka samog uređaja. Rezultati t-testa nisu pokazali nikakvu statistički značajnu razliku među grupama ispitanika, ali je detektiran potencijalni problem vezan uz maksimalnu visinu položaja ekrana koja očito nije primjerena određenoj populaciji ispitanika.

**Glavne riječi:** testiranje ravnoteže, visina očiju, t-test, ukupni indeks stabilnosti, visina ekrana

## THE INFLUENCE OF THE EYES POSITION OF THE PARTICIPANTS ON THE RESULTS OF BALANCE MEASUREMENT WITH THE BIODEX BALANCE SYSTEM

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### ABSTRACT:

The Biodex Balance System has proven to be a reliable balance testing device. Some construction lacks related to the device itself, such as the minimum and maximum height of the screen position, could affect the accuracy of the measured balance parameters. This research tried to determine if there is a difference between the results of balance tests when the screen of the Biodex Balance system can be brought to the eye level of the examinee and the results of balance tests when it is not possible to do this due to the construction lacks of the device itself. The results of the t-test did not show any statistically significant difference between the groups of participants, but a potential problem was detected related to the maximum height of the screen position, which is obviously not suitable for a certain population of participants.

**Key words:** balance testing, eye height, t-test, total stability index, screen height

## DIFFERENCES IN RELATIVE AND ABSOLUTE STRENGTH BETWEEN MALE AND FEMALE WEIGHTLIFTERS: ANALYSIS OF NATIONAL CHAMPIONSHIP RESULTS

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### **ABSTRACT:**

The aim of this study was to determine the differences in absolute and relative strength between male and female weightlifters and to examine the relationships between standardized and absolute performance indicators in the specific context of competitive Olympic weightlifting. The sample consisted of 79 senior athletes (48 males and 31 females) who participated in the 2024 National Weightlifting Championships. The analysed variables included body mass, snatch, clean and jerk, total (absolute strength), relative strength (total/body mass), and Sinclair points. Descriptive statistics, an independent samples t-test, and Pearson correlation analysis were applied. The results indicated significantly higher absolute strength values in male lifters, whereas differences in relative strength were less pronounced. Strong positive correlations were found between absolute and relative strength as well as between total and Sinclair points in both sexes. In conclusion, sex significantly influences absolute strength indicators in weightlifting, while relative strength and standardized coefficients provide a more objective basis for comparing competitive performance between male and female weightlifters.

**Keywords:** Olympic weightlifting, relative strength, absolute strength, Sinclair coefficient, sex differences, performance analysis

## RELACIJE POSTURALNOG STATUSA SA MOTORIČKIM SPOSOBNOSTIMA I ANTOPOMETRIJSKIM DIMENZIJAMA KOD DJEVOJČICA 11-13 GODINA

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### SAŽETAK:

Period juvenilne akceleracije kod djevojčica predstavlja osjetljivu fazu rasta i razvoja koja značajno utiče na formiranje posturalnog statusa. Cilj ovog istraživanja bio je ispitati relacije između motoričkih sposobnosti, antropometrijskih dimenzija i posturalnog statusa kod djevojčica uzrasta 11–13 godina. Uzorak je činilo 74 učenice osnovnih škola u Tuzli. Primijenjeno je sedam antropometrijskih varijabli, devet testova za procjenu motoričkih sposobnosti i osam varijabli za procjenu posturalnog statusa. Za utvrđivanje intenziteta i smjera povezanosti korištena je linearna korelaciona analiza. Rezultati su pokazali statistički značajne relacije između posturalnog statusa i motoričkih sposobnosti, posebno fleksibilnosti, agilnosti, ravnoteže, eksplozivne snage i mišićne aerobne izdržljivosti. Najizraženija relacija utvrđena je između fleksibilnosti i ocjene držanja nogu. Povećana longitudinalna dimenzionalnost skeletnog sistema bila je značajno povezana sa posturalnim devijacijama gornjih segmenata tijela, dok su povećana tjelesna masa i veća količina potkožnog masnog tkiva bile negativno povezane sa posturalnim statusom donjih ekstremiteta. Dobijeni rezultati ukazuju da su posturalne devijacije u periodu puberteta vjerovatno posljedica disproporcionalnog rasta skeletnog sistema i nedovoljne mišićne razvijenosti. Nalazi mogu poslužiti kao osnova za planiranje preventivnih i korektivnih kinezioloških intervencija u ranom adolescentnom periodu.

**Ključne riječi:** posturalni status, motoričke sposobnosti, antropometrijske dimenzije, juvenilna akceleracija, djevojčice

## RELATIONSHIPS BETWEEN POSTURAL STATUS, MOTOR ABILITIES, AND ANTHROPOMETRIC DIMENSIONS IN GIRLS AGED 11–13 YEARS

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### ABSTRACT:

The period of juvenile acceleration in girls represents a sensitive phase of growth and development that significantly influences postural formation. The aim of this study was to examine the relationships between motor abilities, anthropometric dimensions, and postural status in girls aged 11–13 years. The sample consisted of 74 female students from primary schools in Tuzla. Seven anthropometric variables, nine motor ability tests, and eight postural assessment variables were applied. Linear correlation analysis was used to determine the strength and direction of the relationships between variables. The results showed significant associations between postural status and motor abilities, particularly flexibility, agility, balance, explosive strength, and muscular aerobic endurance. The strongest relationship was found between flexibility and leg posture. Increased longitudinal skeletal growth was significantly associated with postural deviations in upper body segments, while higher body mass and greater subcutaneous adipose tissue were negatively associated with lower extremity posture. The findings indicate that postural deviations during puberty may result from disproportionate skeletal growth and insufficient muscular development. These results may provide important guidelines for preventive and corrective kinesiological interventions in early adolescence.

**Keywords:** posture, motor abilities, anthropometry, puberty, adolescent girls

## SPOL KAO SOCIODEMOGRAFSKA ODREDNICA EFEKATA PROGRAMA CJELODNEVNE ŠKOLE NA FITNES STATUS DJECE

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### SAŽETAK:

Cilj ovog rada bio ispitati učinke tromjesečne provedbe programa cjelodnevne škole na morfološka obilježja i sastav tijela djece rane školske dobi, uz poseban naglasak na spolno specifične razlike u odgovorima na intervenciju. Uzorak je sačinjavalo 118 učenika rane školske dobi (9–11 godina; 54 djevojčice), a koji su pohađali 3. i 4. razred osnovne škole na području Splitsko-dalmatinske županije. Uzorak je bio podijeljen u eksperimentalnu grupu ( $n = 51$ , pohađali cjelodnevnu školu) i kontrolnu grupu ( $n = 67$ , pohađali standardni školski program). Morfološka obilježja i sastav tijela procijenjeni su standardiziranim antropometrijskim i bioimpedancijskim mjerenjima, a uključivali su visinu, masu, BMI, postotak masnog tkiva i postotak mišićnog tkiva. Višefaktorskom analizom varijance za ponovljena mjerenja utvrđene su značajne promjene za sve varijable. Diferencijalni efekti programa cjelodnevne škole uočljivi su kod varijabli tjelesna visina, postotak masnog tkiva i postotak mišićnog tkiva. Nije utvrđen spolno-specifični utjecaj eksperimentalnog programa. Izostanak spolno specifičnih efekata upućuje na moguću izjednačavajući učinak cjelodnevne škole na obrasce tjelesnog razvoja kod djece rane školske dobi.

**Ključne riječi:** spol, dob, sociodemografske značajke, cjelodnevna škola

## SEX AS A SOCIODEMOGRAPHIC DETERMINANT OF THE EFFECTS OF THE WHOLE- DAY SCHOOL PROGRAM ON CHILDREN'S FITNESS STATUS

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### ABSTRACT:

The aim of this study was to examine the effects of a three-month implementation of the Whole-Day School program on morphological characteristics and body composition in early school-aged children, with particular emphasis on sex-specific differences in response to the intervention. The sample consisted of 118 children aged 9–11 years (54 girls), attending the 3rd and 4th grades of primary school in the Split-Dalmatia County. Participants were divided into an experimental group ( $n = 51$ , enrolled in the Whole-Day School program) and a control group ( $n = 67$ , attending the standard school program). Morphological characteristics and body composition were assessed using standardized anthropometric and bioelectrical impedance measurements, including body height, body mass, BMI, body fat percentage, and skeletal muscle percentage. A multifactorial repeated-measures analysis of variance revealed significant changes across all variables. Differential effects of the Whole-Day School program were observed for body height, body fat percentage, and skeletal muscle percentage. No sex-specific effects of the experimental program were identified. The absence of sex-specific differences suggests a potential equalizing effect of the Whole-Day School program on patterns of physical development in early school-aged children.

**Keywords:** sex, age, sociodemographic characteristics, whole-day school

## PROMOCIJA WELLBEING PROGRAMA U CILJU UNAPREĐENJA ZDRAVLJA ŽENA NAKON 35. GODINE

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### SAŽETAK:

Savremeni način života karakteriše povećan nivo stresa, sjedilački rad, nedovoljna fizička aktivnost i izražene hormonalne promjene, što posebno pogađa žene nakon 35. godine života. U ovom periodu često se javljaju simptomi perimenopauze i menopauze, anksioznost, poremećaji sna, umor i mišićno-koštani bol. Integrativni well-being programi koji kombinuju holistički fitness, jogu, relaksaciju i tehnike emocionalne regulacije predstavljaju efikasan model prevencije i unapređenja zdravlja. Koncept wellbeinga podrazumijeva integrativni pristup, u kojem se fizičko zdravlje, emocionalna ravnoteža i psihološka otpornost posmatraju kao međusobno povezani elementi. Sportsko-rekreativne aktivnosti, kroz holistički fitness, disanje i relaksacione tehnike sve više se prepoznaju kao efikasni alati prevencije stresa i unapređenja zdravlja. Cilj ovog rada je ispitati efekte strukturiranog well-being programa na fizičko i mentalno zdravlje žena srednje životne dobi. Istraživanje sprovedeno na uzorku od 40 žena pokazuje značajno smanjenje stresa i anksioznosti te poboljšanje kvaliteta sna i energije. Dobijeni rezultati potvrđuju da well-being programi imaju značajan pozitivan efekat na kvalitet života žena srednje životne dobi. Well-being programi doprinose smanjenu stresa tako što sistemski djeluju na psihološke, fizičke i organizacione faktore koji uzrokuju napetost. Posebno su važni u poslovnom okruženju, jer direktno utiču na produktivnost, zadovoljstvo i mentalno zdravlje zaposlenih.

**Ključne riječi:** well-being, zdravlje žena, rekreacija, stres menadžment, promocija

## PROMOTION OF THE WELL- BEING PROGRAM IN ORDER TO IMPROVE THE HEALTH OF WOMEN AFTER THE AGE OF 35

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### ABSTRACT:

The modern way of life is characterized by an increased level of stress, sedentary work, insufficient physical activity and pronounced hormonal changes, which especially affects women after the age of 35. During this period, symptoms of perimenopause and menopause, anxiety, sleep disorders, fatigue and musculoskeletal pain often appear. Integrative well-being programs that combine holistic fitness, yoga, relaxation and emotional regulation techniques represent an efficient model of prevention and improvement of health. The concept of well-being implies an integrative approach, in which physical health, emotional balance and psychological resilience are viewed as interconnected elements. Sports and recreational activities, through holistic fitness, breathing and relaxation techniques are increasingly recognized as effective tools for stress prevention and health improvement. The aim of this work is to examine the effects of a structured well-being program on the physical and mental health of middle-aged women. Research conducted on a sample of 40 women shows a significant reduction in stress and anxiety and an improvement in the quality of sleep and energy. The obtained results confirm that well-being programs have a significant positive effect on the quality of life of middle-aged women. Wellbeing programs contribute to reduced stress by systematically acting on psychological, physical and limiting factors that cause tension. They are especially important in the business environment, because they directly affect the productivity, satisfaction and mental health of employees.

**Keywords:** well-being, women's health, recreation, stress management, promotion

## USPOREDBA UTJECAJA DVA RAZLIČITA REKREATIVNA PROGRAMA TRENINGA NA ANTORPOLOŠKI STATUS VJEŽBAČICA – PRIKAZ SLUČAJA

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### SAŽETAK:

Cilj ovog istraživanja bio je prikazati učinke različitih vrsta tjelesnog vježbanja na antropološki status dviju vježbačica, u dobi od 35 i 38 godina. U ovom istraživanju provedena su dva različita eksperimentalna postupka u trajanju od 12 tjedana (5 treninga tjedno). Prva ispitanica je podvrgnuta eksperimentalnom postupku 1 (EP1) kojeg možemo definirati kao visoko intenzivni intervalni trening, dok je druga ispitanica bila podvrgnuta eksperimentalnom postupku 2 (EP2), koji je sačinjen od treninga nižeg intenziteta. Rezultati kod oba programa ukazuju na minimalne pozitivne promjene u morfološkim obilježjima. Vidljiv je značajan napredak na svakom pojedinom testu motoričkih sposobnosti kod oba programa. Međutim, ispitanica iz EP1 je postigla značajno bolje rezultate na specifičnim testovima funkcionalnih sposobnosti, što ukazuje na primjerenost visoko intenzivnog intervalnog treninga za razvoj izdržljivosti. Rezultati ovog istraživanja doveli su do zaključka da obje ispitanice nisu značajno transformirale morfološka obilježja, ali su značajno unaprijedile motoričke i funkcionalne sposobnosti. Nedostatak napretka na morfološkom planu se vjerojatno može pripisati nedostatku kontrole prehrambenih navika obiju ispitanica, te bi u budućim istraživanjima trebalo povesti računa o planu prehrane prilikom provođenja trenažnih postupaka.

**Ključne riječi:** HIIT, visoko intenzivni intervalni trening, trening snage, transformacije

## COMPARISON OF THE IMPACT OF TWO DIFFERENT RECREATIONAL TRAINING PROGRAMS ON THE ANTHROPOLOGICAL STATUS OF FEMALE EXERCISERS – CASE REPORT

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### ABSTRACT:

The aim of this study was to analyze the fitness status of two healthy female subjects (aged 35 and 38), after conducting two different types of training programs (12 weeks - 5 training sessions per week). The first subject was conducting the experimental program 1 (EP1), which can be defined as high-intensity interval training (HIIT), while the second subject was subjected to experimental procedure 2 (EP2), which can be defined as low intensity training. The results of both programs indicate a minimal positive changes in body composition in both programs. A significant improvement is visible on every single test of skills in both programs. However, the subject from EP1 achieved significantly better results in specific endurance tests. The results of this study indicate that both subjects did not significantly transform their body composition, but significantly improved their motor abilities and endurance, especially in EP1. The lack of progress on the body composition can probably be explained by the lack of nutrition program, and future studies should take into account the diet plan when conducting training procedures.

**Keywords:** HIIT, training protocol, female, adipose tissue

## KOMPARATIVNA ANALIZA NEKIH MOTORIČKIH SPOSOBNOSTI DVE GENERACIJE FUDBALERA PIONIRSKOG UZRASTA

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### SAŽETAK:

Cilj ovog rada je utvrđivanje statističke značajnosti u razlikama aritmetičkih sredina u nekim motoričkim sposobnostima kod dve generacije fudbalera, pionirskog uzrasta FK „Polet“ Karavukovo sa vremenskom razlikom od 15 godina. U istraživanju je učestvovalo ukupno 23 fudbalera pionira uzrasta 13 godina ( $\pm 6$  meseci), koji su bili članovi FK „Polet“ iz Karavukova podeljenih u dve grupe. Statistička obrada podataka i analize su urađene pomoću softvera IBM SPSS (Statistical Package of Social Science) verzija 25. U radu je primenjen t-test nezavisnih uzoraka za ispitivanje razlika između dve grupe ispitanika. Na osnovu rezultata ove studije, može se zaključiti da se ispitanici dve grupe fudbalera pionirskog uzrasta statistički značajno razlikuju u sledećim testovima: skok udalj iz mesta, broj urađenih sklekova, slalom bez lopte na 20m, brzina na 20m i 60m. **Ključnereči:** fudbal, motorika, pioniri, razlike, rezultati.

## COMPARATIVE ANALYSIS OF SOME MOTOR SKILLS OF TWO GENERATIONS OF PIONEER-AGE FOOTBALL PLAYERS

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### ABSTRACT:

The aim of this study is to determine the statistical significance of the differences in arithmetic means in some motor skills in two generations of football players, pioneer age FK “Polet” Karavukovo with a time difference of 15 years. A total of 23 pioneer football players aged 13 years ( $\pm 6$  months), who were members of FK “Polet” from Karavukovo, participated in the study, divided into two groups. Statistical data processing and analysis were performed using IBM SPSS (Statistical Package of Social Science) version 25 software. The independent samples t-test was applied in the study to examine the differences between the two groups of respondents. Based on the results of this study, it can be concluded that the respondents of the two groups of football players of pioneer age differ statistically significantly in the following tests: long jump from a standing position, number of push-ups performed, slalom without a ball at 20m, speed at 20m and 60m. **Keywords:** football, motor skills, pioneers, differences, results.

## DIGITALNE STRATEGIJE SPORTSKIH ORGANIZACIJA I ANGAŽMAN MLADIH U FUNKCIJI RAZVOJA ZDRAVIH ŽIVOTNIH NAVIKA: ANALIZA SEKUNDARNIH PODATAKA

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### SAŽETAK:

Ovaj rad analizira na koji način savremene digitalne marketinške strategije sportskih organizacija – uključujući socialfirst sadržaj, video formate, realtime komunikaciju i multikanalne modele distribucije – utiču na angažman mladih i promociju zdravih životnih navika. Istraživanje se zasniva na savremenim teorijskim pristupima fizičkom vaspitanju i sportu mladih i ispituje kako digitalni sadržaji mogu motivisati mlade generacije da se aktivnije uključuju u sportske i rekreativne aktivnosti te da razvijaju pozitivne obrasce ponašanja povezane sa zdravljem. Empirijski dio rada zasniva se na analizi sekundarnih izvora podataka i primjeni statističkih metoda, uključujući deskriptivnu statistiku, korelacione testove i višestruku linearnu regresiju. Rezultati pokazuju da model objašnjava približno 30% varijanse engagement ratea mladih (ER). Varijabla socialfirst sadržaja ostvaruje statistički značajan efekat ( $p < 0.01$ ), dok video sadržaji i realtime formati pokazuju pozitivne, ali statistički neznačajne koeficijente. Datadriven pristupi bilježe efekat blizu nivoa značajnosti ( $p \approx 0.055$ ). Korelaciona analiza ukazuje na umjerenе pozitivne veze između ERa i udjela video sadržaja ( $r = 0.365$ ) te realtime formata ( $r = 0.178$ ). Uprkos ograničenjima malog i djelimično standardizovanog uzorka, nalazi pokazuju pozitivan trend u podsticanju angažmana mladih kroz savremene digitalne formate. Doprinos rada ogleda se u povezivanju digitalnog marketinga sa savremenim konceptima fizičkog vaspitanja i zdravlja mladih te u ukazivanju na potencijal digitalnih strategija da doprinesu promociji sportskog ponašanja i aktivnog načina života.

**Ključne riječi:** Digitalni marketing, menadžemnt sportskih organizacija, zdrave životne navike

## DIGITAL STRATEGIES OF SPORTS ORGANIZATIONS AND YOUTH ENGAGEMENT IN THE FUNCTION OF DEVELOPING HEALTHY LIFESTYLE HABITS: SECONDARY DATA ANALYSIS

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### **ABSTRACT:**

This paper analyzes how modern digital marketing strategies of sports organizations – including socialfirst content, video formats, real-time communication and multi-channel distribution models – affect youth engagement and the promotion of healthy lifestyle habits. The research is based on contemporary theoretical approaches to physical education and youth sports and examines how digital content can motivate young generations to be more actively involved in sports and recreational activities and to develop positive patterns of health-related behavior. The empirical part of the paper is based on the analysis of secondary data sources and the application of statistical methods, including descriptive statistics, correlation tests and multiple linear regression. The results show that the model explains approximately 30% of the variance in youth engagement rate (ER). The socialfirst content variable has a statistically significant effect ( $p < 0.01$ ), while video content and real-time formats show positive, but statistically insignificant coefficients. Datadriven approaches recorded an effect close to the significance level ( $p \approx 0.055$ ). Correlation analysis indicates moderate positive relationships between ER and the share of video content ( $r = 0.365$ ) and real-time format ( $r = 0.178$ ). Despite the limitations of a small and partially standardized sample, the findings show a positive trend in encouraging youth engagement through modern digital formats. The contribution of the paper is reflected in connecting digital marketing with modern concepts of physical education and youth health, and in pointing out the potential of digital strategies to contribute to the promotion of sports behavior and active lifestyle.

**Keywords:** Digital marketing, management of sports organizations, healthy lifestyle habits

## DIGITALNE MARKETING STRATEGIJE SPORTSKIH ORGANIZACIJA U FUNKCIJI POVEĆANJA PARTICIPACIJE GRAĐANA U SPORTU I REKREACIJI

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### SAŽETAK:

Ovaj rad analizira efekat savremenih digitalnih marketinških strategija sportskih organizacija na povećanje uključenosti građana u rekreativne aktivnosti. Fokus je na multikanalnim modelima distribucije sadržaja (OTT i FAST), socialfirst pristupima i AIzasnovanoj personalizaciji. Istraživanje se zasniva na sekundarnim podacima koji su standardizovani i rekombinovani u simulirani dataset od 20 jedinica, čime je omogućena primjena osnovnih statističkih tehnika. Primijenjeni su deskriptivna analiza, Poisson GLM modeli i neparametrijski testovi radi procjene uticaja digitalnih strategija na digitalni domet i reakcije publike. Rezultati Poisson GLM modela pokazuju da FAST platforme ostvaruju najsnažniji pozitivan efekat na broj pregleda ( $\beta = 0.4539$ ;  $p = 0.0661$ ), dok OTT platforme imaju umjeren, ali statistički neznačajan doprinos ( $\beta = 0.337$ ;  $p = 0.1708$ ). Broj digitalnih kanala pokazuje slab negativan efekat ( $\beta = -0.1123$ ;  $p = 0.2055$ ). Ttest ne potvrđuje da AIpersonalizacija značajno utiče na open rate ( $p = 0.8582$ ). Nalazi ukazuju na postojanje pozitivnog, ali ograničeno statistički potkrijepljenog trenda u korist multikanalnih i FAST modela distribucije.

Ograničenja proističu iz malog i simuliranog uzorka, što smanjuje mogućnost generalizacije rezultata. Ipak, rad doprinosi literaturi time što povezuje digitalne platforme sa potencijalom za povećanje informisanosti i motivacije građana u oblasti rekreativnog sporta.

**Ključne riječi:** Digitalni marketing, sportski menadžment, AI u marketingu, upravljanje digitalnim sadržajem

## DIGITAL MARKETING STRATEGIES OF SPORTS ORGANIZATIONS IN THE FUNCTION OF INCREASING CITIZEN PARTICIPATION IN SPORTS AND RECREATION

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### APSTRACT:

This paper analyzes the effect of modern digital marketing strategies of sports organizations on increasing the involvement of citizens in recreational activities. The focus is on multi-channel content distribution models (OTT and FAST), socialfirst approaches and AI-based personalization. The research is based on secondary data that are standardized and recombined into a simulated dataset of 20 units, which enables the application of basic statistical techniques. Descriptive analysis, Poisson GLM models, and nonparametric tests were applied to assess the impact of digital strategies on digital reach and audience response. The results of the Poisson GLM model show that FAST platforms have the strongest positive effect on the number of views ( $\beta = 0.4539$ ;  $p = 0.0661$ ), while OTT platforms have a moderate, but statistically insignificant contribution ( $\beta = 0.337$ ;  $p = 0.1708$ ). The number of digital channels shows a weak negative effect ( $\beta = -0.1123$ ;  $p = 0.2055$ ). Ttest does not confirm that AI personalization significantly affects the open rate ( $p = 0.8582$ ). The findings indicate the existence of a positive, but limited statistically substantiated trend in favor of multichannel and FAST distribution models.

Limitations arise from a small and simulated sample, which reduces the possibility of generalizing the results. However, the paper contributes to the literature by connecting digital platforms with the potential to increase the information and motivation of citizens in the field of recreational sports.

**Keywords:** Digital marketing, sports management, AI in marketing, digital content management

## EFFECTS OF THE SCHOOL YEAR PHYSICAL EDUCATION CURRICULUM ON PHYSICAL FITNESS IN GRADE 5 AND GRADE 7 STUDENTS: A PRE-POST STUDY

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### ABSTRACT:

Monitoring physical fitness across the school year can inform physical education teachers about possible interventions in curriculum and to identify domains needing targeted programming. Aim of the study was to examine changes from the beginning to the end of one academic year in Grade 5 and Grade 7 students and test whether improvements differed by grade. Participants of the study were 65 students from elementary school which completed initial (September 2024) and final (June 2025) testing (Grade 5: N=42; Grade 7: N=23). Variables included body height, body mass, sit-ups, standing long jump and an agility polygon shuttle task. Within-grade changes were tested with paired t-tests (Cohen's *d*) and between-grade differences in change were tested using change scores (Welch's t-test). Both grades increased in height and mass (Grade 5: ATV  $\Delta=4.14\pm 1.57$  cm; ATT  $\Delta=3.79\pm 2.99$  kg; both  $p<0.001$ ; Grade 7: ATV  $\Delta=3.61\pm 2.23$  cm; ATT  $\Delta=4.35\pm 3.97$  kg; both  $p<0.001$ ). Standing long jump improved significantly in both grades (Grade 5:  $\Delta=12.80\pm 12.00$  cm,  $p<0.001$ ,  $d_z=1.07$ ; Grade 7:  $\Delta=14.87\pm 11.03$  cm,  $p<0.001$ ,  $d_z=1.35$ ). Sit-ups did not change (Grade 5:  $p=0.673$ ; Grade 7:  $p=0.552$ ). Agility polygon improved modestly but not significantly (Grade 5:  $p=0.232$ ; Grade 7:  $p=0.077$ ). Changes did not differ between grades for any outcome (all  $p\geq 0.316$ ). Over one academic year students showed clear gains in anthropometrics and lower body power, while trunk endurance and agility showed limited changes in their results with similar improvements in both Grades 5 and 7.

**Keywords:** Schoolchildren; School field-based testing; Anthropometry; Trunk endurance; Agility

## EVALUATING THE IMPACT OF BODY FAT PERCENTAGE AND BODY MASS ON ON-FIELD PERFORMANCE IN ELITE FOOTBALL REFEREES

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### ABSTRACT:

This study aimed primarily to investigate the impact of morphological characteristics, specifically body fat percentage, on the quality of football refereeing. A secondary objective was to establish the morphological profile of elite football referees officiating in the highest competitive tier in Croatia. The sample comprised 17 referees, representing the entire population of individuals authorized to officiate in the Croatian First Football League during the 2022/2023 season, under the auspices of the Croatian Football Federation. Using simple linear regression analysis, the relationships between anthropometric and morphological variables, measured according to standardized anthropometric protocols, and the quality were examined. Analysis did not reveal a statistically significant association between body fat percentage and quality of refereeing ( $p = 0.476$ ). Furthermore, the Durbin-Watson test, with value of 2.115 indicates the absence of autocorrelation among residual values, thereby demonstrating the independence of residuals and the absence of intercorrelation between variables. The hypothesis positing a significant association between an elevated percentage of body fat in football referees and a lower quality of refereeing quality was tested and subsequently rejected, given the lack of statistical significance. Despite the observed variability in the percentage of body fat within the referee population, no statistically significant relationship with the quality of the field performance was identified. It is postulated that, should the sample or the qualitative ranking of participants exhibit greater heterogeneity, a statistically significant association with refereeing quality may potentially be established.

**Keywords:** anthropometric measures, soccer referees, refereeing quality, main referees; diagnostics

## ANALIZA KVANTITATIVNIH PROMJENA MOTORIČKIH SPOSOBNOSTI POD UTICAJEM PROGRAMIRANOG RADA

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### SAŽETAK:

Istraživanje je provedeno na uzorku od 50 ispitanica-mladih odbojkašica koje redovno treniraju u OK „Modriča-Novoprom“ iz Modriče. U istraživanju je primijenjen set od 18 varijabli za procjenu motoričkih sposobnosti koje relativno dobro pokrivaju motorički prostor. Osnovni cilj istraživanja bio je da se utvrde parcijalne i globalne kvantitativne promjene (razlike) motoričkih sposobnosti pod uticajem šestomjesečnog eksperimentalnog programa odbojke.

Da bi se utvrdile parcijalne kvantitativne promjene (razlike) motoričkih sposobnosti primijenjen je T test za zavisne uzorke. Globalne kvantitativne promjene (razlike) motoričkih sposobnosti utvrđene su primjenom kanoničke diskriminativne analize.

Rezultati analize rezultata T testa pokazuju da je pod uticajem šestomjesečnog programa odbojke došlo do statistički značajnih parcijalnih promjena (razlika) kod osam od ukupno osamnaest motoričkih sposobnosti kod mladih odbojkašica. Rezultati kanoničke diskriminativne analize pokazuju da je došlo do statistički značajnih globalnih kvantitativnih promjena (razlika) u prostoru motoričkih sposobnosti pod uticajem primijenjenog programa odbojke u trajanju šest mjeseci.

Dobiveni rezultati mogu biti od koristi svim trenerima u odbojkaškim klubovima, školama odbojke kao i profesorima fizičkog vaspitanja u svrhu kvalitetnijeg programiranja i praćenja trenažnog (nastavnog) rada.

**Ključne riječi:** globalne i parcijalne promjene, program rada, kanonička diskriminativna analiza, T test, učenici.

## ANALYSIS OF QUANTITATIVE CHANGES IN MOTOR ABILITIES UNDER THE INFLUENCE OF PROGRAMMED WORK

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### ABSTRACT

The research was conducted on a sample of 50 participants – young female volleyball players who regularly train at OK "Modriča-Novoprom" from Modriča. The study used a set of 18 variables to assess motor skills, which relatively well cover the motor space. The primary aim of the research was to determine the partial and global quantitative changes (differences) in motor skills under the influence of a six-month experimental volleyball program.

To determine the partial quantitative changes (differences) in motor skills, a T-test for dependent samples was applied. Global quantitative changes (differences) in motor skills were determined using canonical discriminant analysis.

The results of the T-test analysis show that under the influence of the six-month volleyball program, statistically significant partial changes (differences) occurred in eight out of the eighteen motor skills in young female volleyball players. The results of the canonical discriminant analysis show that statistically significant global quantitative changes (differences) in motor skills occurred under the influence of the six-month applied volleyball program.

The results obtained may be useful for all coaches in volleyball clubs, volleyball schools, and physical education teachers for better programming and monitoring of training (teaching) activities.

**Keywords:** global and partial changes, training program, canonical discriminant analysis, T-test, students.

## RAZLIKE U FUNKCIONALNIM SPOSOBNOSTIMA MLAĐIH I STARIJIH JUNIORA U VATERPOLU

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### SAŽETAK

Istraživanje je izvršeno s ciljem utvrđivanja razlika u funkcionalnim sposobnostima između mlađih (14–16 godina) i starijih juniora (16–18 godina) u vaterpolu. Ukupan uzorak ispitanika činilo je 174 ispitanika iz sljedećih vaterpolo klubova: VK „Borac“ iz Banja Luke, VK „Mladost“, VK „Torpedo“ i VK „Invictum“ svi iz Sarajeva podijeljenih u dvije uzrasne kategorije prema pravilima Vaterpolo saveza BiH.

Uzorak varijabli činilo je devet funkcionalnih sposobnosti procjenjivanih spirometrijskim parametrima u različitim položajima (stojeći i ležeći) u prvoj i šestoj sekundi prije i poslije opterećenja.

Za sve primijenjene varijable funkcionalnih sposobnosti izračunati su osnovni centralni i disperzioni parametri. Za utvrđivanje razlika u funkcionalnim sposobnostima između mlađih i starijih juniora u vaterpolu primijenjena je analiza rezultata T-testa za nezavisne uzorke.

Dobijeni osnovni i centralni disperzioni parametri pokazuju normalnu distribuciju svih varijabli kod obje grupe ispitanika.

Rezultati T-testa ukazuju na statistički značajne razlike u šest od devet funkcionalnih parametara u korist starijih juniora, posebno u protoku zraka u prvoj i šestoj sekundi poslije opterećenja, te varijabli „starost pluća.“

Utvrđene razlike ukazuju da uzrasna dob i kontinuitet trenažnog procesa imaju značajan uticaj na razvoj funkcionalnih sposobnosti mladih vaterpolista.

Dobijeni rezultati mogu biti od koristi boljem razumijevanju razvoja ventilacijskih sposobnosti sportista u vodenom okruženju, procesu selekcije i programiranja trenažnih opterećenja.

**Ključne riječi:** funkcionalne sposobnosti, juniori, spirometrija, razlike, vaterpolo.

## DIFFERENCES IN FUNCTIONAL CAPABILITIES OF YOUNGER AND OLDER JUNIORS IN WATER POLO

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### ABSTRACT

The research was conducted with the aim of determining the differences in functional abilities between younger (14–16 years) and older juniors (16–18 years) in water polo. The total sample of respondents consisted of 174 respondents from the following water polo clubs: VK "Borac" from Banja Luka, VK "Mladost", VK "Torpedo" and VK "Invictum" all from Sarajevo, divided into two age categories according to the rules of the Water Polo Federation of Bosnia and Herzegovina.

The sample of variables consisted of nine functional abilities assessed by spirometric parameters in different positions (standing and lying) in the first and sixth seconds before and after the load.

For all applied functional ability variables, the basic central and dispersion parameters were calculated. To determine the differences in functional abilities between younger and older juniors in water polo, an analysis of the results of the T-test for independent samples was applied.

The obtained basic and central dispersion parameters show a normal distribution of all variables in both groups of respondents.

The results of the T-test indicate statistically significant differences in six out of nine functional parameters in favor of the older juniors, especially in the air flow in the first and sixth seconds after exercise and the variable "lung age."

The established differences indicate that the age and continuity of the training process have a significant impact on the development of the functional abilities of young water polo players.

The obtained results can be useful for a better understanding of the development of ventilation abilities of athletes in the aquatic environment, the process of selection and programming of training loads.

**Key words:** functional abilities, juniors, spirometry, differences, water polo.

## RAZLIKE U SITUACIONO-MOTORIČKIM SPOSOBNOSTIMA MLADIH VATERPOLISTA

**Senad Bajrić<sup>1</sup>, Edin Mirvić<sup>2</sup>, Faris Rašidagić<sup>2</sup>, Alma Dizdar<sup>2</sup>**

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### SAŽETAK

Istraživanje je izvršeno s ciljem utvrđivanja razlika u situaciono-motoričkim sposobnostima između mladih (14–16 godina) i starijih juniora (16–18 godina) u vaterpolu. Ukupan uzorak ispitanika činilo je 174 ispitanika iz sljedećih vaterpolo klubova: VK „Borac“ iz Banja Luke, VK „Mladost“, VK „Torpedo“ i VK „Invictum“ svi iz Sarajeva podijeljenih u dvije uzrasne kategorije prema pravilima Vaterpolo saveza BiH. Za procjenu situaciono-motoričkih sposobnosti na tretiranom uzorku ispitanika primijenjeno je dvanaest varijabli specifičnih za vaterpolo igru.

Za sve primijenjene varijable situaciono-motoričkih sposobnosti izračunati su osnovni centralni i disperzioni parametri. Za utvrđivanje razlika u situaciono-motoričkim sposobnostima između mladih i starijih juniora u vaterpolu primijenjena je analiza rezultata T-testa za nezavisne uzorke.

Izračunati osnovni i centralni disperzioni parametri pokazuju normalnu distribuciju kod većine varijabli za obje grupe ispitanika-mladih vaterpolista. Dobijeni rezultati T-testa ukazuju na statistički značajne razlike između grupa ispitanika u varijablama koje direktno određuju napadačku efikasnost i manipulaciju loptom u korist starijih juniora: postignuti golovi (SMPOGO), golovi iz igre (SMGOIG), vođenje lopte 3x5m (VL3x5M) i brzina lopte (BRZLOP) na nivou statističke značajnosti ( $p < 0,05$ ). U ostalim varijablama nisu registrovane statistički značajne razlike, što ukazuje na sličan nivo ispoljavanja situaciono-motoričkih sposobnosti kod obje grupe ispitanika.

Dobijeni rezultati upućuju na zaključak da duže trenajno iskustvo i veća starosna dob doprinose većoj situacionoj efikasnosti u vaterpolo igri. Takođe, rezultati upućuju na potrebu posebnog usmjerenja mladih juniora ka razvoju brzine, koordinacije i tehnike u realizaciji napadačkih elemenata, čime se omogućava kvalitetniji prelazak u starije kategorije.

Dobijeni rezultati mogu poslužiti trenerima u sprovođenju kvalitetnije selekcije, dijagnostici i planiranju individualizovanog trenajnog procesa kod mladih vaterpolista.

**Ključne riječi:** juniori, situaciono-motoričke sposobnosti, efikasnost u igri, vaterpolo.

## DIFFERENCES IN SITUATIONAL-MOTOR SKILLS OF YOUNG WATER POLO PLAYERS

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### ABSTRACT

The research was conducted with the aim of determining the differences in situational-motor abilities between younger (14–16 years) and older juniors (16–18 years) in water polo. The total sample of respondents consisted of 174 respondents from the following water polo clubs: VK "Borac" from Banja Luka, VK "Mladost", VK "Torpedo" and VK "Invictum" all from Sarajevo, divided into two age categories according to the rules of the Water Polo Federation of Bosnia and Herzegovina. Twelve variables specific to the game of water polo were applied to assess the situational-motor abilities of the treated sample of respondents.

For all applied variables of situational-motor abilities, the basic central and dispersion parameters were calculated. To determine the differences in situational-motor abilities between younger and older juniors in water polo, an analysis of the results of the T-test for independent samples was applied.

The calculated basic and central dispersion parameters show a normal distribution for most variables for both groups of respondents-young water polo players. The obtained results of the T-test indicate statistically significant differences between the groups of respondents in the variables that directly determine attacking efficiency and ball manipulation in favor of older juniors: goals scored (SMPOGO), field goals (SMGOIG), ball handling 3x5m (VL3X5M) and ball speed (SPEED) at the level of statistical significance ( $p < 0.05$ ). No statistically significant differences were registered in the other variables, which indicates a similar level of manifestation of situational-motor skills in both groups of subjects.

The obtained results point to the conclusion that longer training experience and older age contribute to greater situational efficiency in the water polo game. Also, the results point to the need for special orientation of younger juniors towards the development of speed, coordination and technique in the realization of attacking elements, which enables a better transition to older categories.

The obtained results can be used by coaches in carrying out better selection, diagnosis and planning of individualized training process for young water polo players.

**Key words:** juniors, situational-motor skills, efficiency in the game, water polo.

# ANALIZA POTROŠNJE KOMPRIMIRANOG VAZDUHA KOD MUŠKARACA I ŽENA U SLATKOJ I SLANOJ VODI

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## SAŽETAK

Osnovni cilj istraživanja bio je utvrđivanje razlika u potrošnji komprimiranog vazduha između muškaraca i žena ronilaca pri ronjenju u slatkoj (rijeka Vrbas) i slanoj (mjesto Rose u Crnoj Gori) vodi na različitim dubinama zarona.

Uzorak ispitanika činili su članovi ronilačkog kluba „BUK“ iz Banja Luke oba pola sa osnovnim (P1) nivoom obuke u ronjenju. Uzorak varijabli predstavljale su mjere potrošnje kiseonika u slatkoj vodi na dubini do 10m i potrošnje kiseonika u slanoj vodi na dubini od 20 do 30m i od 30 do 40m.

U okviru obrade podataka izračunati su i utvrđeni osnovni deskriptivni statistički parametri za sve ispitanike, u slatkoj vodi u dubinskoj zoni do 10 m i slanoj vodi u dvije dubinske zone: od 20 do 30 m i od 30 do 40 m. Za utvrđivanje statistički značajnih razlika u potrošnji komprimiranog vazduha između dvije grupe ispitanika u odnosu na vrstu sredine i dubinu zarona primijenjena je analiza rezultata T - testa za nezavisne uzorke.

Analiza podataka prikupljenih tokom ronjenja u slatkoj vodi (r. Vrbas) na dubini do 10m, sprovedena primjenom T-testa za nezavisne uzorke pokazala je da ne postoji statistički značajna razlika u potrošnji komprimiranog vazduha između muških i ženskih ronilaca. Vrijednost p koja je blizu granične ( $p \approx 0.07$ ) sugerise postojanje blage tendencije veće potrošnje kod muškaraca, ali ta tendencija nije dovoljno izražena da bi bila statistički značajna.

Analiza podataka prikupljenih tokom ronjenja u slanoj vodi (mjesto Rose u Crnoj Gori) obuhvatila je dvije dubinske zone: od 20 do 30m i od 30 do 40m. U zoni od 20 do 30 metara, T-test je pokazao visoko statistički značajnu razliku ( $t(15) = 9.11, p < 0.001$ ), pri čemu su muškarci u prosjeku trošili značajno više vazduha ( $M=3.10$  bara) od žena ( $M=2.00$  bara). Slično tome, u dubinskoj zoni od 30 do 40 metara, razlika je takođe bila visoko statistički značajna ( $t(15) = 5.675, p < 0.001$ ), sa prosječnom potrošnjom od 4.10 bara kod muškaraca i 3.14 bara kod žena.

Dobijeni rezultati upućuju na zaključak da muški ronionci troše više komprimiranog vazduha od ženskih ronilaca na dubinama između 30 i 40 metara u slanoj vodi. Ovakavi rezultati mogu se objasniti fiziološkim razlikama između polova, jer muškarci u prosjeku imaju veću tjelesnu i mišićnu masu, što povećava metaboličke potrebe i potrošnju kiseonika, a time i komprimiranog vazduha tokom zarona, dok žene, obično imaju sporiji respiratorni ritam i manji ukupni plućni kapacitet, ali i bolju ekonomiju disanja u mirnim uslovima, što doprinosi manjoj ukupnoj potrošnji vazduha.

Dobijeni rezultati su u skladu sa poznatim fiziološkim obrascima u ronjenju gdje potrošnja vazduha raste sa povećanjem tjelesne mase, intenziteta pokreta i dubine zarona. Na dubinama od 30 do 40 metara, gdje pritisak i gustina vazduha značajno rastu, i najmanje razlike u disanju postaju izražene, što objašnjava uočeni statistički efekat.

**Ključne riječi:** t test, ronjenje, slatka i slana voda, zaron

## ANALYSIS OF COMPRESSED AIR CONSUMPTION IN MEN AND WOMEN IN FRESH AND SALT WATER

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### ABSTRACT

The main goal of the research was to determine the differences in the consumption of compressed air between male and female divers when diving in fresh (river Vrbas) and salt water (place of Rose in Montenegro) at different diving depths.

The sample of respondents consisted of members of the diving club "BUK" from Banja Luka of both genders with a basic (P1) level of training in diving. The sample of variables was represented by measures of oxygen consumption in fresh water at a depth of up to 10 m and oxygen consumption in salt water at a depth of 20 to 30 m and from 30 to 40 m.

As part of data processing, basic descriptive statistical parameters were calculated and determined for all subjects, in freshwater in the depth zone up to 10 m and in saltwater in two depth zones: from 20 to 30 m and from 30 to 40 m. To determine statistically significant differences in compressed air consumption between the two groups of subjects in relation to the type of environment and depth of dive, an analysis of the results of the T-test for independent samples was applied.

Analysis of data collected during diving in freshwater (river Vrbas) at a depth of up to 10 m, conducted using the T-test for independent samples, showed that there is no statistically significant difference in compressed air consumption between male and female divers. The p value, which is close to the threshold ( $p \approx 0.07$ ), suggests the existence of a slight tendency for higher consumption in men, but this tendency is not sufficiently pronounced to be statistically significant.

The analysis of data collected during saltwater diving (site Rose in Montenegro) included two depth zones: from 20 to 30m and from 30 to 40m. In the zone from 20 to 30 meters, the T-test showed a highly statistically significant difference ( $t(15) = 9.11, p < 0.001$ ), with men consuming significantly more air on average ( $M=3.10$  bar) than women ( $M=2.00$  bar). Similarly, in the depth zone from 30 to 40 meters, the difference was also highly statistically significant ( $t(15) = 5.675, p < 0.001$ ), with an average consumption of 4.10 bar for men and 3.14 bar for women.

The results obtained suggest that male divers consume more compressed air than female divers at depths between 30 and 40 meters in saltwater. Such results can be explained by physiological differences between the sexes, because men on average have greater body and muscle mass, which increases the metabolic needs and consumption of oxygen and thus compressed air during diving, while women usually have a slower respiratory rhythm and lower total lung capacity, but also a better economy of breathing in calm conditions, which contributes to a lower total air consumption.

The obtained results are in accordance with the known physiological patterns in diving where air consumption increases with increasing body mass, movement intensity and diving depth. At depths of 30 to 40 meters, where air pressure and density increase significantly, even the smallest differences in breathing become more pronounced, which explains the observed statistical effect.

**Key words:** T - test, diving, fresh and salt water, diving

## PREDIKTIVNE VRIJEDNOSTI SKUPA MOTORIČKIH VARIJABLI NA USPJEŠNOST U NOGOMETNOJ IGRI NOGOMETAŠA OD 12 DO 14 GODINA

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### SAŽETAK

Istraživanje je provedeno na uzorku od 110 ispitanika uzrasne dobi od 12 do 14 godina, polaznika nogometne škole FK "Željezničar" iz Sarajeva, FK "Radnik" iz Hadžića, FK "Novi Grad" i FK „Bosna“ iz Sarajeva s ciljem utvrđivanja prediktivne vrijednosti odabranog skupa varijabli za procjenu bazičnih motoričkih sposobnosti na kriterijsku varijablu koja predstavlja zbirnu ocjenu nezavisnih eksperata o uspješnosti u relevantnim elementima nogometne igre.

U istraživanju je primijenjen skup od sedamnaest varijabli za procjenu bazičnih motoričkih sposobnosti definisanih kao prediktorski skup varijabli i zbirna ocjena nezavisnih eksperata o uspješnosti u relevantnim elementima nogometne igre kao kriterij.

Za utvrđivanje prediktivne vrijednosti odabranog skupa motoričkih varijabli definisanih kao prediktorski skup varijabli na zbirnu ocjenu uspješnosti u relevantnim elementima nogometne igre kao kriterijske varijable primijenjena je višestruka regresiona analiza.

Rezultati regresione analize ukazuju da je opći doprinos skupa motoričkih varijabli u predikciji kriterijske varijable 49,7% objašnjene zajedničke varijanse ( $R^2 = .497$ ) na statistički značajnom nivou  $p < 0.005$  (Sig. = .000). Najznačajniji pojedinačni uticaj na kriterijsku varijablu ostvarile su varijable, koraci ustranu (MKUS = -.293), skok udalj s mjesta (MSDM = .265), podizanje trupa (MPODTR = .212) i skok uvis s mjesta (MSVIS = .202).

Na osnovu dobijenih rezultata, jednačina regresije skupa nezavisnih varijabli odabranog skupa varijabli za procjenu motoričkih sposobnosti u odnosu na kriterijsku varijablu – suma ocjena uspješnosti u nogometnoj igri (SUMAUSP) može imati sljedeći oblik:  $SUMUSP = 40.803 - 3.757 (MKUS) - 0.809 (MOKRZ) + 0.624 (MSPR20M) + 0.285 (MTAPN) + 0.211 (MSVIS) + 0.141 (PODTR) - 0.114 (MTAPNZ) - 0.087 (MSLN2L) - 0.081 (MPRETR) + 0.070 (MSDM) + 0.066 (MPRETK) - 0.064 (MSKLEK) - 0.018 (MBSPAG) + 0.001 (MTRO)$ .

Dobijeni rezultati mogu biti od koristi trenerima u nogometnim klubovima, nogometnim školama i svima onima koji su na bilo koji način uključeni u rad sa mladim nogometašima u kvalitetnijem planiranju i programiranju trenažnog rada.

**Ključne riječi:** bazična motorika, mladi nogometaši, predikcija, regresija

## PREDICTIVE VALUES OF A SET OF MOTOR VARIABLES ON SUCCESS IN SOCCER GAMES OF 12-TO-14-YEAR-OLD SOCCER PLAYERS

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### ABSTRACT

The research was conducted on a sample of 110 respondents aged 12 to 14, students of the football school FK "Željezničar" from Sarajevo, FK "Radnik" from Hadžić, FK "Novi Grad" and FK "Bosna" from Sarajevo with the aim of determining the predictive value of a selected set of variables for the assessment of basic motor skills on a criterion variable that represents the collective assessment of independent experts on success in the relevant elements of the football game.

The research used a set of seventeen variables for the assessment of basic motor skills defined as a predictor set of variables and the collective assessment of independent experts on success in the relevant elements of the football game as a criterion.

Multiple regression analysis was applied to determine the predictive value of a selected set of motor variables defined as a predictor set of variables on the summary evaluation of success in the relevant elements of the soccer game as a criterion variable.

The results of the regression analysis indicate that the general contribution of the set of motor variables in the prediction of the criterion variable is 49.7% of the explained common variance (R Square=.497) at a statistically significant level of  $p < 0.005$  (Sig. = .000). The most significant individual influence on the criterion variable was achieved by the variables, steps to the side (MKUS = -.293), long jump from a standing position (MSDM = .265), trunk raising (MPODTR = .212) and high jump from a standing position (MSVIS = .202).

Based on the results obtained, the regression equation of the set of independent variables of the selected set of variables for the assessment of motor abilities in relation to the criterion variable - the sum of the performance ratings in the game of football (SUMAUSP) can have the following form:  $SUMUSP = 40.803 - 3.757 (MKUS) - 0.809 (MOKRZ) + 0.624 (MSPR20M) + 0.285 (MTAPN) + 0.211 (MSVIS) + 0.141 (PODTR) - 0.114 (MTAPNZ) - 0.087 (MSLN2L) - 0.081 (MPRETR) + 0.070 (MSDM) + 0.066 (MPRETK) - 0.064 (MSKLEK) - 0.018 (MBSPAG) + 0.001 (MTRO)$ . The obtained results can be useful for coaches in football clubs, football schools and all those who are in any way involved in working with young football players in better planning and programming of training work.

**Key words:** basic motor skills, young soccer players, prediction, regression

## DOPRINOS SKUPA VARIJABLI SITUACIONO-MOTORIČKIH SPOSOBNOSTI U PREDIKCIJI ZBIRNE OCJENE USPJEŠNOSTI NOGOMETAŠA OD 12 DO 14 GODINA

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### SAŽETAK

Osnovni cilj istraživanja bio je da se utvrdi veličina i značaj uticaja odabranog skupa varijabli za procjenu situaciono-motoričkih sposobnosti na sumu ocjena nezavisnih eksperata o uspješnosti u relevantnim elementima nogometne igre. Ukupan uzorak ispitanika činilo je 110 polaznika nogometne škole škole FK "Željezničar" iz Sarajeva, FK "Radnik" iz Hadžića, FK "Novi Grad" i FK „Bosna“ iz Sarajeva. Uzorak varijabli predstavljao je skup od jedanaest varijabli za procjenu situaciono-motoričkih sposobnosti definisanih kao prediktorski skup u predikciji zbirne ocjene nezavisnih eksperata o uspješnosti u relevantnim elementima nogometne igre kao kriterijske varijable. Za sve primijenjene varijable situaciono-motoričkih sposobnosti izračunati su osnovni statistički parametri. Za utvrđivanje veličine i značaja uticaja odabranog skupa situaciono-motoričkih varijabli definisanih kao prediktorski skup varijabli u predikciji zbirne ocjene o uspješnosti u relevantnim elementima nogometne igre kao kriterijske varijable primijenjena je višestruka regresiona analiza.

Rezultati regresione analize ukazuju da je opći doprinos skupa motoričkih varijabli u predikciji kriterijske varijable 55,2% objašnjene zajedničke varijanse ( $R^2 = .552$ ) na statistički značajnom nivou  $p < 0.005$  (Sig. = .000). Najznačajniji pojedinačni uticaj na kriterijsku varijablu ostvarile su varijable, pravolinijska preciznost nogom – vertikalni cilj (SPRECNV = .207), horizontalno odbijanje od stijene 20 sekundi (SHODST20 = .192),

Na osnovu dobijenih rezultata, jednačina regresije skupa nezavisnih varijabli odabranog skupa varijabli za procjenu motoričkih sposobnosti u odnosu na kriterijsku varijablu – suma ocjena uspješnosti u nogometnoj igri (SUMAUSP) može imati sljedeći oblik:  $SUMAUSP = 42.950 - 2.235 (SBRZT90) + 1.901 (SPRECNV) - 1.158 (SBRZPOL) + 0.822 (SBRZTSLA) + 0.773 (SPRECGH) - 0.771 (SBRZV90) + 0.502 (SHODST20) - 0.460 (SBRZVSL) + 0.256 (SBRZV20) + 0.024 (SSNAUGL)$ .

Dobijeni rezultati mogu biti od koristi trenerima u nogometnim klubovima, nogometnim školama i svima onima koji su na bilo koji način uključeni u rad sa mladim nogometašima u kvalitetnijem planiranju i programiranju trenažnog rada.

**Ključne riječi:** situaciona motorika, nogomet, ispitanici, regresija,

## CONTRIBUTION OF A SET OF SITUATIONAL-MOTOR ABILITY VARIABLES IN PREDICTING THE OVERALL PERFORMANCE RATING OF FOOTBALL PLAYERS AGED 12 TO 14

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### ABSTRACT

The main goal of the research was to determine the size and significance of the contribution of a selected set of variables for assessing situational-motor abilities to the sum of ratings by independent experts on performance in relevant elements of football. The total sample of participants consisted of 110 students from the football schools of FK "Željezničar" from Sarajevo, FK "Radnik" from Hadžići, FK "Novi Grad" and FK "Bosna" from Sarajevo.

The sample of variables represented a set of eleven variables for the assessment of situational-motor abilities defined as a predictor set in the prediction of the collective assessment of independent experts on success in the relevant elements of the football game as a criterion variable.

For all applied variables of situational-motor abilities, basic statistical parameters were calculated. To determine the size and significance of the contribution of the selected set of situational-motor variables defined as a predictor set of variables on the overall performance rating in relevant elements of the football game as criterion variables, multiple regression analysis was applied.

The results of the regression analysis indicate that the overall contribution of the set of motor variables in predicting the criterion variable is 55.2% of the explained shared variance ( $R^2 = .552$ ) at a statistically significant level  $p < 0.005$  ( $Sig. = .000$ ). The most significant individual impact on the criterion variable was achieved by the variables, linear running accuracy of the leg – vertical target ( $SPRECNV = .207$ ), horizontal bouncing off the wall for 20 seconds ( $SHODST20 = .192$ ).

Based on the obtained results, the regression equation of the set of independent variables from the selected set of variables for assessing motor abilities in relation to the criterion variable – the sum of performance scores in football (SUMAUSP) can have the following form:  $SUMAUSP = 42.950 - 2.235 (SBRZT90) + 1.901 (SPRECNV) - 1.158 (SBRZPOL) + 0.822 (SBRZTSLA) + 0.773 (SPRECGH) - 0.771 (SBRZV90) + 0.502 (SHODST20) - 0.460 (SBRZVSL) + 0.256 (SBRZV20) + 0.024 (SSNAUGL)$ . The obtained results may be useful for coaches in football clubs, football schools, and all those who are in any way involved in working with young football players in better planning and programming of training work.

**Keywords:** situational motor skills, football, subjects, regression

# MORFOLOŠKE ODLIKE FUDBALERA OSAM PRVOPLASIRANIH EKIPA POSLJEDNJEG SVJETSKOG PRVENSTVA U KATARU 2022. GODINE

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## SAŽETAK:

Sistem praćenja morfoloških karakteristika u sportu opisan je u okviru Međunarodnog biološkog programa (Weiner & Lourie, 1969) i predstavlja detaljno razrađen metodološki pristup. Postavlja se pitanje koji je optimalan broj instrumenata za procjenu morfološkog statusa sportista. Bez obzira na uzrasnu dob, osnovne morfološke dimenzije kao što su tjelesna visina i tjelesna masa, trebale bi biti u opštoj upotrebi, a istovremeno predstavljaju osnovu za izračunavanje indeksa tjelesne mase (BMI), kao mjere procjene pretilosti i tjelesnog sastava sportista (Mišigoj-Duraković, 2008). Standardne antropometrijske mjere fudbalera preuzete su sa zvaničnih web stranica reprezentacija učesnica FIFA World Cup-a u Kataru 2022. godine. Indeks tjelesne mase izračunat je na osnovu odnosa tjelesne mase izražene u kilogramima i kvadrata tjelesne visine izražene u metrima. Skup varijabli primijenjen u ovom radu obuhvata dvije antropometrijske mjere, tjelesnu visinu i tjelesnu težinu, te izračunati indeks tjelesne mase.

Osnovni cilj ovog rada bio je prikaz morfoloških odlika fudbalera osam prvoplasiranih reprezentacija na FIFA World Cup-u 2022. godine, uključujući analizu tjelesne visine, težine i BMI po pozicijama. Analiza omogućava uvid u morfološke karakteristike fudbalera, njihov položaj u timu i razlike između golmana, odbrambenih, veznih i napadačkih igrača, što predstavlja važan segment u planiranju treninga, selekciji igrača i procjeni fizičkih zahtjeva modernog fudbala.

Na završnom turniru FIFA World Cup-a u Kataru 2022. godine učestvovala su 32 nacionalne selekcije koje su se kvalifikovale kroz kontinentalne kvalifikacije, a analiza je obuhvatila reprezentacije koje su zauzele najbolja mjesta u konačnom plasmanu.

**Ključne riječi:** svjetsko prvenstvo, fudbal, reprezentacije, morfološke odlike

## ANTHROPOMETRIC CHARACTERISTICS OF THE PLAYERS OF THE EIGHT TOP-PLACED TEAMS AT THE LAST FIFA WORLD CUP IN QATAR 2022

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### **ABSTRACT:**

The system for monitoring morphological characteristics in sport is described within the framework of the International Biological Program (Weiner & Lourie, 1969) and represents a detailed methodological approach. The question arises regarding the optimal number of instruments for assessing athletes' morphological status. Regardless of age, basic morphological dimensions such as body height and body mass should be commonly used and at the same time form the basis for calculating the body mass index (BMI), as a measure of obesity and body composition in athletes (Mišigoj-Duraković, 2008). Standard anthropometric measures of football players were obtained from the official websites of the national teams participating in the FIFA World Cup 2022 in Qatar. The body mass index was calculated based on the ratio of body mass in kilograms to the square of body height in meters. The set of variables applied in this study included two anthropometric measurements, body height and body weight, as well as the calculated body mass index.

The main aim of this study was to present the anthropometric characteristics of players from the eight top-placed national teams at the FIFA World Cup 2022, including an analysis of height, weight, and BMI by position. The analysis provides insight into players' morphological characteristics, their role in the team, and the differences between goalkeepers, defenders, midfielders, and forwards, which represents an important aspect for training planning, player selection, and evaluating the physical demands of modern football.

At the final tournament of the FIFA World Cup 2022 in Qatar, 32 national teams participated, having qualified through continental qualifiers, and the analysis included the teams that achieved the highest final rankings.

**Keywords:** World Cup, football, national teams, morphological characteristics

## RAZLIKE U UTICAJU REDOVNE I POSEBNO PROGRAMIRANE NASTAVE TJELESNOG I ZDRAVSTVENOG ODGOJA NA MOTORIČKI STATUS UČENIKA

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### SAŽETAK:

Cilj ovog istraživanja bio je ispitati i uporediti efekte redovne nastave i posebno programirane nastave tjelesnog i zdravstvenog odgoja na transformaciju bazično- motoričkih i situaciono-motoričkih sposobnosti učenika VI razreda osnovne škole. U motoričkom prostoru posmatrano je 15 varijabli a u situaciono- motoričkom 6 varijabli predstavnika prostora. U uzorku ispitanika bilo je 106 učenika podjeljenih u kontrolnu grupu (53 učenika) i eksperimentalnu grupu (53 učenika). Učenici su bili muškog i ženskog spola, starosti 12 godina +/- 6 mjeseci. Kontrolna grupa realizovala je nastavne sadržaje u skladu sa radovnim nastavnim planom i programom rada, dok je eksperimentalna grupa bila podvrgnuta intenzivnom programu sportskih igara- košarka, odbojka i rukomet. Trajanje programa bilo je jedno školsko polugodište. Deskriptivno- statistički metod pokazao je normalnu distribuciju podataka i za motoričke i za situaciono-motoričke varijable. T- test za nezavisne uzorke pokazao je da je inicijalno, u motoričkom prostoru, prednost uočena kod kontrolne grupe samo za varijablu MTA-PNO. U situaciono-motoričkom prostoru inicijalno je evidentirana bolja sposobnost eksperimentalne grupe za varijable OKVLS, ORBLZ i ORVLS. Nakon provedenih programa rada, finalno primjenjeni T- test u prostoru motorike, nije zabilježio statistički značajne razlike između grupa. U okviru situaciono- motoričkog prostora, kod finalnog mjerenja, Eksperimentalna grupa ima veće vrijednosti T- testa za varijable: OKVLS, OLPKS, ORBLZ, i ORISE, dok kontrolna grupa ima veću vrijednost T- testa za varijablu OKBLK. Zaključak: Ne može se sa sigurnošću zaključiti da je posebno dizajnirani program nastave značajno uticao na povećanje motoričkih i/ili situaciono- motoričkih sposobnosti učenika i učenica eksperimentalne grupe.

**Ključne riječi:** Nastava tjelesnog i zdravstvenog odgoja, Kontrolna grupa, Eksperimentalna grupa, Bazična motorika, Situaciona motorika, T – test

## DIFFERENCES IN THE EFFECT OF REGULAR AND SPECIALLY PROGRAMMED PHYSICAL AND HEALTH EDUCATION ON THE MOTOR STATUS OF STUDENTS

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### ABSTRACT:

The aim of this study was to examine and compare the effects of regular and specially programmed Physical and Health Education on the transformation of basic motor and situational–motor abilities of sixth-grade primary school students. In the motor domain, 15 variables were observed, and in the situational–motor domain 6 representative variables were analyzed. The sample included 106 students divided into the control group (53 students) and the experimental group (53 students). Students were male and female, aged  $12 \pm 6$  months. The control group followed the regular curriculum, while the experimental group participated in an intensive program of sports games—basketball, volleyball, and handball. The program lasted one school semester. Descriptive statistical methods showed a normal distribution of data for both motor and situational–motor variables. An independent-samples t-test showed that, initially, the control group had an advantage only in the variable MTAPNO within the motor domain. In the situational–motor domain, the experimental group initially demonstrated better abilities in the variables OKVLS, ORBLZ, and ORVLS. After the implementation of the programs, the final t-test in the motor domain did not record statistically significant differences between the groups. In the situational–motor domain at the final measurement, the experimental group showed higher t-test values for the variables OKVLS, OLPKS, ORBLZ, and ORISE, while the control group had higher t-test values for the variable OKBLK. Conclusion: It cannot be stated with certainty that the specially designed instructional program had a significant effect on improving the motor and/or situational–motor abilities of the students in the experimental group.

**Keywords:** Physical and Health Education, Control group, Experimental group, Basic motor skills, Situational motor skills, t-test