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Differences in Morphological Characteristics and Motoric Abilities Between Boys and Girls From II to V Grades of Elementary School

Razlike u morfološkim karakteristikama i motoričkim sposobnostima između dječaka i djevojčica od II do V razreda

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Abstract: *The research was conducted on a sample of N=1850 students from the 2nd to the 5th grade of elementary school, of which there were N=989 (53%) male respondents and N=861 (47%) female respondents. The research aimed to determine the differences in morphological characteristics and motor abilities between boys and girls from the 2nd to the 5th grade of elementary school. The descriptive statistical method and the t-test for independent samples were applied from the statistical methods. The statistical program for personal computers, SPSS for Windows version 22, was used for data processing. Analyzing the results of morphological characteristics, it was determined that boys have a higher body mass index (BMI) and skin fold on the back (subscapular) than girls. No differences were found in the skin fold of the upper arm (triceps) and the skin folds on the abdomen (suprailiac). Analyzing the results of motor skills, it was determined that boys are better at reaching in a squat (flexibility), lying/squatting (trunk strength), and resisting in a push-up (functional strength). At the same time, girls are better at the standing long jump (explosive leg strength) and hand strength (static strength). All the mentioned tests were statistically significant at the level of less than 1% ($p<0.01$), only the flexion endurance test (functional strength) was statistically significant at the level of $p<0.05$. In the flamingo tests (balance) and running 10x5 m back and forth (running speed and agility), the results were in favor of girls, and in the hand tapping test (movement speed), the results were in favor of boys, but these differences were not statistically significant. It is necessary to act preventively and carry out more frequent tests and measurements of elementary school-aged students to monitor changes in growth and development.*

Keywords: *morphology, motor skills, Eurofit, younger school age, differences.*

Sažetak: *Istraživanje je sprovedeno na uzorku od ukupno N=1850 učenika od II do V razreda osnovne škole, a od toga je bilo N=989 (53%) muških ispitanika i N=861 (47%) ženskih ispitanika. Cilj istraživanja bio je utvrditi razlike u morfološkim karakteristikama i motoričkim sposobnostima između dječaka i djevojčica od II do V razreda osnovne škole. Od statističkih metoda primijenjeni su deskriptivno statistički metod i t-test za nezavisne uzorke. Za obradu podataka korišten je statistički program za personalne računare SPSS za Windows verzija 22. Analizirajući rezultate morfoloških karakteristika utvrđeno je da dječaci u odnosu na djevojčice imaju veći indeks tjelesne mase (BMI) i kožni nabor na leđima (subscapular). Nisu utvrđene razlike u kožnom naboru nadlaktice (triceps) i kožnom naboru na stomaku (suprailiac). Analizirajući rezultate motoričkih sposobnosti utvrđeno je da su dječaci bolji u: dohvatu u sijedu (gipkost), ležanje/sijedu (snaga trupa) i izdržaju u zgibu (funkcionalna snaga), dok su djevojčice bolje u skoku u dalj iz mjesta (eksplozivna snaga nogu) i snazi šaka (statička snaga). Svi navedeni testovi su bili statistički značajni na nivou manjem od 1% ($p<0,01$), samo je test izdržaj u zgibu (funkcionalna snaga) bio statistički značajan na nivou od ($p<0,05$). U testovima flamingo (ravnoteža) i trčanje 10x5m tamo-ovamo (brzina trčanja i agilnost) rezultati su bili u korist djevojčica, a kod testa taping rukom (brzina pokreta) rezultati su bili u korist dječaka ali ove razlike nisu bile statistički značajne. Potrebno je preventivno djelovati na vrijeme i vršiti češća testiranja i mjerenja učenika osnovnoškolskog uzrasta u cilju praćenja promjena rasta i razvoja.*

Ključne riječi: *morfologija, motorika, eurofit, mlađi školski uzrast, razlike.*

Introduction

According to Malina, Bouchard, and Bar-Or (2004), the acquisition of motor skills during childhood is an important developmental task of every child because, through the development of motor skills, the child acquires movement skills, and through movement, the child discovers the world and gains first-hand experiences. How important is the time a child spends doing physical activity, and how does it affect their motor skills? Aaltonen et al. (2015) explain the research results that children with the best coordination are also the most active and that children with motor problems participate less in regular physical activities. The term "motor development" is the association of movement development with age (Aaltonen et al., 2015). Motor (movement) abilities are abilities that participate in solving motor (movement) tasks and are responsible for movement efficiency. Primary motor skills are coordination, balance, precision, speed, strength, and flexibility. Some motor abilities are more and some less innate, that is, genetically conditioned. It is possible to influence certain motor abilities to a greater or lesser extent than others, which depends on the coefficient of innateness of the individual ability, gender, and age. Strength development can be effectively influenced throughout life, while abilities such as speed, coordination, and agility can only be influenced in early childhood. Strength is a motor ability that is 50% genetically determined, and 50% of this significant motor ability is subject to development throughout life. Unlike strength, speed is 80-95% innate, so the influence on speed development is much less possible compared to strength and ranges from 5-20% (Pistotnik, 2003). Motor skills are important for development. Age norms for the assessment of basic motor skills provide useful diagnostics for "typical" development, but cultural differences in child-rearing practices affect the age at which skills are acquired (Adolph and Hoch, 2020). Rodić (2002) investigated the influence of morphological characteristics on the motor skills of students in lower grades of elementary school. The sample of respondents consisted of 430 students (203 boys and 227 girls) in the lower grades of elementary school. Five motor and two morphological variables were used in the research. Regression analysis determined that there are statistically significant relationships between the system of morphological 41 characteristics and motor skills according to the age and gender of students in the lower grades of elementary school. The positive influence of both morphological properties on explosive power type motor ability indicates that the longitudinal dimensionality of the skeleton represents a bio-

Uvod

Prema Malina, Bouchard i Bar-Or (2004) sticanje motoričkih sposobnosti tokom djetinjstva važan je razvojni zadatak svakog djeteta jer kroz razvoj motorike dijete stiče vještine kretanja, a kretanjem dijete otkriva svijet i stiče prva iskustva. Koliko je važno vrijeme koje dijete provede baveći se tjelesnom aktivnošću i kako utiče na motoriku djeteta Aaltonen, i sar. (2015) objašnjavaju rezultatima istraživanja da su djeca s najboljom koordinacijom ujedno i najaktivnija, a da djeca koja imaju problema u motorici manje učestvuju u regularnim tjelesnim aktivnostima. Termin „razvoj motorike" definisan je kao povezanost razvoja pokreta s godinama (Aaltonen i sar., 2015). Motoričke (kretne) sposobnosti su sposobnosti koje učestvuju u rješavanju motoričkih (kretnih) zadataka i odgovorne su za efikasnost kretanja. Primarne motoričke sposobnosti su (koordinacija, ravnoteža, preciznost, brzina, snaga, fleksibilnost). Neke motoričke sposobnosti su više, a neke manje urođene, odnosno genetski uslovljene. Na pojedine motoričke sposobnosti je moguće utjecati u većoj ili manjoj mjeri nego na druge, što zavisi od koeficijenta urođenosti pojedine sposobnosti, spolu i životnoj dobi. Na razvoj snage može se efikasno djelovati tokom cijelog života, dok se na sposobnosti kao što su brzina, koordinacija i gibljivost može utjecati samo u ranom djetinjstvu. Snaga je motorička sposobnost koja je 50% genetski određena, a 50% ove značajne motoričke sposobnosti je podložno razvoju tokom cijelog života. Za razliku od snage, brzina je 80-95% urođena, te je utjecaj na razvoj brzine znatno manje moguć u odnosu na snagu i kreće se u rasponu 5-20% (Pistotnik, 2003). *Motoričke sposobnosti važne su za razvoj. Dobne norme za ocjenu bazičnih motoričkih sposobnosti pružaju korisnu dijagnostiku za "tipičan" razvoj, ali kulturološke razlike u praksama odgoja djece utječu na dob sticanja vještina (Adolph* i Hoch, 2020). Rodić (2002) je istraživao uticaj morfoloških karakteristika na motoričke sposobnosti učenika nižih razreda osnovne škole. Uzorak ispitanika činilo je 430 učenika (203 dječaka i 227 djevojčica) nižih razreda osnovne škole. U istraživanju je korišteno 5 motoričkih i 2 morfološke varijable. Regresionom analizom utvrđeno je da između sistema morfoloških 41 karakteristika i motoričkih sposobnosti prema dobu i spolu učenika nižih razreda osnovne škole postoje statistički značajne relacije. Pozitivan utjecaj oba morfološka svojstva na motoričku sposobnost tipa eksplozivne snage ukazuje da longitudinalna dimenzionalnost skeleta predstavlja biomehaničku osnovu za efikasnu realizaciju nekih motoričkih zadataka, a da se masa ti-

mechanical basis for the efficient realization of some motor tasks. That body mass is determined by active muscle mass. The negative influence of both morphological properties on motor ability, such as static strength, shows the gap in physical development, morphological properties, and motor abilities of children in that period. Pejčić and Malacko (2005). A standard set of four morphological and seven motor variables was applied to a sample of 4,420 students (2,202 boys and 2,227 girls), 7-11 years old. To determine the differences within and outside the groups, the statistical method MANOVA/ANOVA was applied. The results of the research showed that anthropometric and motor variables develop equally and stably in the observed age groups. Motor variables in boys and girls increase equally through defined ages (grades 1-4). Boys achieved better results in the following variables: hand tapping, standing long jump, back squats, squats in 60 seconds, squat height, and aerobic endurance test F3-running for 3 minutes. Girls achieved better results only in the variable of flexibility, deep bending. Physical activity plays a key role in a child's physical development (C., Dapp et al., 2021). The World Health Organization, as an umbrella organization that controls various segments of health status based on certain indicators, recommends daily movement for 60 minutes at a moderate to intense pace to suppress the effects of a sedentary lifestyle successfully, but also to influence the development of basic motor skills. Thanks to the positive health effects of physical exercise, physical education is an integral part of the educational system, with two lessons a week, which is insufficient to achieve the optimal effect in transforming the anthropological status of children (Nikšić et al., 2019a). Success in any sport depends on anthropological characteristics and abilities, as well as their mutual connection (Nikšić et al., 2019b). The need for physical exercise is one of the general biological needs of the organism and plays an important role in its life. The connection of physical activity with the state of human health is indisputable; it is the basic factor in determining the level of changes in the organism and the state of its bones, muscles, cardiovascular, and nervous systems. The process of physical exercise leads to certain transformations and improvements in functional abilities and individual organ systems (Nikšić et al., 2019c). Morphology/anthropometry is important in every sport, based on which athletes are selected for a particular sport. In any sport, success is determined by analyzing various interconnected anthropological dimensions (Nikšić et al., 2020b).

jela determiniše aktivnom mišićnom masom. Negativan utjecaj oba morfološka svojstva na motoričku sposobnost, tipa statičke snage, pokazuje raskorak u tjelesnom razvoju, morfološkim svojstvima i motoričkim sposobnostima djece u tom razdoblju. Pejčić i Malacko (2005). Standardna garnitura od četiri morfološke i sedam motoričkih varijabli bila je primijenjena na uzorku 4.420 učenika (2.202 dječaka i 2.227 djevojčica), 7-11 godina starosti. Da bi se utvrdile razlike unutar i izvan grupa, primijenjena je statistička metoda MANOVA/ANOVA. Rezultati istraživanja pokazali su da se antropometrijske i motoričke varijable razvijaju jednako i stabilno u posmatranim starosnim grupama. Motoričke varijable kod dječaka i djevojčica podjednako se povećavaju kroz definisane uzraste (1-4 razred). Dječaci su postigli bolje rezulate u slijedećim varijablama: taping rukom, skok u dalj iz mjesta, poligon natraške, čučnjevi u 60 sekundi), vis u zgibu, i test aerobne izdržljivosti F3-trčanje 3 minute. Djevojčice su postigle bolje rezultate samo u varijabli fleksibilnosti – duboki pretklon. *Fizička aktivnost igra ključnu ulogu u fizičkom razvoju djeteta (C., Dapp. et al., 2021).* Svjetska zdravstvena organizacija, kao krovna organizacija koja kontroliše različite segmente zdravstvenog statusa, na osnovu određenih pokazatelja preporučila je svakodnevno kretanje u trajanju od 60 minuta, umjerenim do intenzivnim tempom, kako bi potiskivanje efekata sedentarnog načina života bilo uspješno, ali da se ujedno utječe i na razvijanje bazičnih motoričkih sposbnosti. *Zahvaljujući pozitivnim zdravstvenim efektima fizičkog vežbanja, fizičko vaspitanje je sastavni dio obrazovnog sistema, sa dva časa sedmično, što je nedovoljno za postizanje optimalnog efekta u transformaciji antropološkog statusa djece (Nikšić et al., 2019a).* Uspjeh u bilo kojem sportu, zavisi od antropoloških karakteristika i sposobnosti, kao i njihove međusobne povezanosti (Nikšić i sar., 2019b). Potreba za fizičkim vježbanjem jedna je od općih bioloških potreba organizma i igra važnu ulogu u njegovom životu. Veza fizičke aktivnosti sa stanjem ljudskog zdravlja je neosporna, ona je osnovni faktor u određivanju nivoa promjena u organizmu i stanju njegovih kostiju, mišića, kardiovaskularnog i nervnog sistema. Proces fizičkog vježbanja dovodi do određenih transformacija i poboljšanja funkcionalnih sposobnosti i pojedinih organskih sistema (Nikšić i sar., 2019c). Morfologija/antropometrija je važna u svakom sportu, na osnovu čega se biraju i sportisti za određeni sport. U bilo kojem sportu uspjeh se određuje analizom različitih međusobno povezanih antropoloških dimenzija (Nikšić i sar., 2020b).

Material and Methods

Participants

The research included a sample of N=1850 students from II to V grades of elementary school, of which 989 (53%) were male respondents and 861 (47%) were female respondents. The research included students from a total of 8 elementary schools, i.e., one school from each municipality at the level of Sarajevo Canton. In each school, two classes of the same generation were included using a random sample of respondents.

The sample of variables

The anthropometric variables used for this research are Body Height (BH), Body Weight (BW), Body Mass Index (BMI), upper arm skin fold - triceps, back skin fold - subscapular, and abdominal skin fold - suprailiac. Body composition was measured with the InBody120 Body Mass Analyzer (Aandstad, Holtberget, Hageberg, Holme, & Anderssen, 2014). The variables that were used to assess basic motor skills are the variables that were taken from the Eurofit battery of tests, namely: Flamingo (balance), Taping with the hand (speed of movement), Reach in gray (flexibility), Long jump from a standing position (explosive leg strength), Hand strength (static strength), Lying down (trunk strength), Push-up endurance (functional strength), Running 10x5 meters back and forth (running speed and agility).

Research Desing

Anthropometric variables were measured according to standard procedures of the International Society for the Advancement of Kinanthropometry (ISAK) (Marfell-Jones et al. 2006). Based on the variables BH and BW, BMI [BMI = BH (kg) / BW (cm^2 ^{2}] was calculated. BMI values for both subsamples were classified into four nutritional levels, according to the recommendations of the Centers for Disease Control and Prevention 2000 (Kuczmarski et al., 2000).

Statistical Analaysis

Of the statistical methods, descriptive statistics was applied. Statistical processing of the data in this research was done using the computer software SPSS Statistics 20.0 in the Windows 10 operating system. The statistical program for personal computers, SPSS for Windows version 22, was used for data processing.

Materijal i Metod

Uzorak ispitanika

Istraživanjem je obuhvaćen uzorak od N=1850 učenika od II do V razreda osnovne škole, od čega je bilo 989 (53%) ispitanika muškog spola i 861 (47%) ispitanika ženskog spola. Istraživanjem su obuhvaćeni učenici iz ukupno 8 osnovnih škola, odnosno po jedna škola iz svake opštine na nivou Kantona Sarajevo. U svakoj školi metodom slučajnog uzorka ispitanika su obuhvaćena po dva razreda iste generacije.

Uzorak varijabli

Antropometrijske varijable koje su korištene za ovo istraživanje su: tjelesna visina, tjelesna masa, indeks tjelesna mase (BMI), kožni nabor nadlaktice – triceps, kožni nabor leđa – subscapular, kožni nabor stomaka – suprailiac. Tjelesna kompozicija mjerena je Analizatorom tjelesne mase InBody120 (Aandstad i sar., 2014). Varijable koje su korištene za procjenu bazičnih motoričkih sposobnosti su varijable koje su uzete iz kartona eurofit baterije testova, a to su: Flamingo (ravnoteža), Taping rukom (brzina pokreta), Dohvat u sijedu (gipkost), Skok u dalj iz mjesta (eksplozivna snaga nogu), Snaga šaka (statička snaga), Ležanje sijed (snaga trupa), Izdržaj u zgibu (funkcionalna snaga), Trčanje 10x5 metara tamo-ovamo (brzina trčanja i agilnost).

Dizajn istraživanja

Antropometrijske varijable su mjerene prema standardnim procedurama Međunarodnog društva za unapređenje kinantropometrije (ISAK) (Marfell-Jones i sar. 2006). Na osnovu varijabli tjelesne visine i tjelesne mase, izračunat je indeks tjelesne mase - BMI [BMI = BH (kg) / BW (cm^2]. Vrijednosti BMI za oba poduzorka su klasifikovane u 4 nutritivna nivoa, prema preporukama Centra za kontrolu i prevenciju bolesti, 2000. (Kuczmarski i sar., 2000.)

Statistical Analaysis

Od statističkih metoda primijenjena je deskriptivna statistika i i t-test za nezavisne uzorke. Statistička obrada podataka u ovom istraživanju rađena je pomoću kompjuterskog softvera SPSS statistics 20.0 u operativnom sistemu Windows 10. Za obradu podataka korišten je statistički program za personalne računare SPSS za Windows verzija 22.

Results

Table 1. *Differences in Body Mass Index (BMI) between boys and girls from 2nd to 5th grade of primary school – Descriptive statistics, t-test*

Varijables / Varijable	*Gender /* Spol	*Mean ± Std.Dev.*	*t-test*	
			t-value	*p*
Body Mass Index (kg/m²)	♂ / M	18.68 ± 4.01	16.07	0.00 **
	♀ / Ž	18.09 ± 3.68	13.52	
Triceps (mm)	♂ / M	12.87 ± 6.36	39.27	0.09
	♀ / Ž	13.96 ± 5.90	34.83	
Subscapular (mm)	♂ / M	11.00 ± 7.54	53.40	**0.04 ***
	♀ / Ž	11.49 ± 7.24	52.39	
Suprailiac (mm)	♂ / M	14.36 ± 8.91	79.37	0,97
	♀ / Ž	14.38 ± 8.18	66.89	

Legend: *male – ♂; female – ♀; mean – arithmetic mean; std. Dev. (standard deviation p-level of significance; * t-test is statistically significant at the level of less than 5%; ** t-test is statistically significant at the less than 1% level.*

Analyzing the results shown in Table 1, we can notice that there are statistically significant differences between boys and girls from II to V grades of elementary school in Body Mass Index (BMI) and skinfold on the back (subscapular). No differences were identified in the triceps and suprailiac folds.

Table 2. *Frequencies and percentage values of BMI by category by gender for students from II to V grades of elementary school*

Nutritional status / Status uhranjenosti	*Boys /* Dječaci	*Percentiles*	*%*	*Girls /* Djevojčice	*Percentiles*	*%*
Obesity / Gojaznost	19	≥95	1.92	6	≥95	0.70
Overweight / Prekomjerna uhranjenost	67	85-95	6.77	48	85-95	5.57
Normal weight / Normalna uhranjenost	338	5-85	34.18	269	5-85	31.24
Malnutrition / Neuhranjenost	565	<5	57.13	538	<5	62.49
Total / Ukupno	989		100.0	861		100,0

Table 2 shows the values for the BMI variable, based on which it is possible to see the state of nutrition of students from the 2nd to the 5th grade of elementary school according to gender and level of nutrition. Looking at boys and girls separately, it can be noted that obesity and overnutrition are more prevalent in boys than in girls. Out of a total of 989 (53.46%) boys, 19 of them belong to the category of obese, 67 boys to the category of excessive nutrition, 338 boys are normally nourished, and 565 boys are malnourished. Out of a total of 861 (46.54%) girls, 6 of them belong to the category of obese, 48 girls to the category of excessive nutrition, 269 girls

Rezultati

Tabela 1. *Razlike u indeksu tjelesne mase (BMI) i kožnim naborima između dječaka i djevojčica od II do V razreda osnovne škole – Descriptive statistic*

Varijables / Varijable	*Gender /* Spol	*Mean ± Std.Dev.*	*t-test*	
			t-value	*p*
Body Mass Index (kg/m²)	♂ / M	18.68 ± 4.01	16.07	0.00 **
	♀ / Ž	18.09 ± 3.68	13.52	
Triceps (mm)	♂ / M	12.87 ± 6.36	39.27	0.09
	♀ / Ž	13.96 ± 5.90	34.83	
Subscapular (mm)	♂ / M	11.00 ± 7.54	53.40	**0.04 ***
	♀ / Ž	11.49 ± 7.24	52.39	
Suprailiac (mm)	♂ / M	14.36 ± 8.91	79.37	0,97
	♀ / Ž	14.38 ± 8.18	66.89	

Legenda: *M - muško; Ž - žensko; Mean – aritmetička sredina; Std. Dev. – standardna devijacija p-razina značajnosti; * t-test je statistički značajan na nivou manjem od 5%; ** t-test je statistički značajan na nivou manjem od 1%*

Analizirajući rezultate prikazane u tabeli 1, možemo primjetiti da postoje statističi značajne razlike između dječaka i djevojčica od II do V razreda osnovne škole u indeksu tjelesne mase (BMI) i kožnom naboru na leđima (subscapular). Nisu identificirane razlike u kožnom naboru nadlaktice (triceps) i kožnom naboru na stomaku (suprailiac).

Tabela 2. *Učestalosti i procentualne vrijednosti BMI po kategorijama prema spolu za učenike od II do V razreda osnovne škole*

Nutritional status / Status uhranjenosti	*Boys /* Dječaci	*Percentiles*	*%*	*Girls /* Djevojčice	*Percentiles*	*%*
Obesity / Gojaznost	19	≥95	1.92	6	≥95	0.70
Overweight / Prekomjerna uhranjenost	67	85-95	6.77	48	85-95	5.57
Normal weight / Normalna uhranjenost	338	5-85	34.18	269	5-85	31.24
Malnutrition / Neuhranjenost	565	<5	57.13	538	<5	62.49
Total / Ukupno	989		100.0	861		100,0

U tabeli 2., prikazane su vrijednosti za varijablu BMI, na osnovu kojih je moguće sagledati stanje uhranjenosti učenika od II do V razreda osnovne škole prema spolu i nivou uhranjenosti. Posmatrajući odvojeno dječake i djevojčice, može se primijetiti da su gojaznost i prekomjerna uhranjenost zastupljeniji kod dječaka, nego kod djevojčica. Od ukupno 989 (53.46%) dječaka, njih 19 spada u kategoriju gojaznih, 67 dječaka u kategoriju prekomjerne uhranjenostti, 338 dječaka je normalno uhranjeno, dok je 565 dječaka neuhranjeno. Od ukupno 861 (46.54%) djevojčica, njih 6 spada u kategoriju gojaznih, 48 djevojčica u kategoriju prekomjerne uhranjenosti, 269

are normally nourished, and 538 girls are malnourished. Today's big problem is not only obesity in children but also the most prevalent malnutrition.

djevojčica je normalno uhranjeno, dok je 538 djevojčica neuhranjeno. Veliki problem današnjice nije samo gojaznost kod djece, već i pothranjenost koja je bila najviše zastupljena kod učenika od II do V razreda osnovne škole.

Table 3. *Differences in motor abilities between boys and girls from II to V grades of primary school – Descriptive statistics, t-test*

Tabela 3. *Razlike u motoričkim sposobnostima između dječaka i djevojčica od II do V razreda osnovne škole – Descriptive statistic, t-test*

Variables / **Varijable**	***Gender /*** ***Spol***	***Mean ± Std.Dev.***	***t-test***	
			t-value	***p***
Balance / Ravnoteža	♂ / M	00:11:40 ± 0.01	0.000182	0.23
Flamingo / Flamingo	♀ / Ž	00:12:45 ± 0.01	0.000180	
Movement speed / Brzina pokreta	♂ / M	00:18.23 ± 0.02	0.000405	0,60
Typing by hand / Taping rukom	♀ / Ž	00:17:51 ± 0.01	0.000075	
Flexibility / Gipkost	♂ / M	5.89 ± 9.19	84.49	**0.00 ****
Reach in gray / Dohvat u sijedu	♀ / Ž	10.92 ± 10.99	120.70	
Explosive leg power / Eksplozivna snaga nogu	♂ / M	130.25 ± 27.72	768.32	**0.00 ****
Standing long jump / Skok u dalj iz mjesta	♀ / Ž	122.01 ± 24.91	620.68	
Static power / Statička snaga	♂ / M	15.21 ± 5.24	27.46	**0.00 ****
Fist strength / Snaga šaka	♀ / Ž	14.18 ± 6.41	41.05	
Troop strength / Snaga trupa	♂ / M	17.89 ± 5.18	26.81	**0.00 ****
Lying gray / Ležanje sijed	♀ / Ž	16.59 ± 5.30	28.05	
Functional strength / Funkcionalna snaga	♂ / M	00:18:51 ± 0.01	0.000170	**0.03 ***
Push-up endurance / Izdržaj u zgibu	♀ / Ž	00:17:01 ± 0.01	0.000138	
Running speed and agility / Brzina trčanja i agilnost	♂ / M	00:34:24 ± 0.08	0.00670	0,70
Running 10x5 m back and forth / Trčanje 10x5m tamo-ovamo	♀ / Ž	00:32:25 ± 0.07	0.00547	

Legend: *male – ♂; female – ♀; mean – arithmetic mean; std. Dev. – standard deviation; p – significance level; * t – the test is statistically significant at the less than 5% level; ** t - the test is statistically significant at the less than 1% level.*

Legenda: *Mean – aritmetička sredina; Std. Dev. – standardna devijacija; p-razina značajnosti; * t-test je statistički značajan na nivou manjem od 5%; ** t-test je statistički značajan na nivou manjem od 1%*

Analyzing the results shown in Table 3, it is noticeable that there are certain differences in motor abilities between boys and girls from II to V grades of elementary school. Analyzing the results of the t-test, it was determined that there are statistically significant differences in the following tests: reaching in a squat (flexibility), lying in a squat (trunk strength), and standing in a squat (functional strength) in favor of boys, and long jump from a standing position (explosive strength legs) and hand strength (static strength) in favor of girls. All the mentioned tests were statistically significant at the level of less than 1% ($p<0.01$), only the flexion endurance test (functional strength) was statistically significant at the level of less than ($p<0.05$). In the flamingo tests (balance) and running 10x5 m back and forth (running speed and agility), the results were in favor of girls, and in the hand tapping test (movement speed), the results were in

Analizirajući rezultate prikazane u tabeli 3, uočljivo je da postoje izvjesne razlike u motoričkim sposobnostima između dječaka i djevojčica od II do V razreda osnovne škole. Analizom rezultata t-testa utvrđeno je da postoje statistički značajne razlike u sljedećim testovima: dohvat u sijedu (gipkost), ležanje sijed (snaga trupa) i izdržaj u zgibu (funkcionalna snaga) u korist dječaka, a skok u dalj iz mjesta (eksplozivna snaga nogu) i snaga šaka (statička snaga) u korist djevojčica. Svi navedeni testovi su bili statistički značajni na nivou manjem od 1% ($p<0,01$), samo je test izdržaj u zgibu (funkcionalna snaga) bio statistički značajan na nivou manjem od ($p<0,05$). U testovima flamingo (ravnoteža) i trčanje 10x5m tamo-ovamo (brzina trčanja i agilnost) rezultati su bili u korist djevočica, a kod testa taping rukom (brzina pokreta) rezultati su bili u korist dječaka i ove razlike nisu bile statistički značajne. Rezultati testa dohvat u si-

favor of boys, and these differences were not statistically significant. The results of the gray reach test (flexibility) were in favor of boys, although girls were expected to do better because they are considered to be more flexible than boys, which is confirmed by numerous studies. The differences were relatively small, but it should not be ignored that the total number of boys was higher by 128 respondents compared of girls.

Discussion

There are differences between children depending on their capabilities and abilities, as well as their gender. Any additional sports activity leads to a certain transformation of the morphological and motor status. The most important thing is to adapt a certain sports activity to the age at which it is practiced so that this activity affects the transformation of students (Rašidagić et al., 2000). Balance and precision are the least monitored of motor skills in classroom teaching due to a lack of time. There is a whole series of research on the anthropological characteristics of students, both in BiH, Croatia, and abroad. Research is of various types and for various purposes. Investigating gender differences in the condition of motility by hereditary factors, it was concluded that genetic factors are more pronounced in females (Mikić, 2000). Pejčić (2001) researched 655 students from the 1st to 4th grade. The students were examined in 4 morphological variables and six motor variables (long jump, 20 m sprint, stand-up with a pull-up, lifting the trunk, and the backstroke polygon). The conclusion is that girls have better results only in mobility, and that physical activity, i.e., sports, can affect changes in morphological characteristics and motor skills. The development of motor skills should be the key to development in childhood, which will continue later and in adolescence (Barnett et al., 2008). In the physical development of children of younger school age between the ages of 9 and 11, the ratio of body mass and body height is favorable (Nićin and Stjepić, 2008), so probably because of this fact, there are no statistically significant differences between boys and girls in basic morphological variables. Fewer changes occur in the body, and the amount of muscle mass lags significantly less about body weight, children are not durable and strong enough, so it is likely that the differences that occurred between boys and girls in the strength of the arms and shoulder girdle are the result of a greater number individuals who are at a higher level in this motor ability. Krsmanović and Radosav (2008) state that boys are more dominant in tests of strength and running speed, and girls in tests of flexibility. Transversal research (Prskalo et al., 2009) on a sample of 128 male and 117 female students from the 1st to 3rd grade of primary school, divided into subsamples

jedu (gipkost) su bili u korist dječaka, iako se očekivalo da djevojčice budu bolje, jer se smatra da su fleksibilnije od dječaka, što potvrđuju i brojna istraživanja. Razlike su bile relativno male, ali ne treba zanemariti da je ukupan broj dječaka bio veći za 128 ispitanika u odnosu na djevojčice.

Diskusija

Postoje razlike između djece u zavisnosti od njihovih individualnih mogućnosti i sposobnosti, kao i samog spola. Bilo koja dodatna sportska aktivnost dovodi do određene transformacije morfološkog i motoričkog statusa. Najbitnije je određenu sportsku aktivnost prilagoditi uzrastu sa kojim se radi, kako bi ta aktivnost utjecala na transformaciju učenika (Rašidagić et al., 2000). U razrednoj nastavi od motoričkih sposobnosti se najmanje prate ravnoteža i preciznost, zbog nedostatka vremena. Postoji čitav niz istraživanja antropoloških obilježja učenika, kako u BiH, Hrvatskoj, tako i u inozemstvu. Istraživanja su razne vrste i raznih ciljeva. Istražujući spolne razlike u uslovljenosti motorike nasljednim faktorima, zaključeno je da su genetski faktori više izraženi kod ženskog pola (Mikić, 2000). Pejčić (2001) istražuje 655 učenika od 1. do 4. razreda. Učenici su ispitani u 4 morfološke varijable i 6 motoričkih (skok u dalj, 20 m sprint, izdržaj u visu zgibom, podizanje trupa i poligon natraške). Zaključak je da djevojčice imaju bolje rezultate samo u gibljivosti i da tjelesna aktivnost, odnosno sport mogu uticati na promjene morfoloških karakteristika i motoričkih sposobnosti. Razvoj motoričkih sposobnosti treba da bude ključ razvoja u detinjstvu, koji će se nastaviti kasnije i u adolesenciji (Barnett i sar., 2008). U tjelesnom razvoju djece mlađeg školskog uzrasta između 9. i 11. godine, povoljan je odnos tjelesne mase i tjelesne visine (Nićin i Stjepić, 2008), pa vjerovatno zbog te činjenice i ne postoje statistički značajne razlike između dečaka i djevojčica u osnovnim morfološkim varijablama. U organizmu se dešavaju nešto manje promjene, a količina mišićne mase znatno manje zaostaje u odnosu na težinu tijela, te djeca nisu dovoljno izdržljiva i snažna, pa su vjerovatno razlike koje su se javile između dječaka i djevojčica u snazi ruku i ramenog pojasa rezultat većeg broja pojedinaca koja su na višem nivou u ovoj motoričkoj sposobnosti. Krsmanović i Radosav (2008), navode da su dječaci dominantniji u testovima snage i brzine trčanja, a dejvojčice u testovima gipkosti. Transverzalno istraživanje (Prskalo et al., 2009) na uzorku od 128 učenika i 117 učenica od 1. do 3. razreda osnovne škole podijeljenih na subuzorke po dobi i spolu istraženo je u 19 antropometrijskih varijabli i 12 motoričkih varijabli (koraci u stranu, poligon

by age and gender, was investigated in 19 anthropometric variables and 12 motor variables (steps to the side, polygon backbends, various bends, bends on the bench, hand tapping, hand tapping 10'', foot tapping on the wall, long jump from a standing position, standing high with a pull-up, raising the trunk and high jump). The conclusion is that the results of motor skills do not show statistically significant differences, justifying the joint organization of work for boys and girls from the 1st to the 3rd grade of elementary school. The research was conducted on a sample of 400 students of early school age. In most motor skills, boys are better than girls. A higher level of motor skills in boys is due to a faster flow of impulses from the cerebral cortex to the effectors in the muscles. Each newly learned activity enriches the motor skills of a child at a younger school age, which is particularly reflected in their general motor ability (Lončar, 2011). On a sample of 324 respondents aged 6 to 11, the authors investigated the difference in motor skills between boys and girls. To assess motor skills, 14 field tests were applied that tested aerobic and anaerobic endurance, flexibility, repetitive strength, explosive strength, speed, agility, balance, and maximal isometric strength. Boys proved to be dominant and statistically significantly better than girls in aerobic and anaerobic endurance, speed, agility, explosive strength, and maximal isometric strength. Girls are statistically significantly better in flexibility and balance (Marta et al. 2012). On a total sample of 568 subjects, of which 273 were boys and 295 were girls, the authors investigated the differences in motor abilities between boys and girls in the fourth and fifth grades of elementary school. Tests were applied that measured speed, where boys in both classes showed statistically significantly better results. In the fourth grade, girls showed better results in bending forward and sitting, and, with that, better flexibility. The boys had the repetitive strength of the abdominal muscles and showed better results in both classes. Boys in both classes showed better results in long jump tests to assess explosive strength and hand grip to assess maximal isometric strength (Flanagan et al., 2012). The results showing that boys achieve better results in most motor tests can be explained by the different habits of boys and girls of the same age. Boys are still playing outdoors, running and eager for outdoor games, practicing various ball games (soccer and many other games), and climbing trees, imitating their cartoon heroes, where static and explosive arm strength and speed dominate running, longer physical activities. The different life habits of children of different sexes can affect the existence of differences in the manifestation of motor skills. Such results may have been influenced by the environment (physical activity of children), the genetic potential of boys to achieve success in

natraške, pretklon raznožno, pretklon na klupi, taping rukom, taping rukom 10'', taping nogom o zid, skok u dalj s mjesta, izdržaj u visu zgibom, podizanje trupa i skok u vis). Zaključak je da rezultati motoričkih sposobnosti ne pokazuju statistički značajne razlike opravdavajući zajedničku organizaciju rada za dječake i djevojčice od 1. do 3. razreda osnovne škole. Istraživanje provedeno je na uzorku od 400 učenika rane školske dobi.

U većini motoričkih sposobnosti dječaci su bolji od djevojčica. Viši nivo motoričkih sposobnosti kod dječaka uslovljen je bržim protokom impulsa od kore velikog mozga ka efektorima u mišićima. Svaka nova naučena aktivnost bogati motoriku djeteta u mlađem školskom uzrastu, što se posebno odražava na njegovu generalnu motoričku sposobnost (Lončar, 2011). Na uzorku ispitanika od 324 ispitanika u dobi od 6 do 11 godina autori su istražili razliku u motoričkim sposobnostima između dječaka i djevojčica. Za procjenu motoričkih sposobnosti primijenjeno je 14 terenskih testova koji testiraju aerobnu i anaerobnu izdržljivost, fleksibilnost, repetitivnu snagu, eksplozivnu snagu, brzinu, agilnost, ravnotežu i maksimalnu izometričku snagu. Dječaci su se pokazali dominantni i u rezultatima statistički značajno bolji od djevojčica u aerobnoj i anaerobnoj izdržljivosti, brzini, agilnosti, eksplozivnoj snazi i maksimalnoj izometrijskoj snazi. Djevojčice su statistički značajno bolje u fleksibilnosti i ravnoteži (Marta i sar. 2012). Na ukupnom uzorku od 568 ispitanika, od kojih su 273 dječaka i 295 djevojčica, autori su istraživali razlike u motoričkim sposobnostima između dječaka i djevojčica u četvrtom i petom razredu osnovne škole. Primijenjeni su testovi koji su mjerili brzinu gdje su dječaci u oba razreda pokazali statistički značajno bolje rezultate. U četvrtom razredu su djevojčice pokazale bolje rezultate u pretklonu i sjedu, te s tim bolju fleksibilnost. Repetitivnu snagu trbušne muskulature imali su dječaci i pokazali su u oba razreda bolje rezultate. U testovima skok udalj za procjenu eksplozivne snage i stisak šake za procjenu maksimalne izometričke snage su dječaci u oba razreda pokazali bolje rezultate (Flanagana i sar., 2012). Rezultati koji pokaju da dječaci postižu bolje rezultate u većini motoričkih testova mogu se objasniti drugačijim navikama dječaka i djevojčica istog uzrasta. Dječaci se i dalje igraju na otvorenom prostoru, trče i željni su igara na otvorenom, upražnjavaju razne igre sa loptom (fudbal i mnoge druge igre) i penju se po drveću, imitirajući svoje crtane junake, prilikom čega dominira statička i eksplozivna snaga ruku i brzina trčanja, dugotrajnije fizičke aktivnosti. Različite životne navike djece različitog pola, mogu uticati na postojanje razlika u ispoljavanju motoričkih sposobnosti. Na ovakve rezultate je možda mogla

motor tasks and competitions, struggle, and a greater desire to succeed in tasks dominated by strength and speed (Carlos et al., 2014). Halaši (2016), in his research on a sample of a total of 214 respondents, of whom 101 girls and 113 boys aged 8 years from Subotica, under the title "Body structure and motor status as predictors of the quality of life of younger school-aged children," tested motor skills, anthropometric measures, assessment of body composition, tests to assess the development of gross motor skills and measures related to health-related quality of life. According to his conclusion, there is a statistically significant difference between boys and girls in running 20 meters and the long jump from a standing position in favor of boys, while squatting showed better results in favor of girls. The results of research into the motor abilities of younger school-aged students show a trend of decreasing motor abilities among students (Kraljević, Gadžić, and Vučković, 2013). The research was conducted on a sample of 70 subjects (36 boys and 34 girls) of younger school age, that is, 9 - 11 years old, students of Elementary School "Mića Stojković" in Umčari. The research aimed to determine the differences in morphological characteristics and motor abilities between girls and boys of a younger school age. Two anthropological measures and eight motor tests were applied. There were no statistically significant differences in body height and mass between girls and boys. Using a multivariate analysis of variance, the existence of a statistically significant difference in the motor area of girls and boys was determined. At the level of individual variables, significant differences were found in the variables: Running 30 m from a high start, Endurance in a push-up, Throwing a medicine bag (1kg) from a lying position on the back, and Running for 6 minutes in favor of boys, that is, in the variables Bouncing the ball off the wall and Leaning on the bench in favor of the girls. Boys exhibited significantly higher levels of strength, speed, and aerobic endurance, while girls were more successful in tests of coordination and flexibility. The obtained results can be interpreted by differences in the level of physical activity of girls and boys and differences in body composition and structure (Smajić et al., 2017). Modern society is characterized by markedly reduced motor activity, improper nutrition, and an increasing number of people whose lifestyles can be described as sedentary. It is necessary to act preventively by more frequent monitoring and analyzing the correctness of growth and development, and by motivating young people to actively or recreationally engage in sports (Nikšić et al., 2020a). It is necessary to monitor, measure, and analyze all segments of the students' anthropological status daily to influence the development of basic motor skills and act preventively in the fight against obesity,

da utiče i okolina (fizička aktivnost djece), genetski potencijali dječaka za ostvarivanjem uspjeha u motoričkim zadacima i nadmetanjima, borba i veća želja za uspjehom u zadacima u kojima dominira snaga i brzina (Carlos i sar., 2014). Halaši (2016) je u svom istraživanju na uzorku od ukupno 214 ispitanika, od kojih su 101 djevojčica i 113 dječaka uzrasta 8 godina iz Subotice, pod nazivom „Tjelesna struktura i motorički status kao prediktori kvalitete života djece mlađeg školskog uzrasta", testirao motoričke sposobnosti, antropometrijske mjere, procjenu tjelesne strukture, testove za procjenu razvoja vještina krupne motorike i mjere koje se odnose na kvalitetu života povezanu sa zdravljem. Prema njegovom zaključku, postoji statistički značajna razlika između dječaka i djevojčica u trčanju na 20 metara, skoku u dalj iz mjesta u korist dječaka, dok je pretklon u sjedu raznožno pokazao bolje rezultate u korist djevojčica. Rezultati istraživanja motoričkih sposobnosti učenika mlađeg školskog uzrasta, pokazuju trend opadanja motoričkih sposobnosti kod učenika (Kraljević, Gadžić i Vučković, 2013). Istraživanje je sprovedeno na uzorku od 70 ispitanika (36 dječaka i 34 djevojčice) mlađeg školskog uzrasta, odnosno uzrasta od 9 - 11 godina, učenika OŠ „Mića Stojković" u Umčarima. Cilj istraživanja bio je utvrđivanje razlika u morfološkim karakteristikama i motoričkim sposobnostima između djevojčica i dječaka mlađeg školskog uzrasta. Primijenjene su dvije antropološke mjere i osam motoričkih testova. Između djevojčica i dječaka nisu konstatovane statistički značajne razlike u tjelesnoj visini i masi. Primjenom multivarijantne analize varijanse utvrđeno je postojanje statistički značajne razlike u motoričkom prostoru djevojčica i dječaka. Na nivou pojedinačnih varijabli, značajne razlike su utvrđene u varijablama: Trčanje 30 m iz visokog starta, Izdržaj u zgibu, Bacanje medicinke (1kg) iz ležećeg položaja na leđima i Trčanje 6 minuta u korist dječaka, odnosno, u varijablama Odbijanje lopte od zid i Pretklon na klupici u korist djevojčica. Dječaci su ispoljili značajno viši nivo snage, brzine i aerobne izdržljivosti, dok su djevojčice bile uspješnije u testovima koordinacije i gipkosti. Dobijeni rezultati se mogu tumačiti razlikama u nivou fizičke aktivnosti djevojčica i dječaka, i razlikama u tjelesnoj građi i strukturi (Smajić i sar., 2017). Moderno društvo karakteriše izrazito smanjena motorička aktivnost, nepravilna ishrana i sve veći broj ljudi čiji se životni stil može opisati kao sedentarni. Potrebno je preventivno djelovati češćim praćenjem i analizom ispravnosti rasta i razvoja i motivisanjem omladine da se aktivno ili rekreativno bave sportom (Nikšić i sar., 2020a). Potrebno je svakodnevno vršiti praćenja, mjerenja i analizu svih segmenata antropološkog statusa učenika, kako bi se utjecalo na

which is the leading epidemiological health problem of today. It is obvious that physical activity based on physical and health education classes is not enough or is not represented enough to respond to the challenges of the modern sedentary lifestyle, which was even more exacerbated by the COVID-19 pandemic and online teaching (Nikšić et al., 2021).

Conclusion

This research was conducted to determine the differences in morphological characteristics and motor abilities between boys and girls from the 2nd to the 5th grade of elementary school. The research was conducted on a sample of N=989 (53%) male respondents and N=861 (47%) female respondents. The results of the research showed that in terms of morphological characteristics, there are statistically significant differences between boys and girls from the 2nd to the 5th grade of elementary school in Body Mass Index (BMI) and skinfold on the back (subscapular), while no differences were identified in the skinfold of the upper arm (triceps). And a skin fold on the stomach (suprailiac). Obesity and overnutrition are more prevalent in boys than in girls. Today's big problem is not only obesity in children but also malnutrition, which is most prevalent among students from the 2nd to the 5th grade of elementary school. It was found that there are statistically significant differences in flexibility, trunk strength, and functional strength in favor of boys and explosive leg strength and static strength in favor of girls. The results for balance running speed and agility were in favor of girls, and movement speed was in favor of boys, these differences were not statistically significant. Today's fast-paced lifestyle has led to a decrease in physical activity and an increase in a sedentary lifestyle, which has further influenced the irregular growth and development of students. Reduced physical activity in children leads to major changes in their overall development, especially in motor skills and nutritional status. To enable maximum growth and development in children, it is necessary to perform tests and measurements of data on anthropological status. Indicators are important to indicate to parents the current state of development of the anthropological status of the student population. Any sporting activity leads to a certain transformation. The most important thing is to adapt a certain sports activity to the age at which it is being worked so that the activity affects the transformation of the student.

Conflicts of Interest
The authors would like to thank all participants for the effort and time spent on the tattooing and measurement processes.

razvijanje bazičnih motoričkih sposobnosti i preventivno djelovalo u borbi protiv gojaznosti, kao vodećeg epidemiološkog zdravstvenog problema današnjice. Očito je da tjelesna aktivnost zasnovana na časovima tjelesnog i zdravstvenog odgoja nije dovoljna ili nije dovoljno zastupljena da odgovori na izazove savremenog sedentarnog načina života, što je još više prouzrokovala pandemija COVID – 19 i online nastava (Nikšić i sar., 2021).

Zaključak

Ovo istraživanje je provedeno s ciljem utvrđivanja razlika u morfološkim karakteristikama i motoričkim sposobnostima između dječaka i djevojčica od II do V razreda osnovne škole. Istraživanje je provedeno na uzorku od N=989 (53%) muških ispitanika i N=861 (47%) ženskih ispitanika. Rezultati istraživanja su pokazali da kod morfoloških karakteristika postoje statističi značajne razlike između dječaka i djevojčica od II do V razreda osnovne škole u Body Mass Indexu (BMI) i kožnom naboru na leđima (subscapular), dok nisu identificirane razlike u kožnom naboru nadlaktice (triceps) i kožnom naboru na stomaku (suprailiac). Gojaznost i prekomjerna uhranjenost zastupljeniji su kod dječaka, nego kod djevojčica. Veliki problem današnjice nije samo gojaznost kod djece, već i pothranjenost koja je bila najviše zastupljena kod učenika od II do V razreda osnovne škole. Utvrđeno je da postoje i statistički značajne razlike u gipkosti, snazi trupa i funkcionalnoj snazi u korist dječaka, a eksplozivna snaga nogu i statička snaga u korist djevojčica. Rezultati kod ravnoteže i brzine trčanja i agilnosti su bili u korist djevočica, a brzina pokreta u korist dječaka i ove razlike nisu bile statistički značajne. Današnji ubrzani način života doveo je do smanjenja tjelesne aktivnosti, a povećanja sedentarnog načina života, što je dodatno utjecalo na nepravilan rast i razvoj učenika. Smanjena tjelesna aktivnost kod djece dovodi do velikih promjena u njihovom cjelokupnom razvoju, a posebno u motoričkim sposobnostima i stanju uhranjenosti. Da bi se omogućio maksimalni rast i razvoj kod djece, neophodno je uraditi testiranja i mjerenja, podataka o antropološkom statusu. Pokazatelji su važni kako bi se roditeljima ukazalo na trenutno stanje razvijenosti antropološkog statusa kod učeničke populacije. Bilo koja sportska aktivnost dovodi do određene transformacije. Najbitnije je određenu sportsku aktivnost prilagoditi uzrastu sa kojim se radi, kako bi ta aktivnost utiecala na transformaciju učenika

Priznanja
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