DIFFERENCES BETWEEN MORPHOLOGICAL CHARACTERISTICS AND MOTORIC CAPABILITIES OF ACTIVE AND INACTIVE ATHLETIC STUDENTS

[1]Faris Rasidagic, [1]Nermin Nurkovic, [1]Dzenana Imamovic-Turković, [2]Hana Hadzibulic-Nurkovic, [3]Elvira Niksic

[1]Faculty of Sports and Physical Education, University of Sarajevo
[2]Faculty of Mathematics and Natural Sciences, University of Sarajevo
[3]Faculty of Education, University of Sarajevo

Original scientific paper

Abstract

The set objective of the research was to „determine differences between morphological characteristics and motoric capabilities of active and inactive athletic students". Sample of inactive athletic boys was made of 87 examinees, and 85 examinees were active athletic boys. Average age of examinees was 12. All examinees were primary school students. Inactive athletic students had their regular Physical Education lessons, and active students had extracurricular activities such as basketball, volleyball, football and handball. Additional training was realized two times a week for 90 minutes. Morphological space is presented through 15 variables and motoric has 24 variables. Statistical significance was determined with t-test on level ($p<.05$). Variant result coverage was checked by calculating eta coefficient. Morphological space has differences in: pelvic width (.00/.00 $\eta 2=.09$), skin curves of the arm (.00/.00 i $\eta 2=.062$). Motoric space has differences in: rod coordination (.00/.00 i $\eta 2=.54$), trifold medicine slalom (.00/.00 i $\eta 2=.35$), bent eights (.00/.00 i $\eta 2=.09$), throwing from chest (.00/.00 i $\eta 2=.05$, 20m running with low start (.00/.00 i $\eta 2=.07$), leg tapping against the wall (.00/.00 i $\eta 2=.31$), push-ups (.00/.00 i $\eta 2=.10$ and sit-ups (.00/.00 i $\eta 2=.10$). After the analysis, it can be said that the objective of research was completed and differences in anthropological status were determined. Students are recommended to get additional training activities in order to positively transform anthropological status. Research with the same or similar variables should be organized with different age categories on both sexes.

***Key words**: Primary School, Additional Training, Anthropological Status*

Introduction

Non-sedentary way of life means that children should daily participate in at least 60 minutes of medium to energetic physical activity since there are many health advantages if they do. (Nikšić and Rašidagić, 2014; Centers for Disease Control and Prevention, 2009 & 2010). However, as students finish their education, they slowly abandon regular physical activity, and it is estimated that 70% of young people stops doing any kind of activity after they finish their education (Donovan et al, 2006). With such approach to physical activity, negative side effects of sedentary way of life are emphasized so it is more than welcome that children pick their sports activities according to their interests since they would have more motivation (Martinčević, 2010). Inactive athletic students regularly participated in Physical Education classes two times a week during this research while active athletic students had other trainings outside of school. Activities lasted for 90 minutes in basketball, volleyball, football and handball. Since active athletic students have more physical activity during the week, it is assumed that their anthropological status is on higher level than with inactive athletic students (Haskel, 2008). For a student to be considered an athletic person, one year should be spent in training process. Students in this research were in the same age category, so results of morphological and motoric status transformation are to be attributed to ergogenic factors that are transformational processes achieved with training results (Batričević, 2008). Results of this research should determine a higher level of morphological and motoric status with active athletic students and confirm that higher movement activity positively affects transformation of morphological characteristics and motoric capabilities. Research is significant since it determines different ways to enhance movement with students and removes negative side effects of sedentary lifestyle (Jamner et al, 2000).

Methods

Examinee Sample

Examinee samples are primary school boys from Central Bosnia Canton in Bosnia and Herzegovina. Average age is 12 years +/- 11 months. Inactive athletic students N=87. Active athletic students N=85. According to Helsinki Regulations of

Measurement and Testing, this was completed with parents, students and school approval. Only students who were completely healthy at the time were tested. Students could leave the research process whenever they wanted.

Variable Sample

Variables of morphological status were gathered according to authors Bala, G. Popović. *B., & Stupar, D*, (2002). Body Height (VIST), Arm Length (DUZRUK), Leg Length (DUZNOG), Shoulders Width (SIRRAM), Pelvic Width (SIRKARL), Hand Width (SIRSAK), Foot Width (SIRSTOP), Middle Torso Amplitude (OBGRU), Amplitude Above Knee (OBNTK), Amplitude Above Elbow (OBNDL), Back Skin Curves (NBLED), Stomach Skin Curves (NBTRB), Arm Skin Curves (NBNDL), Knee Skin Curves(NBNTK), Body Mass (MASTJ).

Variables to determine motoric capabilities are gathered according to authors Drljačić et al, (2012): Bat Coordination (KOOPAL), Trifold Medicine Slalom (SLA3MED), Bent Eights (OSMSAG), Back Sit-up Throwing (BACMED), Long Jump (SKOKDAL), 20m Running (TRC20M), Leg Tapping (TAPNOG), Leg Tapping Against the Wall (TAPNOGZ), Hand Tapping (TAPRUK), Loom Push-ups (SKLEK), Sit-up Torso Lift (LEZSJED), Pressure Squats (CUCANJ), Standing on One Leg on a Bench with Eyes Open (OTVOCIUZ), Standing on One Leg on a Bench with Eyes Shut (ZATVOCIPOP), Standing on One Leg on a Balance Bench with Eyes Shut (ZATVOCIUZ), Long Stick Aim (CILJDUGST), Leg Vertical Aim (CILJVERT), Hand Horizontal Aim (CILJHOR), Bat Turnover (ISKRPAL), Deep Bend on a Bench (PRETKL), 20 m High Start Running (TRCVISST), 20 m Lying Start Running (TRCLEZST), 20 m Flying Start Running (TRCLETZST).

Methods of Data Analysis

Given data was analyzed in SPSS 22 program with the approval from the Faculty of Sports and Physical Education, University of Sarajevo. Differences between groups were determined with t-test for independent samples on level .05. Values above the mentioned were not considered as statistically relevant. Significance of t-test up to .05 is checked by calculating eta coefficient of covered variant result between the groups. Calculation of eta coefficient is performed according to Kolesarić & Tomašić-Humer, (2016): .01 – high coverage, .06 – medium coverage and .13 – small coverage of the variant.

Results and discussion

Results of t-test for morphological characteristics show 5 variables with significant statistical difference. Those variables are: Shoulders Width: 136.68/83.82 (Table 1) do not exceed relation: 1:1.5. Value of Sig2 is .04/.04 (Table 2), eta coefficient is .00 (Table 2) and shows high coverage of variant – results do not differ. Relation SIRKARL in standard deviation (102.71/87.92) does not exceed relation 1:1.5. Values Sig2: .00/.00 show there is a difference between groups. Sig1 value with .00 shows there is difference in homogeny group results.

After checking the coverage of variant with eta coefficient η2=.09, it is stated that there is a low coverage of variants and differences in pelvic measures. NBTRB in standard deviation (7.01/9.43) does not exceed relation 1:1.5 which is an indicator of result homogeny.

Results of Sig2 value: .02/.02 indicate there is a difference between results however Sig1 value (.03) goes to the upper boundary of T-test. Calculation of eta coefficient η2=.00 states medium coverage of variants so we cannot say with certainty there is a difference for this variable which is valid. NBNDL in standard deviation (3.10/6.49) exceeds relations 1:2. This data shows results between the groups are not in homogeny.

Values Sig2: .00/.00 indicate there is significant difference between results. Sig1 value is also .00 so we can assume that difference will be confirmed with t-test. Additional calculation of eta coefficient η2=.06 confirmed medium to small coverage of variants and less fat skin in favor of students in this variable. NBNTK in standard deviation (3.57/7.62) exceeds relations 1:2 and shows results between the groups are not in homogeny. Values Sig2: .01/.01 indicate there is a difference between active and inactive athletic students. Even though Sig1 is on level .00 there was an additional checking and calculation of eta coefficient (η2=.00) which did not confirm significant difference between variants. Coverage of variants for this variable between groups goes up to 75% so it can be stated that groups have no differences.

Table 1: Descriptive Statistics for Morphological Characteristics: 1 Athletes/2 Non - Athletes

Variable	N	Valid N	Mean	Std.Dev.
SIRRAM	1	87	292.34	136.68
	2	85	327.81	83.82
SIRKARL	1	87	187.34	102.71
	2	85	230.36	87.92
NBTRB	1	87	9.17	7.01
	2	85	12.04	9.43
NBNDL	1	87	7.00	3.10
	2	85	11.30	6.49
NBNTK	1	87	10.34	3.57
	2	85	12.57	7.62

Table 2. T-test for Morphological Characteristics: 1 Athletes/2 Non - Athletes

Variable	F	Sig 1	t	df	Sig 2	eta η^2	Mean	Std Error	95% Low	95% Upp
SIRRAM	23.98	.000	-2.04 -2.05	170 143.22	.042 .042	.002	-35.46 -35.46	17.33 17.24	-69.69 -69.55	-1.24 -1.37
SIRKARL	9.558	.002	-4.93 -4.91	170 167.12	.004 .004	.098	-43.01 -43.01	14.59 14.56	-71.82 -71.78	-14.21 -14.25
NBTRB	3.034	.033	-2.27 -2.26	170 155.06	.024 .025	.002	-2.87 -2.87	1.266 1.270	-5.37 -5.38	-.374 -.364
NBNDL	28.89	.000	-5.56 -5.52	170 119.77	.000 .000	.062	-4.30 -4.30	.7737 .7794	-5.83 -5.84	-2.77 -2.76
NBNTK	23.25	.000	-2.46 -2.44	170 118.62	.015 .016	.003	-2.23 -2.23	.9048 .9116	-4.01 -4.03	-.445 -.426

When it comes to motoric capabilities, t-test confirmed significant difference for nine variables: KOOPAL in standard deviation presented in Table 3 is 2.473/5.750 and exceeds relation 1:3. This data shows higher difference in result variants. Value Sig2: .00/.00 in Table 4 show difference between groups after checking Sig1: .00. Checking coverage of variant with eta=.05 confirmed medium result coverage that is KOOPAL is better with athletic students. SLA3MED in standard deviation 4.885/3.811 does not exceed value 1:1.5. Data shows possible coverage of results. Values Sig2: .00/.00 and Sig1: .00 show statistically significant differences. Eta coefficient η2=.35 confirmed small coverage of results between groups and better SLA3MED results for athletic students. For OSMSAG relation in standard deviation, values do not exceed 1:1.5 so there could be groups within the existing ones.

Values Sig2: .00/.00 and Sig1: .00 show statistically significant difference between group results. Calculation of eta coefficient η2=.09 shows that OSMSAG is better realized with athletic students. BACMED in standard deviation (1.678/1.279) does not exceed relation value 1:1.5. Data shows group results in both groups. Sig2: .00/.00 and Sig1: .00 show significant difference between groups. Additional checking of η2=.05 given result significance was confirmed with medium variant coverage. TRC20M in standard deviation (0.594/0.405) has concentrated result relation in group (1:1.5). Values Sig2: .00/.00 show statistically significant group differences. Sig1 value is .00 and eta coefficient η2=.07 with small variant coverage and confirms high differences given by t-test TAPNOGZ in standard deviation (4.068/3.484), has values 1:1.5 that is group results within the groups. Values (Table 4) Sig2: .00/.00 show result differences. Sig1 value is .03 so it could be assumed that T-test is less significant and there is coverage in group results. Data check was made with eta coefficient η2=.31 which negates result coverage and confirms big differences. Variable SKLEK in standard deviation (4.600/5.254) does not exceed value 1:1.5. Data is similar to previous value of variables. Values in Table 4 Sig2: .00/.00 show significant group differences. Sig1 is .04 it should have eta coefficient calculated as well. Calculation of η2=.10 confirmed low coverage of results and that realization of variable SKLEK athletic students have advantage. LEZSJED in standard deviation 2.727/5.075 does not exceed value 1:1,5. Data shows higher group results. Values Sig2: .00/.00 and Sig1: .00 confirm differences between groups. Calculation of eta coefficient η2=.10 confirms great difference in group results (small coverage). Results of variable ZATVOCIUZ in standard deviation (2.226/2,165) do not exceed value 1:1.5. Values Sig2: .04/.04 show statistically different results. Sig1 value is on higher level (.03). There was checking of coverage by calculating eta coefficient η2=.02 so the difference determined by t-test cannot be considered significant for this variable.

Table 3. Descriptive Statistics for Motoric Capabilities: 1 Athletes/2 Non – Athletes

Variable	N	Valid N	Mean	Std.Dev.
KOOPAL	1 2	87 85	8.95 12.42	2.473 5.750
SLA3MED	1 2	87 85	30.43 31.50	4.885 3.811
OSMSAG	1 2	87 85	20.10 22.173	1.881 2.721
BACMED	1 2	87 85	3.38 2.95	1.678 1.279
TRC20M	1 2	87 85	4.50 5.06	0.594 0.405
TAPNOGZ	1 2	87 85	26.34 21.21	4.068 3.484

SKLEK	1	87	17.20	4.600
	2	85	13.90	5.254
LEZSJED	1	87	24.51	2.727
	2	85	21.70	5.075
ZATVOCIUZ	1	87	6.24	2.226
	2	85	5.42	2.165

Table 4. T-test for Motoric Capabilities: 1 Athletes/2 Non – Athletes

Variable	F	Sig 1	t	df	Sig 2	eta η2	Mean	Std Error	95% Low	95% Upp
KOOPAL	34.21	.000	3.091	114	.002	.054	69.88	22.61	25.25	114.52
			3.123	112	.002		69.88	22.38	25.47	114.30
SLA3MED	169.8	.000	-9.79	170	.000	.355	-1635.1	167.0	-1964.8	-130
			-9.71	115.84	.000		-1635.1	168.3	-1968.5	-130
OSMSAG	100.9	.000	-4.23	170	.000	.094	-464.60	109.74	-681.25	-247.9
			-4.20	113.66	.000		-464.60	110.6	-683.77	-245.4
BACMED	12.75	.000	-3.19	170	.002	.056	-76.94	24.08	-124.48	-29.39
			-3.19	167.70	.002		-76.94	24.11	-124.54	-29.34
TRC20M	78.20	.000	-3.78	170	.000	.070	-95.60	25.23	-145.40	-45.79
			-3.76	125.86	.000		-95.60	25.40	-145.86	-45.33
TAPNOGZ	.715	.039	8.877	170	.000	.316	5.133	.5782	3.99	6.27
			8.893	167.15	.000		5.133	.5772	3.99	6.27
SKLEK	.636	.046	4.386	170	.000	.101	3.301	.7525	1.81	4.78
			4.380	165.99	.000		3.301	.7537	1.81	4.78
LEZSJED	23.89	.000	4.539	170	.000	.107	2.811	.6193	1.58	4.03
			4.510	128.12	.000		2.811	.6233	1.57	4.04
ZATVOCIU	.734	.031	2.040	170	.043	.023	95.360	46.73	3.103	187.61
			2.038	166.85	.043		95.360	46.79	2.968	187.75

In various researches it is determined that additional movement activity creates more developed anthropological status (Keiner et al, 2013; Rašidagić & Imamović 2018; Bavčević et al, 2017). For that reason, this research was completed and enabled. The difference between anthropological statuses was checked for morphological characteristics and motoric capabilities. Morphological characteristics have shown via t-test that there are differences in variables: SIRRAM, SIRKARL, NBTRB, NBNDL and NBNTK. Such results have confirmed the results of the research completed by Prahović & Protić, (2007). The significance of difference through t-test is checked by eta coefficient for each of the previously mentioned variables. Only variables with low coverage of results (eta coefficient) could be accepted as different. Such criteria were implemented because values of t-test were set to lower boundary level ($p< 0.05$). After calculating η^2, only two morphological characteristics have shown differences between groups: width of pelvis in athletic students is bigger which is in accordance with results done by Bojić, (2016), and smaller fat skin tissue of the arm (Kruschitz, 2013). Motoric capabilities have shown significant differences with t-test in nine variables: KOOPAL, SLA3MED, OSMSAG, BACMED, TRC20M, TAPNOGZ, SKLEK, LEZSJED and ZATVOCIUZ. To check difference significance there was previously completed control on results coverage that is calculation of eta coefficient. It can be stated that only one variable ZATVOCIUZ – standing on one leg on balance bench with eyes closed, has more variant coverage and it was significantly different between the groups. Other given variables of motoric space are statistically more developed with athletic students. Given results are in accordance with research completed by Bajrić et al, (2016) where just like in this research, coordination of athletic student's movement is higher in all three analyzed variables. Explosive strength of athletic students is higher in upper and lower extremities rather than with students who are not athletes which results obtained by Đukić et al, (2014) have proven.

Frequency movement speed of lower extremities, endurance of upper extremities and muscle strength in the abdomen area are higher when it comes to athlete students. All the given results are in accordance with results obtained by Vrbik et al, (2011). Owing to additional sports activities, two times a week per 90 minutes, athletic students have certain transformation of anthropological status. It can be stated that the objective of research has been achieved and „differences between morphological characteristics and motoric capabilities of active and inactive students" were made.

Conclusion

Weakness of this research is the absence of insight into training activities which are suitable for this age group of students. Students should acquire additional information about nutrition habits and free time movement activity. Research could be organized with different age or sex categories and all mentioned information could give additional knowledge about such determined differences.

References

Bajrić, O., Bašinac, I., Srdić, V. and Bajrić, S. (2016) Factor Structure of Morphological and Motoric Space of Athletic and Non – Athletic Students. Summary of Works - Proceedings, Sixth International Conference ''Sport Science and Health ", 132 – 141, Pan European University, Banja Luka.

Bala, G. (2002). Popović. *B., & Stupar, D*, 411-417.

Batričević, D. (2008). Discriminatory Analysis of Motoric and Functional Capabilities of Athletic and Non – Athletic Students, Sport Science 1:50-53.

Bavčević, T., Vlahović, L., Božinović-Mađor, S. (2017). Structure of Morphological Space on Students Aged 6-7 Years, 15th Summer School of Kinesiologists in Republic of Croatia, pp 67-72. Zagreb.

Bojić, A., Šljivić, E., Dedić, V., Bojić, S. and Dautović, A. (2016) Differences in Skeleton Dimensions and Motoric Capabilities of Urban and Rural Students in Tuzla Canton. Sixth International Conference „Sports Science and Health"1:21 – 28.

Centers for Disease Control and Prevention (2009). Youth Risk Behavior Surveillance, MMWR 2010; 59 (SS-5); 1-142. United States.

Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion Division of Adolescent and School Health (2010). Strategies to Improve the Quality of Physical Education. U.S. Department of Health and Human Services.

Drljačić, D., Arsić, K., Arsić, D. (2012) Appliance of Eurofit Test Battery for Children to Follow Physical Capability and Health Conditions, Article. PONS Medicine Journal pg.; 158 – 164.

Donovan, M., Jones, G. and Hardman, K. (2006). Physical Education and Sports. Kinesiology 38. 1; 16-27. Zagreb.

Đukić, B.; Kalentić, Ţ.; Vujkov, N.; Vujanović, S. & Smajić, M. (2014). Differences in the Explosive Force of the Leg and the Speed and Speed of the Individual Movement, Journal of Sports Sciences, 27 (12): 1311-1321. [GS].

Haskel, W.L. (2008). Physical Activity Guidelines Advisory Committee Report. U.S. Department of Health and Human Services.

Jamner, M., Spruijt-Metz, D., Bassin, S., Cooper, D. (2000). "A controlled evaluation of a school-based intervention to promote physical activity among sedentary adolescent females: project FAB". Journal of Adolescent Health, Volume 34, Pages 279-289.

Keiner, M., Sander, A., Wirth, K, and Schmidtbleicher, D. (2013). Is There a Difference Between Active and Less Active Children and Adolescents in Jump Performance. The Journal of Strength & Conditioning Research . 27(6):1591-6.

Kolesarić, Vladimir., Tomašić-Humer, J. (2016) Greatness of the Impact. Faculty of Philosophy, University "Josipa Jurja Strossmayera", Osijek.

Kruschitz R, Wallner-Liebmann SJ, Hamlin MJ, Moser M, Ludvik B and Schnedl WJ, (2013) Detecting Body Fat–A Weighty Problem BMI versus Subcutaneous Fat Patterns in Athletes and Non-Athletes. PLoS ONE 8(8): e72002. https://doi.org/10.1371/journal.pone.0072002.

Martinčević, J. (2010). Spending Free Time and Including Children in Extracurricular Activities in the School, no. 24, god. 56. pg. 19-34. 16.

Prahović, M. & Protić, J. (2007). Differences in Anthropological Characteristics of 14-year-old Players of Basketball, Football, Handball and Non - Athletes. U: Prof.dr.sc. Vladimir Findak (ur.) Anthropological, Methodical, Methodological, Technical Assumptions of Work in the Fields of Education, Sports, Sports Recreation and Kinesiotherapy. Zagreb, Society of Kinesiology Croatia, pg. 470-476.

Rašidagić, F. and Imamović, Dž. (2018). Differences in the Morphological and Motor Status of Female Students from inner-city and Suburban City Areas. Sport Science, Vol.11, ISSUE1, Pg 119 -123.

Nikšić, E. and Rašidagić, F. (2014). The Deformity of the Spinal Column at the School for Students of Clasroom teaching. Sport Science, 7(2), pp 87-93.

Vrbik, I., Čižmek, A. & Peršun, J. (2011). Functional Capabilities of Primary School Students. 6th FIEP European Congress U: Summary of Works, Physical and Health Education – Student Competencies. Ur. Prskalo I. Novak D. 2011. Poreč., 512-519.

RAZLIKE IZMEĐU MORFOLOŠKIH KARAKTERISTIKA I MOTORIČKIH SPOSOBNOSTI SPORTSKI AKTIVNIH I SPORTSKI NEAKTIVNIH UČENIKA

Sažetak

Postavljeni cilj istraživanja bio je „Utvrditi razlike između morfoloških karakteristika i motoričkih sposobnosti sportski aktivnih i sportski i neaktivnih učenika". Uzorak sportski neaktivnih dječaka činilo je 87 ispitanika a uzorak sportski aktivnih dječaka činilo je 85 ispitanika. Prosječna starost ispitanika bila je 12 godina. Svi ispitanici su učenici osnovne škole. Sportski neaktivni učenici su redovno pohađali časove tjelesnog i zdravstvenog odgoja, a sportski aktivni su dodatno uključeni u trenažni proces košarkaških, odbojkaških, nogometnih i rukometnih klubova. Dodatni trening se realizovao dva puta sedmično u trajanju od 90 minuta. Morfološki prostor predstavljen je sa petnaest varijabli, a motorički prostor sa dvadestčetiri varijable. Statistička značajnost razlike je utvrđena t-testom na nivou ($p< 0,05$). Prepokrivanje varijansi rezultata provjereno je izračunavanjem eta koeficijenta. Morfološki prostor se razlikuje u Širini karlice (.00/.00 i η^2=.09) te Kožnom naboru nadlaktice (.00/.00 i η^2=.06). Motorički prostor se razlikuje u: Kordinaciji sa palicom (.00/.00 i η^2=.54), Slalomu sa tri medicinke (.00/.00 i η^2=.35), Osmicama sa saginjanjem (.00/.00 i η^2=.09), Bacanju medicinke sa grudi (.00/.00 i η^2=.05, Trčanju 20m niski start (.00/.00 i η^2=.07, Tapingu nogom o zid (.00/.00 i η^2=.31), Sklekovima (.00/.00 i η^2=.101) i Ležanju-sjed (.00/.00 i η^2=.10). Nakon analize se može konstatovati da je cilj istraživanja ostvaren i da su utvrđene razlike antropološkog statusa. Učenicima se može preporučiti dodatna trenažna aktivnost u cilju pozitivnih transformacija antropološkog statusa. Istraživanje sa istim ili sličnim varijablama trebalo bi se organizovati i provesti sa različitim uzrasnim kategorijama oba spola.

Key words: Osnovna škola, Dodatni trenig, Antropološki status

---

Corresponding information:
Received: *04.05.2019.*
Accepted: *18.10.2019.*
Correspondence to: dr. sci. Faris Rašidagić, van. prof.
University: *University of Sarajevo*
Faculty: *Faculty of Sports and Physical Education*
Phone: *061 109 435*
E-mail: e-mail: faris.rasidagic@gmail.com