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THE EFFECTS OF THE CONDITIONAL PREPARATION EXERCISE MODEL ON FLEXIBILITY OF YOUNG ATHLETES

Summary

The aim of the research is to study the effects of model exercises in the fitness and conditioning training of athletes on the motor abilities (flexibility) in young athletes. The sample of respondents referred to a high school student in Krusevac, aged 15 and 16 years, covered by regular physical education classes and the training process in additional physical education classes. The total sample of 112 subjects was divided into two sub-samples: The first sub-sample of 56 subjects included regular physical education classes and training three times a week to realize the model of motor exercises (flexibility) in the physical preparation process in the additional physical education classes constitutes the experimental group.The second sub-sample of 56 subjects, included in regular physical education classes only, constitutes the control group of respondents. A sample of variables consisted of: a deep bow on the bench, a split exercise and a flexibility of shoulder strap with baton. The results of the T-test of motor skills between the initial and final measurements of control group subjects were analyzed. After analysis of the obtained results, it is concluded that there is no statistically significant difference in the tests of motor skills.
The univariate analysis of the variance of motor ability tests compared the results of the arithmetic means of the experimental and control groups at the final measurement. Based on the coefficients of the F-ratio and their significance (P-Level), it can be concluded that no statistically significant difference in the level of motor abilities was found between the experimental and control groups.

Keywords: *motor skills, athletes, high school, physical education, univariate analysis*

INTRODUCION

There is a long development process between predisposition and ability development. Predispositions do not condition, but they predetermine a person's level of ability and ability. There are several theories about abilities, their origins, development factors and species. Some rely more on the significant role of inheritance factors and genes, while others attach greater importance to the social environment, however, the activity of individuals is a common feature of all theories.By some classifications, abilities manifest themselves in two forms - as general and as special abilities. These two groups have a large number of abilities

that have been studied to a greater or lesser extent. Among the most important human abilities, important for performing various activities, are motor skills. There are a number of definitions and views on motor skills.

Previous research

“Motor abilities have a significant impact on motor manifestations that are influenced by regulatory structures that provide excitation intensity in different topological regions of the body and regulatory mechanisms for structuring movement. (Malacko, 2002; Pržulj, 2006). "

"Motor skills are partly hereditary and partly acquired through the training process. There are opportunities to influence their development through specific training methods. Basic motor skills are the basis in any learning of motor tasks of a certain technique, so they can be considered to represent a basic value in the total space of human motor skills (Pržulj, 2006). "

"Motor abilities are those forms of motor activity that occur in moving structures that can be described by the same parametric system, which can be measured with the same set of measures and in which analogous physiological, biological and psychological processes, or mechanisms occur (Zatsiorski, 1975)."

Kurelić (1975), under motor skills, means that part of "the general psychophysical ability of a person, which refers to a certain level of development of the basic latent dimensions of a person, which condition the successful execution of movement, whether or not those abilities are acquired by training."

Findak (1998) states that "motor abilities are defined as latent motor structures that are responsible for an infinite number of manifest motor responses and can be measured and described."

“Biomechanical analysis of the technique of free swimming with the analysis of rational execution of the segments on which the resultant success depends. The rationality of movement depends on these important segments: stride length, frequency of repetition, number of strokes or movements, the surface area in which the swimmer operates (conditioned by anthropological dimensions) speed, continuity of movement (coordination of legs, arms and breathing). (Markovic, V., Trivun, M. 2013).”

“In order to determine the resultant success in long-distance apneo diving, depending on the water temperature in the pool and the air temperature, a comparison of the results of the basic central and dispersion parameters and the analysis of the t-test results were performed. Based on the results obtained, it can be concluded that the water temperature in the pool and the air temperature have a significant influence on the length of the lime dive by increasing the water temperature in the pool by 3 to 5º Celsius and the air temperature by 2 to 4º C contributing to better results in apnea diving (in length). (Trivun, M., Tosic, J., Pasic, G. 2015).”

“The provision of swimming competitions in terms of organization is prescribed by rules and regulations. The rules and regulations are the responsibility of the World Swimming Organization (FINA), which is responsible for national federations. Depending on the rank of the competition, the rules and regulations determine the time period for the deadline for competitors, and in this case, the swimmer. The organization of the competition at the international level include the rally with international participation swimmers.At the rally in Banja Luka, every year in May, the organizer is the Olympic Swimming Club, sponsored by the Ministry of Family, Youth and Sports of the Government of the Republic of Srpska and the City of Banja Luka. In addition to the stewards and volunteers, organization and safety of participants provided by the Ministry of Internal Affairs of the Republic of Srpska. The announcement of the meeting is 30 days from the day of the meeting. The aim is to take the example of two rallies held to present safety and stewarding during maintenance of swimming competitions. (Panic, Z., Trivun, M., Markovic, V. 2017.).”

“In a sample of 24 subjects of the student population of the school year 2009/10 of the Faculty of Physical Education and Sports of the University of East Sarajevo, enrolled in the

second year of study, male, a comparison of the results in eleven variables of morphological characteristics and one variable of swimming at 50 m by the dolphin technique.Predictor variables of morphological characteristics consisted of: body height, body weight, shoulder width, hip width, skin fold of the upper arm, skin fold of the abdomen, circumference of the upper arm, circumference of the lower leg and the diameter of the knee joint, and the criterion variable is the variable of swimming performance with the dolphin technique at 50 meters.Using regression analysis, we obtained a printout of data containing information on regression parameters, as well as statistical quantities relevant to the described test procedures with estimated parameters, in this case 11 variables of morphological characteristics and variables of swimming performance by the dolphin technique at 50 m. (Trivun, M., Budimlic, J. 2010)."

„After the implementation of the program, the results of the essential descriptive parameters show that the Group 2 respondents accomplished better results in all observed variables. The analysis of the t-test results for independent samples indicates a high level of statistical significance for all the variables used: the assessment of swimming knowledge (OPP <.000); swimming length expressed in meters (MET <.000); jumping into shallow pools feet first (SUV <.000). Results of the research indicate that the implemented swimming training program was more effective for young school-age children, thus confirming the results of earlier research regarding this issue (Kazazovic and Associates 2007); Torlakovic, A., Kebat, R., Pestek, E., Trivun, M. (2018)."

„Two samples of respondents of the male population of two generations of students at the Faculty of Physical Education and Sport, University of East Sarajevo, in enrolled in the school year 2015/2016 and school year 2018/2019 had insignificant statistical significance by analyzing t-test of the variables of the body mass index and the variables of 100 meters freestyle swimming. (Trivun, T., Torlakovic, A., Németh,Z., Mirvic, E. 2018)."

"A regression analysis was used to determine the influence of predictor variables (flexibility skills) on criterion variables (specific motor skills). The results indicated that the system of flexibility variables had a statistically significant influence at the p= .001 level, with a multiple correlation coefficient of .77 (R= .77), and multiple correlation squared of .59, explaining approximately 59% (R^2= 0.59) of the variance for the criterion variables Turn time. Based on the results, we can conclude that the predictive variable Sit and Reach (p= .005) had a statistically significant influence on the criterion variable Turn time. (Djurovic, M., Okicic, T., Madic, D., Dopsaj, M., Thanopoulos, V., Rozi, G., Pešić, M., Trivun, M. 2017.)."

METHOD

The subject of the research is the study of the effects of model exercises in the process of conditioning athletes on motor skills in young athletes, high school students in Krusevac, ages 15 and 16, covered by regular physical education and training in additional physical education classes.

Experimental program of motor exercise models in the process of conditioning

Experimental group

The experimental program of the model of programmed exercise in the process of fitness preparation of athletes was realized in the halls for physical education of high schools in Krusevac. The experiment lasted for three months, with three hours of exercise per week, totaling 36 hours of training.

The structure of classes for the implementation of the experimental program was four-part:

- preparatory part: 5 minutes of preparatory activities for exercise,

- formatting exercises: 10 minutes,
- Main part: two parts of 15 minutes of exercise with one break of five minutes between parts (35 minutes total) and
- final part: 10 minutes of stimulating recovery, calming all the organism's functions and emotions of the subjects by using means of less dynamism and low intensity (relaxing activity).

Flexibility

1. Deep bow on the bench..... MDPK
2. Split exercise..... MŠPA
3. Flexibility of shoulder strap with baton……..... MISP

Test description

Deep bow on the bench (MDPK)

Instruments: Bench 40 cm high, wooden meter 60 cm long with dividers in centimeters; the meter is attached vertically to the bench, glued with tape glue.

Task: the subject is standing on a bench with two feet provided the legs bent and feet of reach as deep as possible. The beginning of the meter is up and the end is on the floor. He is entitled to two attempts. The respondent retains the end position to read the results.

Assessment: The reach depth measured in cm is estimated; a better attempt is taken. The zero point is at the top of the meter.

Notes: Respondent must be barefoot.

Split exercise (MŠPA)

Instruments: Steel pendulum with split in cm, chalk.

Task: The subject stands barely against the wall, the foot is moved to the wall. Make a twist off the wall and step the other foot at right angles to the wall for as long as possible. The heel slides on the ground. The chalk marks the furthest position of the heel, the closest edge.

Assessment: The result is the distance of the heel from the wall, measured in cm. The task is performed 2 times, and it counts better than two attempts.

Flexibility of shoulder strap with baton (MISP)

Instruments: Round baton 150cm long and 3cm thick; at one end is a grip with a stop (ring 1 cm high), the tailor's meter is recessed into a baton and glued; the zero point starts from the delimiter.

Task: Respondent stands in a standing posture, with feet at shoulder width apart. He holds the baton in front of the body with one hand on the grip at the end of the stick and the other with it. He raises his baton in front of him, up and over his head in honest hand. One hand stands on the grip all the time and the other slides on the baton. The respondent tries to make a turn with as little distance as possible between his hands.

Assessment: The test result is measured by the distance of the hands after the completed turn, which is read in cm on a stick. It's worth the better (smaller) score of two tries.

Coordination development exercises

Acrobatics (reel forward + lifting upright, flying reel forward + lifting upright, reel backward + lifting upright, sideways, jumping on an elastic table).

Skipping (in place, with tasks, in pairs, in group).

Body position control (leap over a small groin to the toes and hold that position upright and sideways, 360º turn with rubber in your hands).

Hand Coordination (Kinetic Sensitivity): Adding props, grabbing props, hitting goals, hitting a jump shot, hitting a jump, adding a ball to one or both hands from below, above the head, back, through the legs.

Sample of respondents

The population from which the sample was derived are students of first and second year of high school in Krusevac, male, aged 15 and 16 years old. A total of 112 subjects was divided into two sub-samples:

1. A sub-sample of 56 subjects enrolled in regular physical education and training three times a week to realize a model of motor exercises in the physical preparation process in additional physical education classes forms an experimental group.
2. A sub-sample of 56 subjects, encompassed only by regular physical education classes, forms a control group of respondents.

RESULTS WITH DISCUSSION

Table 1. Basic statistical parameters for estimation of motor abilities of experimental group at initial measurement

Variables	N	Mean	Min.	Max.	Std.dev.	Skewn.	Kurtos.
MDPK	56	39.26	28.00	47.00	15.78	-0.347	-0.041
MŠPA	56	158.45	143.00	173.00	15.25	-0.358	0.144
MISP	56	82.79	62.00	95.00	11.34	-0.954	1.655

Legend: arithmetic mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. Dev.), Skewns (Skewn.), Kurtosis (Kurtos.)

Analysis of Table 1 in the subjects of the experimental group in the field of motor ability tests indicates that there are no statistically significant deviations of the results from the normal distribution. The results of tests assessing the motor skills of the respondents indicate that the distribution is positive. This is confirmed by the results of asymmetry of distribution (skjunis) not exceeding 1.00, which means that the tests are not difficult (up to +1.00) or light (up to -1.00), but correspond to the research population and are below the units. The homogeneity of the results (kurtosis) indicates that good sensitivity (test discriminability) is present, since values below 2.75 are obtained.

Table 2. Basic statistical parameters for the evaluation of the motor abilities of the experimental group at the final measurement

Variables	N	Mean	Min.	Max.	Std.dev.	Skewn.	Kurtos.
MDPK	56	48.73	32.00	52.00	12.12	-0.315	-1.311
MŠPA	56	164.26	146.00	175.00	21.84	0.213	-1.241
MISP	56	76.45	58.00	92.00	15.34	0.142	1.401

Legend: arithmetic mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. Dev.), Skjunis (Skewn.), Kurtosis (Kurtos.)

The results presented in Table 2 indicate that there are no statistically significant deviations from the normal distribution in the experimental group in the field of motor ability tests at the final measurement. The results of tests assessing the motor skills of the respondents indicate that the distribution is positive. This is confirmed by the results of asymmetry of distribution (skjunis) not exceeding 1.00, which means that the tests are not difficult (up to +1.00) or light (up to -1.00), but correspond to the research population and are below the units. The homogeneity of the results (kurtosis) indicates that good sensitivity (test discriminability) is present, since values below 2.75 are obtained.

Table 3. Basic statistical parameters for the assessment of motor abilities of the control group at the initial measurement

Variables	N	Mean	Min.	Max.	Std.dev.	Skewn.	Kurtos.
MDPK	56	40.15	29.00	48.00	25.62	0.445	1.515
MŠPA	56	162.36	141.00	176.00	11.14	0.187	-0.448
MISP	56	79.83	59.00	92.00	10.11	0.202	-1.555

Legend: arithmetic mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. Dev.), Skjunis (Skewn.), Kurtosis (Kurtos.)

Analysis of the results in Table 3 in the control group subjects in the field of motor ability tests at the initial measurement indicated that there were no statistically significant deviations from the results from the normal distribution. The results of tests assessing the motor skills of the respondents indicate that the distribution is positive. This is confirmed by the results of asymmetry of distribution (skjunis) not exceeding 1.00, which means that the tests are not difficult (up to +1.00) or light (up to -1.00), but correspond to the research population and are below the units. The homogeneity of the results (kurtosis) indicates that good sensitivity (test discriminability) is present, since values below 2.75 are obtained.

Table 4. Basic statistical parameters for the assessment of motor abilities of the control group at the final measurement

Variables	N	Mean	Min.	Max.	Std.dev.	Skewn.	Kurtos.
MDPK	56	46.54	37.00	51.00	11.29	0.875	-0.524
MŠPA	56	171.79	152.00	184.00	15.82	0.555	-0.152
MISP	56	74.62	51.00	86.00	25.38	0.164	0.305

Legend: arithmetic mean (Mean), minimum (Min), maximum (Max), standard deviation (Std. Dev.), Skjunis (Skewn.), Kurtosis (Kurtos.)

The results presented in Table 4 indicate that there are no statistically significant deviations from the normal distribution in the motor control subjects in the final measurement. The results of tests assessing the motor skills of the respondents indicate that the distribution is positive. This is confirmed by the results of asymmetry of distribution (skjunis) not exceeding 1.00, which means that the tests are not difficult (up to +1.00) or light (up to -1.00), but correspond to the research population and are below the units. The homogeneity of the results (kurtosis) indicates that good sensitivity (test discriminability) is present, since values below 2.75 are obtained.

Table 5. Univariate analysis of variance of motor ability between experimental and control subjects at initial measurement

Tests	Mean (E)	Mean (K)	F-odnos	Q
MDPK	39.26	40.15	0.25	.325
MŠPA	158.45	162.36	1.84	.196
MISP	82.79	79.83	1.86	.212

Legend: arithmetic mean of experimental group (Mean (e)), arithmetic mean of control group (Mean (k)), F-test value (F-ratio) and significance level (Q)

Table 5 shows the univariate analysis of variance in motor ability tests by comparing the results of the arithmetic means of the experimental and control groups at the initial measurement. Based on the coefficients of the F-ratio and their significance (P-Level), it can be concluded that no statistically significant difference in the level of motor abilities was found between experimental and control groups.

Table 6. Significance of differences of the arithmetic means - experimental group:

Tests	Mean(i)	Mean(f)	T-value	p
MDPK	39.26	48.73	1.43	**.258**
MŠPA	158.45	164.26	1.57	**.120**
MISP	**82.79**	**76.45**	**1.56**	**.144**

Legend: arithmetic mean initially (Mean (i)), arithmetic mean final (Mean (f)), T-value (T-value) and significance level (p)

Table 6 contains the results of the T-test of motor skills between the initial and final measurements of the experimental group. After analyzing the results obtained, it is concluded that there is a statistically significant difference in the Sargent jump (MSAR .005), distance jump (MSDM .004), triple jump (MTRS .001), foot tap (MTAP .006), arm tap (MTAP .005), running at 20 meters high start (M20V .000), running at 30 meters high at start (M30V .000) and running at 50 meters at high start (M50V .001).

Table 7. Significance of differences of the arithmetic means -control group:

Tests	Mean(i)	Mean(f)	T-value	p
MDPK	40.15	46.54	-1.52	**.108**
MŠPA	162.36	171.79	-1.27	**.205**
MISP	**79.83**	**74.62**	**-1.42**	**.244**

Legend: arithmetic mean initially (Mean (i)), arithmetic mean final (Mean (f)), T-value (T-value) and significance level (p)

Table 7, contains the results of the T-test of motor skills between the initial and final measurements of the control group subjects. After analysis of the obtained results, it is concluded that there is no statistically significant difference in the tests of motor skills.

Table 8. Factor structure of the isolated discriminant function of the experimental group

Variables	Root 1
MDPK	0.400
MŠPA	0.375
MISP	0.351

Table 8 gives the structure of the discriminant function of the participation of motor skills variables in the formation of significant discriminant functions. The group centroids shown are the arithmetic means of the results of the initial and final measurements. In order to check the efficiency of the training process for the realization of the model of motor exercises in the process of fitness preparation of athletes, 3 motor tests were measured, which are assumed to be good predictors of the studied area. The results presented indicate that the greatest contributor to the discriminant function is the Deep bow on the bench (MDPK 0.400), Split exercise (MŠPA 0.375), and Flexibility of shoulder strap with baton (MISP 0.351).

Table 9. Factor structure of the isolated discriminant function of the control group

Variables	Root 1
MDPK	0.248
MŠPA	0.236
MISP	0.225

Table 9 gives the structure of the discriminant function of the participation of motor skills variables in the formation of significant discriminant functions. The group centroids shown are the arithmetic means of the results of the initial and final measurements. In order to determine the significance of the differences between the initial and final measurements in the control group, 3 motor tests were measured, which are assumed to be good predictors of the investigated area. The present results indicate that all coefficients have lower value, and on the basis of the total contribution of all motor tests can be concluded that there was no statistically significant transformation process in the mobility area of the control group.

Table 10. Univariate analysis of variance of motor ability between experimental and control subjects at final measurement

Tests	Means (E)	Means (K)	F-odnos	Q
MDPK	48.73	46.54	1.44	.125
MŠPA	164.26	171.79	1.56	.220
MISP	76.45	74.62	1.44	.210

Legend: arithmetic mean of experimental group (Mean (e)), arithmetic mean of control group (Mean (k)), F-test value (F-ratio) and significance level (Q)

Table 10 shows the univariate analysis of variance in motor ability tests by comparing the results of the arithmetic means of the experimental and control groups at the final measurement. Based on the coefficients of the F-ratio and their significance (P-Level), it can be concluded that no statistically significant difference in the level of motor abilities (flexibility) was found between the experimental and control groups, and the reason should be sought in accelerated growth (adolescence) in a male population of 15 up to 16 years, as well as a short period of work (15 minutes in the main part of the class) to cause marked changes that would be statistically very significant.

CONCLUSION

The sample of respondents referred to a high school student in Krusevac, aged 15 and 16 years, covered by regular physical education classes and the training process in additional physical education classes. The total sample of 112 subjects was divided into two sub-samples: The first sub-sample of 56 subjects included regular physical education classes and training three times a week to realize the model of motor exercises (flexibility) in the physical preparation process in the additional physical education classes constitutes the experimental group.The second sub-sample of 56 subjects, included in regular physical education classes only, constitutes the control group of respondents. A sample of variables consisted of: a deep bow on the bench, a split exercise and a flexibility of shoulder strap with baton. The results of the T-test of motor skills between the initial and final measurements of control group subjects were analyzed. After analysis of the obtained results, it is concluded that there is no statistically significant difference in the tests of motor skills.The aim of the research is to study the effects of exercise models in the process of conditioning athletes on motor skills (flexibility) in young athletes.

The univariate analysis of the variance of motor ability tests compared the results of the arithmetic means of the experimental and control groups at the final measurement. Based on the coefficients of the F-ratio and their significance (P-Level), it can be concluded that no statistically significant difference in the level of motor abilities was found between the experimental and control groups, and the reason should be sought in the insufficient intensity of exercise (15 minutes in the main part of the class), as well as the adolescent age (15 and 16 years) of the male population, where rapid growth of long bones is emphasized.

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