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**THE SIGNIFICANCE OF THE INFLUENCE OF
MOTOR SKILLS ON SUCCESS OF WOMEN
RHYTHMIC GYMNASTS IN EXERCISES WITH HOOP****Abstract**

In this paper has been tested the influence of motor skills, as one of the segments of anthropological status of women rhythmic gymnasts, on the success in performing of exercises with hoop. Rhythmic gymnastics is a sport where one need to master in advance given and trained movement structures with highlighted aesthetic moment. Therefore, they are required to possess a high level of motor skills that will enable successful execution of the exercises in the form of trained composition. It can be said that the technical part of the choreography depends on the motor abilities of rhythmic gymnast. Overcoming the elements of a coordinated handling props depends on the manual handiness or ability of manipulation by hands, or, as we call them elements of props. Motor skills are through the number and difficulties of elements, by body manifested through jumps, equilibrium positions, turns, mobility and others. How significant is the importance of motor skills on performing the exercises with hoop represents the main problem of this paper. The study was conducted on 52 girls, members of rhythmic club "Olympic" from Sarajevo, aged 8 to 10 years (± 6 months). Checking of motor skills was performed by testing 14 variables, as well as verification of success in carrying out exercises with hoop. For the purposes of this study we used Regression analysis and ANOVA (analysis of variance). The research results indicate that the contribution of motor skills is significant on the success in performing exercises with hoop.

Key words: motor skills, rhythmic gymnastics, exercise with a hoop.

1. INTRODUCTION

Rhythmic gymnastics is one of the sports of aesthetic coordination character in which prevail acyclic structures of movement. It is a sport in which the exercises are performed with five props: rope, hoop, ball, skittles and ribbon, wherein with body are performed basic elements out of the natural form of movement. The movements arising from natural forms of motion, softness, expressiveness and elegance, which are based on the rhythmicity and dyna-

mics, make this sport pleasant and attractive to the eye and make it one of the most suitable sports activities for girls. Rhythmic gymnastics is a very young sport discipline for which the research interest appeared in the 60s of the last century. The success in many sports depends primarily on morphological characteristics and motor abilities. That is why is for the rhythmic gymnastics important general research of those areas, especially motor skills.

The studies that were aimed to identify predictors of success in rhythmic gymnastics, suggest some desirable motor skills in women rhythmic gymnasts, such as coordination (Furjan-Mandić and Wolf-Cvitak, 1992, Rutowski-Kucharski and Bober, 1998), strength (Wolf -Cvitak, 1984, Sorhoj, 1989), flexibility (Jastrjemskaia and Titov, 1999, Sergienko, 1999) and coordination in the rhythm (Miletic, Katic and Sorhoj, 1998).

Bogdanovic (1994) conducted a survey in order to determine the influence of motor abilities on some elements of specific motor skills as the primary selection of girls preschoolers for engaging in rhythmic gymnastics. She concluded that for the successful selection in rhythmic gymnastics the emphasis should be placed on the ability of coordination and balance, especially flexibility.

Miletic (1999) conducted a study on a sample of 100 girls, aged 11 years, to determine the relation between some morphological characteristics, motor abilities and success in rhythmic gymnastics after six months of Kinesiology treatment. Criteria were three compositions: Exercise with Lopra, jumping rope and without props. Regression analysis has found that to achieve good results is extremely important the expressed ability of coordination in rhythm and speed. The dominance of these abilities she explained by peculiarity of rhythmic gymnastics as a competitive discipline that is performed along with music. Music makes easier and faster the learning of connected movements.

Wolf-Cvitak and Lizačić (2001) found differences in some of motor abilities of girls who were with six years included in the half year program of rhythmic gymnastics as extra-curricular activities. By rhythmic gymnastics girls significantly developed flexibility (range of motion) and explosive power (hops and jumps), by which they differed significantly from the other girls who were not included in the program. This program enabled them further selection in this sport.

The research problem in this paper is placed in the function of determining the influence of motor abilities (as predictor variables) that will serve to identify their significances to the success in performing exercises with hoop (criterion variable).

2. METHODS

For the purposes of this study has been used a representative sample, which accounted for 52 female rhythmic gymnasts from Rhythmic Club "Olympic" from Sarajevo, aged 8 to 10 years (± 6 months). The sample of variables consisted of 14 variables related to motor skills (explosive strength, speed of frequency of motion, flexibility, coordination and balance) and one variable from the area of rhythmic gymnastics (exercises with hoop).

Table 1. Criteria for evaluation

GRADE	Received respondents who :
5 (five)	The whole composition (exercise) performed correctly, properly, with ease, with a full range of motion, at a high aesthetic level (expressive) and in accordance with musical accompaniment
4 (four)	The whole composition (exercise) performed correctly, properly, with ease, with partial absence of amplitude of movements and in accordance with musical accompaniment
3 (three)	Certain sections of the composition (exercise) performed with minor errors that do not affect performance, with the absence of amplitude of motion, with minor irregularities and partly short-term non-alignment with musical accompaniment
2 (two)	The whole composition (exercise) performed with effort and large deviation from the description of the composition, with a lot of irregularities, with no range of motion and with a pronounced disharmony of movement and music
1 (one)	Could not carry out the composition (exercise) in full, with a lot of rough errors, without the compatibility of movement and music.

The criterion variable makes exercise with a hoop which is estimated on the basis of certain criteria (formed grades are from 1 to 5). The respondents were assessed by the women judges of rhythmic gymnastics. Evaluation criteria was based on the precisely defined recommendations for each grade.

Data obtained in this study were analyzed by regression analysis and analysis of variance (ANOVA). As the level of statistical significance was determined that the $p < 0.05$. Statistical analysis was performed using SPSS application statistical software (version 10.0) and Statistics.

3. RESULTS AND DISCUSSION

Table 2. Regression Summary for Dependent Variable: VSOBR

Regression Summary for Dependent Variable: VOBR						
N=52	b*	Std.Err. of b*	b	Std.Err. of b	t(37)	p-value
Intercept			0,66	3,90	0,17	0,86
MSDM	0,14	0,16	0,01	0,01	0,86	0,39
MPGK	-0,09	0,16	-0,04	0,07	-0,56	0,57
MSSV	0,04	0,17	0,01	0,05	0,25	0,80
MTAN	-0,29	0,18	-0,06	0,03	-1,55	0,12
MTAR	0,53	0,24	0,13	0,06	2,18	0,03
MTAZ	-0,02	0,15	-0,01	0,08	-0,17	0,85
MDPK	0,15	0,14	0,02	0,02	1,03	0,30
MISP	-0,29	0,14	-0,01	0,00	-2,00	0,05
MONT	0,08	0,17	0,01	0,03	0,44	0,65
MŠKI	-0,11	0,16	-*0,13	0,19	-0,69	0,49
MPHV	-0,01	0,17	-0,00	0,03	-0,08	0,93
MHNG	0,11	0,17	0,04	0,07	0,67	0,50
MSTN	0,12	0,15	0,06	0,07	0,84	0,40
MHNT	-0,23	0,16	-0,18	0,13	-1,36	0,17

R= ,655 R²= ,429 F(14,37)=1,98 *p<,047

Tabela 3. Analysis of Variance; DV: VSOBR

Analysis of Variance; DV: VSOBR					
Effect	Sums of Squares	df	Mean Squares	F	p-value
Regress.	12,77	14	0,91	1,98	0,04
Residual	16,98	37	0,45		
Total	29,76				

Tabela 4. Correlations

Variable	Correlations VSOBR
MSDM	0,43*
MPGK	0,26
MSSV	0,27
MTAN	0,20
MTAR	0,49*
MTAZ	0,08
MDPK	0,27
MISP	-0,29*
MONT	-0,31*
MŠKI	-0,29
MPHV	0,24
MHNG	-0,22
MSTN	-0,04
MHNT	-0,31*

Table 2 shows the relationship between a dependent (criterion) variable - an exercise with a hoop VSOBR and independent (predictor) variables of motor abilities. From this table we can see that multiple (multipla) correlation of variables of motor abilities towards the variable exercise with the hoop amounts $R=0.655$. Based on the size of the obtained coefficient of multiple correlation, we conclude that the interdependence of test in performing the exercise with hoop (VSOBR) on the one hand and tests of motor skills on the other is of high degree. The coefficient of multiple determination $R^2=0.429$, shows that motor skills have an impact on the performance of exercises with hoop 42.9%, while the influence of others (not included) factors of 57.1.

By the analysis of variance of multiple regression analysis (Table 3) we can see that the value of explained (regression) variability is less than the unexplained (residual).

Based on F test $F=1.98$, we can conclude that the relationship between sets of motor abilities as predictor variables on the one hand and the criterion variable exercise with the hoop on the other is statistically significant ($0,001 < 0,042$) which means that the model is representative.

Based on the beta coefficients (Table 2) it can be seen that the largest contribution to the correlation of predictor variables with the key variable (VSOBR) provides variable MTAR (hand tapping-the speed of frequency of hand movements) and MISP (turn to side with stick-the flexibility of arms and shoulders area). From in this way obtained results it can be concluded that respondents who have achieved better results on these tests have been more successful in carrying out exercises with hoop.

Agility of handling props, in this case a hoop, which can be called manual ability, depends on the speed frequency of hand movements, as well as on the flexibility of the arms and shoulders, which is logical and expected. So the factor of speed and flexibility had the greatest impact on the success of this exercise.

Based on the results obtained by regression analysis it can be concluded that these two variables gave statistically significant unique contribution to the success of the performance of rhythmic exercise with hoop which that does not mean that other abilities should be considered less important.

Significance of only these two tests can be attributed to their age (8-10 years). Female beginners in rhythmic gymnastics are usually between the ages of 7 to 8 years, when they are expected to master a large number of motor skills with props to enable them to attain the necessary criteria in order to participate in competitions. Previous research (Miletic and Viskić - Štalec, 2002) show that there are quite objective reasons why girls in the initial stage can not acquire prescribed knowledge with certain props.

Exercise with the hoop contains elements of expressed, wide ranges of motion, which better adopted and demonstrated girls with greater flexibility. Bogdanovic (1994) found that for the successful selection of rhythmic gymnastics, in girls of preschool age, the emphasis should be placed on the ability of coordination, balance, and especially flexibility.

Table 4 shows the relationship between the individual variables from area related to motor skills with variable exercise with the hoop. The highest correlation coefficient $R=0.49$ has a variable MTAR, then the variable MSDM with a correlation coefficient $R=0.43$ and variables MONT MHNT with the correlation coefficient $R=-0.31$. From this we can conclude that the rhythmic gymnasts who have a faster frequency of movement, better explosive leg strength, coordination and dynamic balance are more successful in performing exercises with the hoop, as found by other researchers on a sample of female respondents in this age group.

Numerous analyzes determined the correlation between the results of motor tests and performing of jumps in rhythmic gymnastics. According to these results, power (especially explosive leg strength) contributes to the achievement of better results in the execution of jumps in rhythmic gymnastics, the crucial and the most attractive element in rhythmic gymnastics, which we have also in this exercise with the hoop. The so far research results found that to girls in the initial stages of learning the basic elements of rhythmic gymnastics is the hardest to adopt far-high jump and jumps associated with the ejection of props. According to many research results, the ability for motor learning of jumps is particularly conditioned by coordination, but also with the explosive power of the legs. The authors suppose that explosive leg strength contributes to better performing of high jumps, and so allows for greater amplitude of movement.

Dynamic equilibrium in rhythmic gymnastics is important for elements that are performed as a transient positions without retention, such as turning, that we have in this, as in all other exercises of rhythmic gymnastics with and without props. According to its biomechanical properties, turns represent dynamic equilibriums, given that there is a need to establish the position of the center of gravity of the body vertically above the surface of the support, so that in a fixed position would be performed further rotation, when the conditions for maintaining balance are considerably more difficult (L., Radisavljević 1992).

Extensive research of certain motor abilities (predictor variable) on the success of performance of the basic elements of the technique of rhythmic gymnastics (criterion variable) researched the Wolf-Cvitak (1993) and she found that out of all motor abilities the greatest positive impact have measures of coordination, speed, balance and rhythmic movements, which was confirmed by this study.

Speaking of rhythmic gymnastics as a competitive sport, we can say that from the female competitors are demanded, at first glance, the two diametrically opposed significances. Strength and explosiveness on the one hand, and flexibility and rhythm on the other. It is the achievement of optimal ratio of these parameters what makes this sport complex, but interesting. A high level of motivation and readiness to very demanding training process are indicators that must be integrated into the uniqueness of each individual competitor.

4. CONCLUSION

The testing of the influence of motor abilities of female rhythmic gymnasts on the success of performing exercise with the hoop, was conducted on a representative sample of rhythmic gymnasts Rhythmic Club "Olympic" from Sarajevo, aged 8 to 10 years (± 6 months). The predictor variables consisted of 14 tests from the area of motor skills (explosive strength, speed, flexibility, coordination and balance), and the criterion variable constituted of the exercise with hoop.

Based on the results obtained by regression analysis it can be concluded that the size of the obtained coefficient of multiple correlation and interdependence of test exercise with the hoop and tests of motor skills is of high degree. Based on these results it can be concluded that the impact of motor abilities on success in performing exercises with hoop is significant. The highest correlation was observed in variables from the area of speed of frequency of movement (MTAR), and variable from the area of flexibility of arms and shoulders (MISP), which confirms that the female rhythmic gymnasts performed better exercises with hoop who had a faster frequency of hand movements and greater flexibility of arms and shoulders. By this paper can be confirmed that the manual ability of handling the hoop is conditioned by the speed and flexibility of the hands.

The analyzed results of tests for the assessment of motor abilities indicate also on the importance of explosive strength, coordination and balance, which have influenced at the overcoming the body elements which are manifested through jumps, equilibrium positions, turns, mobilities and others.

Success in rhythmic gymnastics is conditioned by a larger or smaller number of factors. One of the main prerequisites for the management of sports training is to determine the main factors that largely affect the success.

Since rhythmic gymnastics is a relatively young sport branch there is still no defined and clearly elaborated equation of specification of sport, which exists for other older sports. Therefore further research is needed. From most of other research it is visible that unexplained is left at least 30% of the space of success. It is assumed that this part characterize some other aesthetic premises also important for achieving success in rhythmic gymnastics.

Female athletes in rhythmic gymnastics are very young and therefore rhythmic gymnastics can be considered as a sport for children. Already in the sixth year of life begin training and selection, while in the senior competition can perform female rhythmic gymnasts from 14 years of age. That's why a lot of research, as well as this, was carried out at young female respondents.

Bearing in mind that there is very little research in the field of rhythmic gymnastics, we can say that the contribution of this paper is that it encourages other research projects in which would be perceived and studied all aspects that condition the sport result in rhythmic gymnastics. Open questions, dilemmas and new ideas that may arise from reading this paper may be directions for new research in the field of rhythmic gymnastics.

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