

QUANTITATIVE CHANGES OF FUNCTIONAL ABILITIES AT BOYS UNDER INFLUENCE OF EXPERIMENTAL RACE WALKING PROGRAMME

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Summary

The aim of research is to analyze influence of Experimental race walking program in physical education classes (EPWPE) on increasing physical abilities at primary school boys. Eight measures of functional abilities were applied. Influence of EPWPE on increasing of functional abilities was estimated on sample of 200 boys of fifth grade primary school, aged 11 ± 0.5 and they represented experimental group. Control group as consisted of 120 same aged boys, participated in ordinary physical education classes. EPWPE had positive influence on increasing functional abilities.

Key words: functional abilities, race walking, boys

Introduction

The race walking is the discipline of stamina and it is physiologically related to the long-distance running (Hagberg, & Coyle, 1984; Pollock & al., 1997; Brisswalter, & al. 1998). The Olympic program includes the races of 20 km and 50 km for males and 20 km for female competition. For that reason, the training with race walkers is aimed to the largest extent to increase cardiovascular capacity, both aerobic and anaerobic (Tončev, 1983). The quality and success in the athletics club depends to the largest extent on the teacher/coach himself. He has to know the methods of learning, technical and tactics skills, development of physical abilities and characteristics of methodological formation of training work. In order to improve the work in the athletics club, in this particular case, with race walkers of younger school age, it is necessary to realize a regular orientation and selection of the gifted students. The frames of this kind of orientation and work with the younger age pupils are included in the Experimental program of race walking in the classes of physical education (EPWPE) and they are aimed to increase the aerobic abilities of children. The program which has been mentioned in this project work has been modelled for the 10km race but the exercises, trainings and principles can be applied to the work with the top race walkers (Škof, 2003). This research is aimed to determine the influence of the experimental program of race walking (EPWPE) on increasing the functional abilities with the population of primary schools pupils, aged 11. One of the aims is that this research gives a larger scientific contribution to the sport practice, to increase the degree of young people in race walking in the conditions when a specially formed experimental program of work in the physical education is used.

Methods

The population, from which the sample was taken, has been defined as fifth grade primary school pupils, aged 11 ± 6 months. Whole sample consisted of 320 boys from four towns in Serbia, in the way that 200 of them formed the experimental (EG), and 120 of them formed the control group (CG). EG was covered, except with the physical education classes, with EPWPE in the athletics club of race walking. CG had only ordinary classes of physical education. Serving the needs of this research, the testing data has been taken only from the testees who took a regular participation in the classes of physical education and who do not have more than two absences in the realization of EPWPE. The following tests represent the system for evaluation of functional abilities: PUMI Puls in the state of inactivity, VO2APS Absolute maximal oxygen uptake ($\text{mlO}_2 \cdot \text{min}^{-1}$), VO2REL Relative maximal oxygen uptake ($\text{mlO}_2 \cdot \text{min}^{-1} \cdot \text{kg}^{-1}$), FOPOR1 Pulls in the first minute of recovery after the test after Astrand and ($\text{b} \cdot \text{min}^{-1}$), FOPOR2 Pulls in the second minute of recovery after Astrand test ($\text{b} \cdot \text{min}^{-1}$), FOPOR3 Pulls in the third minute of recovery after the test after Astrand ($\text{b} \cdot \text{min}^{-1}$), TASMIN Systolic arterial blood pressure in the state of inactivity (kPa) and TADMIN Diastolic arterial blood pressure in the state of inactivity (kPa). The discriminative analysis has been applied to serve the needs for determination of differences between the initial and final measuring in the system of functional abilities variables in EG. The univariant analysis of variance (ANOVA) has been applied to determine the differences within functional abilities between EG and CG at the initial and final measuring. The EPWPE experimental program is acceptable for the teachers/coaches and the course takers because it does not involve using some special gyms, apparatus or equipment.

The basic activity of the testees in the realization of the programme consisted of walking and running whereas the usual complex of the exercises similar to the exercises performed in regular classes of physical education was used during the preparation phases. The interval method with different combinations of running and active pauses (slow running and walking) was used at the process of EPWPE realization. Some short distance paths of walking and longer paths of running were used at the beginning of the process of training in order to obtain some inverse proportion gradually up to the end of the programme. After the initial state of functional abilities had been determined, the testees were included in the experimental process of training which was realized three times a week (on Monday, Wednesday, Friday) and lasted 45 minutes each. The introductory and preparation part of each class lasted 15 minutes and it was identical for all of the testees made of groups with 50 testees each. The basic part of the class was realized in the groups consisted of 5 to 10 testees. The finish part of the class consisted of slow running with gradual transformation to walking up to 500m.

After the EPWPE application, the final measuring was realized in order to determine the realized effects of training work in relation to the initial measuring. 1st lesson: oral presentation of the task characteristics, presentation of kinogram, technique demonstration, 30-40m slow walking performance emphasizing the typical mistakes observed by the teachers. 2nd lesson: creating a correct conception on the technique of race walking, presentation of the technique of walking by coaches or a quality race walker, performance of the presented technique of race walking at the courses of 50-100m with correction of typical mistakes by teachers. 3rd lesson: slow walking of 200-300m, warming up, 10 minutes of exercise, slow and speed up walking positioning the stretched leg on the ground, walking on the straight line, walking on the straight line with the tendency to push the hip of the pace leg forward during stepping forward. 4th lesson: slow walking and running about 800m, 10 minutes of exercise, 8X20m, walking alphabet, 2000m changeable (200 meters of walking, 200 meters of running-fartlek), 500m of slow running. 5th lesson: slow walking about 500m, 10 minutes of exercise, 8X40 meters, walking alphabet, 5X200 meters of walking, running. 6th lesson: slow walking about 500-800 meters, 10 minutes of exercise, 5X50 meters, walking alphabet, 1000 meters of changeable speed walking (100 meters faster followed by 1000 meters of slower walking), running. 7th lesson: slow walking about 500-800 meters, 10 minutes of exercise, 5X80 meters off-speed up, 1500 meters of walking, running. 8th lesson: slow walking about 400 meters /warming up), 10 minutes of exercise, slow running about 500 meters. 9th lesson: slow walking and running about 800-1000 meters, 10 minutes of exercise, 4X40 meters, walking alphabet, 5X100

meters in walking technique, slow running. 10th lesson: slow walking about 800-1000 meters, 10 minutes of exercise, 8X20 meters, walking alphabet, 15000 meter of running with a moderate intensity, slow running. 11th lesson: slow walking about 1000m, 10 minutes of exercise, 5X50 meters, walking alphabet, 5 minutes of exercise, 500meters of race walking, 500 meters of slow running. 12th lesson: slow walking about 500-800 meters, 10 minutes of exercise, 5X50 meters, walking alphabet, 5X50 meters of speed-up, race start of 1000 meters race walking, 500 meters of slow running.

Results

At comparison of average values of variables referring to functional abilities at initial and final measuring with EG, it was noticed that the pulls levels in inactivity state, and in the first, second and the third minute of recovery after the test by Astrand were a little bit lower whereas the values of the absolute and relative oxygen consumption were a little bit higher in the final one in relation to the initial measuring. The readings of the systolic and diastolic blood pressure were almost the same. After EPWPE was applied, a calculation referring to the differences in the levels of functional abilities of testees in the final measuring in compare to the initial one was done.

Table 1. Isolated discriminative function

Eigen value	Canonicl R	Wilks' λ	χ^2	Df	P-level
.155	.367	.866	56.871	8	.000

On the basis of the presented results in the table 1., it can be said that a significant discrimination in the scope of the functional abilities of the testees in the final measuring in comparance to the initial one (P-level=100) was determined. The coefficient of canonic correlations (Canonical R=.37) indicates that a significant canonic function was explained about 37% and thus the experimental program, which lasted for 12 months, had a positive influence on changes in functional abilities of testees. The intensity of the realized discrimination is very high (Wilks' $\lambda = .86$), which shows that the experimental program had a positive influence on increasing functional abilities at larger number of testees. Statistical significance of the discrimination, which actually represents the sum of squares of the correlation coefficient magnitude, applied to the whole set of variables is high and it was explained by χ^2 test and it amounts (56.87). By the analysis of the discriminative function, which was presented in the table 2., it can be concluded that the variable of the absolute oxygen consumption VO2APS (.74) was defined best, by the pulls after the pause of three minutes FOPOR3 (.68); pulls after the pause of two minutes FOPOR2 (.67) and pulls after the pause of one minute FOPOR1 (.65), and a little bit less by the variable of the pulls in the state of inactivity PUMI (.47) and by the oxygen consumption VO2REL (.43).

Table 2. Structure of the isolated discriminative function

Variable	ROOT 1
PUMI	-.475
VO2APS	.748
VO2REL	.439
FOPOR1	-.658
FOPOR2	-.669
FOPOR3	-.688
TASMIN	-.029
TADMIN	-.046

It can be also seen that the function was defined bipolar, which means that numerically lower results readings were bigger at initial measuring in comparance to the final one. The results of final measuring are better in comparance to the initial one, which resulted in the fact that EPWPE had a positive influence on changes of functional abilities of young athletes. On the basis of the position of the centroid of the initial and final measuring (Table 3), it can be seen that the initial and final measuring were mostly different due to the above mentioned variables.

Table 3. Group's centroids

Group	ROOT 1
G_1:1	-.393
G_2:2	.393

The precision of the difference-discrimination realized, which amounts 68% (Total=68.00) in the percentage for functional indicators, is presented in the Table 4. The recovery tests results readings after the 1st, 2nd and 3rd minute and the absolute oxygen consumption indicate that EPWPE allowed the testees a higher level of functional abilities and also a better physical fitness for enduring some certain efforts. Based on the results obtained, it can be said that EPWPE had a positive influence on adjustment of testees' cardiovascular system to some bigger efforts since 68% of testees witnessed the change in functional abilities.

Table 4. Precision in results classification

Group	Percent Correct	G_1:1 p=.500	G_2:2 p=.500
G_1:1	68.000	136	64
G_2:2	68.000	64	136
Total	68.000	200	200

The results of ANOVA tests of functional abilities between EG and CG at initial measuring are presented in the Table 5. On the basis of the analysis of the results obtained, it can be concluded that there are no statistically important differences in the tests of functional abilities between the groups. The testees from both of the groups had the identical levels of functional abilities at the beginning of research.

Table 5. Importance of differences in functional abilities between EG and KG at initial measuring

Variable	N	Mean	SD	F	p
PUMI	200	76.54	11.49	.4208	.5170
	120	77.43	12.62		
VO2APS	200	1.92	.32	.6963	.4047
	120	1.95	.33		
VO2REL	200	46.52	9.47	.2388	.6254
	120	47.07	10.10		
FOPOR1	200	127.77	7.40	.2121	.6454
	120	127.38	7.21		
FOPOR2	200	119.05	7.24	.3485	.5554
	120	118.55	7.49		
FOPOR3	200	100.65	9.55	2.7009	.1013
	120	98.82	9.77		
TASMIN	200	116.67	6.91	.0827	.7739
	120	116.91	7.60		
TADMIN	200	74.61	6.44	.0051	.9430
	120	74.66	6.48		

Table 6. Importance of differences in functional abilities between EG and KG at final measurement

Variable	N	Mean	SD	F	p
PUMI	200	72.63	9.36	15.1594	.0001
	120	77.43	12.62		
VO2APS	200	2.11	.32	17.6891	.0000
	120	1.95	.33		
VO2REL	200	49.77	9.36	5.9023	.0157
	120	47.07	10.10		
FOPOR1	200	124.19	6.38	16.9415	.0000
	120	127.38	7.21		
FOPOR2	200	114.93	8.39	15.1567	.0001
	120	118.55	7.49		
FOPOR3	200	96.02	7.40	8.3505	.0041
	120	98.82	9.77		
TASMIN	200	116.52	6.29	.2437	.6219
	120	116.91	7.60		
TADMIN	200	74.36	7.24	.1423	.7062
	120	74.66	6.48		

Discussion and conclusion

Table 6 presents the ANOVA results of functional abilities between the groups at the final measurement and they show that there can be found a significant difference in six tests for evaluation of functional abilities in favor of EPWPE, except in the tests for evaluation of systolic and diastolic (TASMIN, TADMIN) arterial blood pressure. Stagnation was recorded with CG but EG had a positive transformation in the tests examined. The existence of difference between the groups after EPWPE can be explained with nonexistence of a cardiovascular system functional ability unique for all life situations, but that there are a number of specific abilities for different kinds of activities and situations. Biggest differences in the cardiovascular functional abilities for the maximal efforts are between non-trained and trained sportsmen for special disciplines (Rakovac & Heimer, 2003; Škof, 2003).

The bigger toil, the bigger differences in the reactions of cardiovascular system of different people are. On the basis of the results of this research and the aims set, the following conclusions can be made:

1. The given experimental program of race walking had a positive influence on increasing the pupils' functional abilities. After its realization, a higher level of physical fitness was determined, which influenced on the better adjustment of the cardiovascular system to bigger efforts (Yoshida & al., 1990; Željaskov, 2003).
2. The Apparatus for physical exercise, used strains and methods for development of physical abilities, learning and adoption of technique and tactics knowledge, used forms and types of work given in the realized EPWPE can serve as a model for realization of training and school work with the examinees of this age.
3. Although this research examines the development of functional abilities, it is necessary to be aware of the interaction of functional-motoric and technique-tactics preparations (Murray & al., 1983). Thus, it is requested by teachers/coaches to know a lot of information from both of the fields of preparation in order to make as better program in quality as possible for improvement of young race walkers skills.
4. It is concluded that, during the period of research realization, the lessons of physical education did not bring any improvement in the domain of the examined functional abilities. A small number of lessons (twice a week) and the actual curriculum are one of the reasons for this kind of development.

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KVANTITATIVNE PROMJENE FUNKCIONALNIH SPOSOBNOSTI DJEČAKA POD UTJECAJEM EKSPERIMENTALNOG PROGRAMA SPORTSKOG HODANJA

Sažetak

Cilj istraživanja je analiza utjecaja Eksperimentalnog programa sportskog hodanja u nastavi Tjelesne i zdravstvene kulture (EPHTZK) na povećanje funkcionalnih sposobnosti učenika osnovnih škola. Primjenjeno je 8 mjera funkcionalnih sposobnosti. Utjecaj EPHTZK na povećanje funkcionalnih sposobnosti ispitan je na uzorku od 200 učenika petog razreda, starih 11 godina \pm 6 mjeseci koji su činili eksperimentalnu grupu. Kontrolnu grupu činilo je 120 njihovih vršnjaka, koji su imali samo nastavu Tjelesne i zdravstvene kulture. EPHTZK pozitivno je utjecao na povećanje funkcionalnih sposobnosti.

Ključne riječi: funkcionalne sposobnosti, sportsko hodanje, dječaci

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