THE IMPACT OF ADDITIONAL ATHLETIC EXERCISE ON MORPHOLOGICAL DIMENSION TRANSFORMATION OF SEVEN YEAR OLD GIRLS

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Abstract

In order to determine the efficacy of additional athletic exercise on morphological feature transformation, we analyzed totally 82 seven year old girls divided into experimental (N=33) and control (N=49) group. The experimental group included respondents who, beside regular PE classes three hours per week, attended three additional training units of athletic exercise for a period of nine months. The control group included respondents who only attended regular PE classes. The sample of variables to assess the morphological features of the initial and final measurements included 12 standard anthropometric measures. The results obtained indicate positive changes in experimental group which manifest primarily through increase of nonadipose body voluminous, while in control group saturated fat coverage was more pronounced. The working effects obtained with appliance of additional athletic exercise confirm previous findings that additional forms of extra-curricular activities are of crucial significance for the harmonious growth and development of children in early school age.

Keywords: *girls, transformation process, changes, growth harmony*

Introduction

It is well known that any systematic repetition of movement or appropriately graded physical exercise provides an effective stimulus focused on desired changes in the anthropological status of children. Although the changes of anthropological features in younger school age are primarily determined by the process of growth and development (Malina & Bouchard, 1991), we can assume these changes will further intensify under influence of various transformation processes. However, the area of kinesiology is extremely complex and requires good knowledge of many details, since the complexity of children development composite is exceptional with reflection into adulthood (Sherar et al., 2005). Particularly awkward situation is the one with monitoring the growth and development segments of anthropological status because it is very difficult to isolate the biological development from the support of growth and development implemented by the means of kinesiology operators - the tasks that produce motion integration and development (Bonacin et al., 2004; Bilić et al., 2006 b; Bilić, 2007). The subject of this study was to determine the actual possible impact of nine - month athletic training on modeling and transformation of morphological dimensions in seven year old girls. The basic idea of the study was to compare above mentioned girls with their peers who are not included in organized programs of physical exercise (besides mandatory physical education classes) and to determine whether engagement in athletic activities in younger school age enables proper and quality growth and development of children.

Methods

The research was conducted on the sample of 82 girls, seven years of age (± 6 months) of the first grade of Elementary school.

The sample of respondents was divided in two groups: experimental (N=33) and control (N=49). The experimental group included respondents who, beside regular PE classes three hours per week, attended additional athletic training for a period of nine months. The control group included respondents who only attended mandatory PE classes. The only selection criterion was that girls are clinically healthy and without aberrative disorders, and that they are not engaged in other extra-curricular activities. Athletic training units were conducted three times a week and for 60 minutes each and contained the most appropriate teaching units for this age: walking, school of running, start acceleration and maximum speed running, persistent running, relay running, hurdling, jumping and throwing. The share of the energy load was continuously growing and progressive discontinuity was achieved by inserting teaching units with an explicit information component.

The sample of variables to assess the morphological characteristics included 12 standard anthropometric assessment measures (Mišigoj-Duraković, 1995): longitudinal skeleton dimensionality (AVIS – body height, ADUR – arm length); transversal skeleton dimensionality (AŠIZ – biiliac width, ADRZ – wrist diameter, ADIK – knee diameter); volume and body mass (ATEŽ – body weight, AOPL - forearm circumference, AOPK - lower leg circumference, AOGK - chest circumference); and subcutaneous adipose tissue (AKNN - upper arm skin fold, AKNL - skin fold of the back and AKNT - abdominal skin fold). The differences between control and experimental respondent groups in initial and final measuring were analyzed with multivariate (MANOVA) and univariate (ANOVA) variance analyzes for independent samples.

Results and discussion

After the appliance of established descriptive procedures determined that all variables have normal result distribution, we continued further statistical analysis. Based on obtained parameter of multivariate variance analysis for independent samples (Table 1) we can conclude that it is not possible to form statistically significant difference within the area of morphological features between control and experimental respondent groups in initial measuring. In fact, a large number of children, starting school, are getting a lot more engaged kinesiologically through involvement in a systematic program of sports schools. By this time there is generally no difference in kinesiology involvement of children. In pre school age children mostly satisfy their need for motion through their playing, during which they individually regulate the level of their engagement. Since the entire sample of respondents lived in the same conditions, the expectation of differences in morphological characteristics in the initial measurement would be unrealistic. However there are cases when children are engaged in certain organized activity as their parents desired because the parents practiced the same activity. In such cases we simply can not exclude the influence of phylogenetic and ontogenetic factors which significantly define the growth and development. (Katić & Co., 2001). Such obtained results give us the ability to assess eventual differential effects of two forms of kinesiology involvement. With the review of results obtained with multivariate variance analysis for dependant samples it's evident that global changes between initial and final measuring are significantly important in both respondent groups.

Table 1. Results of multivariate variance analysis for independent and dependant samples

MANOVA	Independent samples		Dependent samples	
	Initial measure.	Final measure.	Exp group	Control group
WL	0.80	0.60	0.03	0.04
df 1	12	13	12	12
df 2	69	68	21	37
p	0.20	0.00	0.00	0.00

WL – Wilks's lambda, df – degrees of freedom, p – significance level

Based on the results of partial changes obtained (Table 2) between initial and final measuring, we can conclude that the girls during nine month period have grown and evolved and there has been some significant changes in their morphological structure. In control group of respondents statistically significant change is visible in all applied variables. Analyzing indicators of partial changes in univariate analysis we can conclude that significant changes occurred in all measured variables of morphological features during period between initial and final measuring. Significant increase in subcutaneous adipose tissue on the upper arm (AKNN) was detected indicating a lack of physical activity among girls of the control group.

Even though there is no significant change found between measuring in variables: skin fold of the back (AKNN) and abdominal skin fold (AKNT), it should be noted that the values of arithmetic means increased in final measuring compared to initial measuring.

Table 2. Differences between initial and final measuring in experimental and control respondent group

Univariate variance analysis - ANOVA						
Variables	Initial measuring		Final measuring			
	Exp. group	Contr.group	Exp. group		Contr. group	
	AS±SD	AS±SD	AS±SD	p	AS±SD	p
AVIS	126,81±4,83	127,95±4,53	130,34±5,08	**0,00**	131,80±4,78	**0,00**
ATEZ	25,57±3,51	26,74±3,39	27,37±3,73	**0,00**	29,02±3,50	**0,00**
ADUR	54,17±2,61	54,95±2,26	55,71±2,78	**0,00**	56,02±2,20	**0,00**
AOPL	17,46±1,25	17,90±1,48	18,34±1,19	**0,00**	18,66±1,53	**0,00**
AOGK	59,43±3,27	60,70±3,36	60,73±3,41	**0,00**	61,74±3,57	**0,00**
AOPK	26,16±1,70	26,37±1,60	27,11±1,93	**0,00**	27,25±1,60	**0,00**
AKNN	9,91±2,99	11,01±2,77	9,84±2,76	0,82	12,04±3,03	**0,00**
AKNL	6,60±1,85	7,59±2,50	6,54±1,56	0,74	8,04±2,75	0,15
AKNT	6,58±2,21	7,12±3,14	6,63±2,01	0,81	7,18±3,44	0,85
AŠIZ	19,87±1,03	20,24±0,82	20,40±1,02	**0,00**	20,69±0,88	**0,00**
ADRZ	4,08±0,29	4,10±0,23	4,15±0,27	**0,00**	4,22±0,23	**0,00**
ADIK	7,60±0,34	7,59±0,42	7,72±0,35	**0,00**	7,68±0,41	**0,00**

AS – arithmetic mean; SD – standard deviation, p – the level of significance

In experimental group, during period between initial and final measuring, the occurred changes were expected. Considering that, in all variables, except in variables for subcutaneous adipose tissue assessment, statistically significant changes occurred; we can conclude that total kinesiology involvement of treated respondent sample was programmed in such way to ensure optimal growth and development.

This is also confirmed by the arithmetic mean values in variables: upper arm skin fold (AKNN), skin fold of the back (AKNL) and abdominal skin fold (AKNT) which are reduced in final measuring. Therefore, the conclusion would be that additional athletic exercise prevented negative impact of motion insufficiency which occurs when starting school and which manifested through accumulation of subcutaneous adipose tissue prevention.

Table 3. Differences between control and experimental group in final measuring

Univariate variance analysis (ANOVA) – final measuring			
	AS±SD	AS± SD		
AVIS	131,80±4,78	130,34±5,08	1,75	0,19
ATEZ	29,02±3,50	27,37±3,73	4,16	**0,04**
ADUR	56,02±2,20	55,71±2,78	0,32	0,57
AOPL	18,66±1,53	18,34±1,19	1,02	0,32
AOGK	61,74±3,57	60,73±3,41	1,63	0,21
AOPK	27,25±1,60	27,11±1,93	0,14	0,71
AKNN	12,04±3,03	9,84±2,76	11,17	**0,00**
AKNL	8,04±2,75	6,54±1,56	7,99	**0,01**
AKNT	7,18±3,44	6,63±2,01	0,69	0,41
AŠIZ	20,69±0,88	20,40±1,02	1,87	0,17
ADRZ	4,22±0,23	4,15±0,27	1,85	0,18
ADIK	7,68±0,41	7,72±0,35	0,22	0,64

AS – arithmetic mean; SD – standard deviation,
F – test; p – the level of significance

In final measuring we can notice that global difference (difference obtained with multivariate variance analysis – table 1) between control and experimental group is significant ($p < 0.00$). Analyzing partial difference indicators (Table 3) it is visible that in variable - upper arm skin fold (AKNN) statistically significant difference between control and experimental respondent group exists at the level of 0.00. In variables skin fold of the back (AKNL) and body weight (ATEŽ) there is also significant difference but with slightly lower value. Values of arithmetic means indicate lower values found in almost all variables in the experimental group, similar to the initial measuring. The biggest changes have occurred in the arithmetic mean values of variables - upper arm skin fold (AKNN) and back skin fold (AKNL). Namely, comparing the results from the initial to final measuring it was concluded that the control group increased their values found in mentioned variables and in the experimental group the values reduced. If we take into account the fact that the morphological measures of longitudinal and transversal skeleton dimensionality are heavily influenced by genetic factors, it is quite logical why statistically significant differences occurred precisely at the soft tissue. Any changes in the structure of the soft tissues were conditioned, besides growth and development, certainly by kinesiological involvement of respondents in the period of nine months. So in this study we reaffirmed repeatedly confirmed fact that motion insufficiency leads to adipose tissue accumulation in children of younger school age (Malina & Bouchard, 1991; Katić et al., 1997) and that only mandatory attendance of PE at this age is not sufficient for proper growth and development (Bonacin et al., 2002).

Conclusion

In this study of the additional athletic exercise effects on transformation in morphological features of seven year old girls, it is determined that the athletic program conducted for period of nine months with three training units per week has led to pronounced positive changes in morphological structure of treated sample. Obvious changes manifested through increase in nonadipose body voluminous in experimental respondent group, while in control group, which only attended mandatory PE classes, saturated fat coverage was more pronounced. This proves that the results of this study are in accordance with a large number of indications that suggest that mandatory PE classes are not sufficiently stimulating the development of basic morphological dimensions in children of young school age. The proper influence on the growth and development of young school children is of fundamental importance and its absence at this age is impossible to compensate. Exactly at this segment athletics has great significance because it provides comprehensive, broad motor and morphological development through activities that are most appropriate for their age. Athletic exercise and games should be practiced as much as possible in PE classes and other sport activities as well.

References

Bilić, Ž, Bonacin, D., Manić, G., & Talović, M. (2006 b). Identification of the basic kinesiology processes in girls from grades V-VIII. *Homo Sporticus, 9*(1) 54-56.
Bilić, Ž. (2007) The levels of the biological children potentials at the start of Elementary school. *Acta Kinesiologica, 1*(1), 5-10.
Bonacin, D., Katić, R., & Blažević, S. (2002). Aspects of growth and development of children of different genders at age 7 to 9. *Napredak, 143*(3), 307-315.
Bonacin, D., Carev, Z., & Blažević, S. (2004). Determining the absolute processes as the basics of all evaluations in kinesiology. *Evaluation in the field of education, sports and recreation. 13th Summer School of kinesiologists Republic of Croatia, Rovinj,* (pp. 420-424).
Katić, R., & Grgantov, Z. (1997). Analysis of quantitative and qualitative changes in anthropometric and motor variables in girls during the first grade of Elementary school. *Školski vjesnik, 46*(2), 127-138.
Katić, R., Bonacin, D. & Blažević, S. (2001). Phylogenetically conditioned possibilities of the realization and of the development of complex movements at the age 7 years. *Coll. Antropol. 25*(2), 573-583.
Mišigoj-Duraković, M., Matković, B., & Medved, R. (1995). *Morphological anthropometry in sport*. Zagreb: Faculty of physical culture.
Sherar, L.B., Mirwald, R.L., Baxter-Jones, A.D.G., & Thomis, M. (2005). Prediction of adult height using maturity-based cumulative height velocity curves. *Journal of pediatrics, 147*(4), 508-514.

UTJECAJ DODATNOG ATLETSKOG VJEŽBANJA NA TRANSFORMACIJE MORFOLOŠKIH DIMENZIJA SEDMOGODIŠNJIH UČENICA

Sažetak

S ciljem određivanja učinkovitosti dodatnog atletskog vježbanja na transformacije morfoloških dimenzija, analizirano je ukupno 82 sedmogodišnjih učenica podijeljenih u eksperimentalnu (n=33) i kontrolnu (n=49) skupinu. Eksperimentalna skupina uključivala je ispitanice koje su, osim uobičajene nastave TZK – tri sata tjedno, sudjelovale i u dodatnim trenažnim jedinicama atletskog vježbanja u razdoblju od 9 mjeseci. Kontrolna skupina uključivala je ispitanice koje su jedino sudjelovale u uobičajenoj nastavi TZK – tri sata tjedno. Uzorak varijabli za opis morfoloških dimenzija u inicijalnom i finalnom mjerenju uključivao je 12 standardnih morfoloških mjera. Dobiveni rezultati pokazuju pozitivne promjene kod eksperimentalne skupine koji se iskazuju primarno kroz povećanje neadipoznog volumena tijela, dok je kod kontrolne skupine sadržaj masnog tkiva bio više izražen. Učinci rada dobiveni kroz primjenu dodatnih atletskih vježbi potvrđuje prethodne nalaze da su dodatni oblici izvan-nastavnih aktivnosti od krucijalnog značenja za skladan rast i razvoj djeteta ranog školskog uzrasta.

Ključne riječi: *djevojčice, transformacijski proces, promjene, skladan rast*