



Effects of the combined swimming, corrective and aqua gymnastics programme on body posture of preschool age children

Aldvin Torlaković^{1*}, Mirsad Muftić², Dijana Avdić², Roman Kebata¹

¹Olympic Swimming Pool Centre Sarajevo. Bulevar M. Selimovic 83b, Sarajevo, Bosnia and Herzegovina. ²Faculty of Health Studies, University of Sarajevo, Bolnicka 25, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction: This research paper is aimed at identifying the possible effects that the implementation of the combined kinesiological programs of swimming and hydro-kinesiological therapy may have on the body posture in preschool children.

Methods: The survey was conducted on a sample of 50 boys selected from a number of Sarajevo kindergartens, in the age group of 5.2 ± 0.6 yrs.; mean height = 114 ± 7 cm; mean weight = 21.8 ± 4.7 kg. In order to evaluate the postural status, we used a reduced Napoleon Wolanski method. The activities were carried out within the period of 16 weeks, twice a week for 60 minutes.

Results: The analysis of the initial and final series of testing with t-test indicates a high level of statistical significance in the variables of shoulder posture assessment, shoulder blade posture assessment, spinal cord posture assessment, leg posture assessment, feet posture assessment, overall body posture assessment according to Wolanski, whereas somewhat lower level of statistical significance was found in the variables of abdominal posture assessment and chest posture assessment. A relatively low level of statistical significance is observed only in the variable of head posture assessment.

Conclusion: It can be concluded that a combined program of corrective gymnastics with games and exercises in water had significant effects on improving the muscle tone in the respondents, which in turn had a direct impact on improving their body posture, both in terms of all of the individually surveyed body parts and in overall terms.

Keywords: Body posture, children's, swimming, corrective gymnastics, Hydro-gymnastics

INTRODUCTION

Movement and various sport activities of largely comprehensive affect anthropological status of man

*Corresponding author: Aldvin Torlakovic
Olympic Swimming Pool Centre
Bulevar M. Selimovic 83b, 71000 Sarajevo, Bosnia and Herzegovina
Phone: +38761159200; Fax: + 38733773874
e-mail: aldvint@gmail.com

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and the quality of his life (1). The complex functional transformation of a developing child does not occur regularly and equally in all of the different body parts, but it does according to a specific rhythmic flow, which is marked by the so-called *development crisis* (2). The regular growth and development in children plays an important role as a foundation for maintaining their psycho-physical health. Due to the plasticity and sensitivity of the child's organ-



ism, the process of forming a correct posture is of particular importance in both the preschool period of development and the first years of schooling (3). The fact is that the correct postural position takes an ever decreasing presence in the children's daily activities. Improper sitting postures, different kinds of motion activities and certain endogenous factors all have a systematic impact on the spinal cord, thus causing such levels of strain and pressure that often exceed the zone of tolerance in the soft spinal tissues. Even though in such situations there are no major resulting defects, the cumulative effect as a result of a series of repeating and long-lasting positions and motions is that the tissues go through certain visible changes. The findings of some research efforts undertaken thus far lead to the conclusion that the bad posture in the preschool and early school age children is actually an indicator of specific health problems, and these problems can become extremely serious if the bad posture is not corrected in due time (4). In the age between 5 and 10, when the growth becomes slower, the postural problems show somewhat lower rate of incidence, whereas with the onset of puberty, an increased emergence of abruptly deteriorating postural conditions and a detection of new cases can be widely anticipated. Therefore, it is highly important to detect the postural problems at an early stage and keep them under the strict kinesiological control (5). As it is widely known, body posture consists of a set automatically regulated mechanisms activated by a neuromuscular system so that the body could resist (defy) the force of gravity. The best posture is the one that provides for maximum energy savings, maximum comfort, maximum performance while guaranteeing ideal relationships between the various parts of the body (6). To put it in simple terms, the posture of the body involves proper alignment of the body segments and their balance, which is achieved by providing a minimal input of power with maximum mechanical efficiency (7). One should bear in mind that among a number of diverse physical activities, it is undoubtedly the child play that has an extremely important place in every child's life. Such types of motion activities greatly contribute to the mental and physical development of the child, the improvement of his or her psychomotor skills, and consequently to the improvement of their muscle tone, which in turn plays an important role in enabling the child to adopt

and maintain the proper posture. This research paper is aimed at identifying the possible effects that the implementation of the combined kinesiological programs of swimming and hydro-kinesiological therapy may have on the body posture in preschool children.

METHODS

Respondents Sample

The survey was conducted on a sample of 50 boys (medical assessment - boys with poor muscle tone) from a number of Sarajevo kindergartens, in the age group of 5.2 ± 0.6 yrs.; mean height = 114 ± 7 cm; mean weight = 21.8 ± 4.7 kg. The final data processing of the research results captured the children who participated in the initial and final measurements and regularly attended the planned programme of combined kinesiological activities (all respondents have undergone complete treatment).

Sample of Variables

In order to evaluate the postural status (Table 1), we used a reduced Napoleon Wolanski method (8). As part of that evaluation, we used 9 variables for the observed body parts: head posture assessment (HPA), shoulder posture assessment (SPA), shoulder blade posture assessment (SBPA), chest posture assessment (CPA), spinal cord posture assessment (SCPA), abdominal posture assessment (APA), leg posture assessment (LPA), feet posture assessment (FPA) and the overall body posture assessment according to Wolanski (OBPAW).

TABLE 1. Sample of Variables

Variable	Measured capacity
HPA	Head Posture Assessment
SPA	Shoulder Posture Assessment
SBPA	Shoulder Blade Posture Assessment
CPA	Chest Posture Assessment
SCPA	Spinal Cord Posture Assessment
APA	Abdominal Posture Assessment
LPA	Leg Posture Assessment
FPA	Feet Posture Assessment
OBPAW	Overall Body Posture Assessment by Wolanski method

TABLE 2. Posture Assessment according to the Negative Score Model - Wolanski

Scores	Degree of deviation from proper posture
0	No deviation
1	Partial deviation
2	Extreme deviation

TABLE 3. Defining the posture status according to Wolanski

Scores	Grade	Description
0	5	Excellent body posture
1-4	4	Very good body posture
5-8	3	Good body posture
9-12	2	Bad body posture
13-16	1	Very bad body posture

TABLE 4. Implementation of the programme contents by week

Program/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Swimming games & exercises			*	*	*	*	*	*	*	*	*	*	*	*	*	*
Corrective dryland (out-of-pool) workouts & exercises	*	*	*	*		*		*		*		*		*		*
Hydro-gymnastics	*	*			*		*		*		*		*		*	
Pilates balance ball exercises					*		*		*		*		*		*	

The diagnosing of the body posture status has been carried out by scoring the deviations that occurred in the particular body parts compared with the normal (proper) posture. The scoring has been made by the method of Wolanski - expert evaluation (Table 2). On the basis of the total scores, we have determined the assessment values (grades) for the particular observed body parts, and also an overall grade for the overall body posture (Table 3).

Exercise Program

A combined program of exercises was undertaken in the Olympic Swimming Pool Centre Sarajevo in the afternoon hours. The activities were carried out within the period of 16 weeks, twice a week for 60 minutes (Table 4). The program of corrective gymnastics, workouts and exercises with Pilates balance balls was carried out in a sports hall covered with adequate floor-padding. Hydro-gymnastics exercises and basic swimming games and exercises were performed in a pool with the multifaceted gradually sloping floor, whose depth was 40-90 cm. During the implementation of the swimming and hydro-gymnastics programmes, the water temperature was 29.4°C on average. The exercises were performed in groups of 15 respondents under the expert guidance of a Graduate Physiotherapist and a Professor of Sports and Physical Education.

Each class of workouts and exercises consisted of four stages. Warm-up exercises for 5-10 minutes, aerobic dryland exercises for 20-25 minutes, then

20-25 minutes of aerobic water exercises (swimming games and exercises with hydro-gymnastics) and 5-10 minutes of relaxation and body-calming. During each class, the Introductory-Preparatory and the Main „A“ stages were performed on dryland outside the pool, whereas the Main „B“ Stage and the Final Stage were performed in water.

Statistical analysis

For the analysis of the outcomes of the initial and final series of testing we used a T-test for dependent samples, i.e. Paired Samples Test (where differences are regarded as significant at $p < .05$).

RESULTS

The Analysis of the initial and final series of testing with T-test (Table 5) indicates a high level of statistical significance in the variables of shoulder posture assessment (SPA $p=.000$), shoulder blade posture assessment (SBPA $p=.000$), spinal cord posture assessment (SCPA $p=.000$), leg posture assessment (LPA $p=.000$), feet posture assessment (FPA $p=.000$), overall body posture assessment according to Wolanski (OBPAW $p=.000$), whereas somewhat lower level of statistical significance was found in the variables of abdominal posture assessment (APA $p=.004$) and chest posture assessment (CPA $p=.013$). A relatively low level of statistical significance is observed only in the variable of head posture assessment (HPA $p=.083$).

TABLE 5. Results of T-test for dependent samples (Paired Samples Test) in assessing postures and awarding body posture grades

	Paired Samples Test						T	df	p
	Paired Differences			95% Confidence Interval of the Difference					
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper				
HPA1 HPA2	.060	.240	.034	-.008	.128	1.769	49	.083	
SPA1 SPA2	.920	.133	.030	.890	1.011	30.000	49	.000*	
SBPA1 SBPA2	.980	.141	.020	.940	1.020	49.000	49	.000*	
CPA1 CPA2	.120	.328	.046	.027	.213	2.585	49	.013*	
SCPA1 SCPA2	1.040	.283	.040	.960	1.120	26.000	49	.000*	
APA1 APA2	.160	.370	.052	.055	.265	3.055	49	.004*	
LPA1 LPA2	.340	.479	.068	.204	.476	5.024	49	.000*	
FPA1 FPA2	.600	.495	.070	.459	.741	8.573	49	.000*	
OBPAW1 OBPAW2	-1.340	.479	.068	-1.476	-1.204	-19.801	49	.000*	

A somewhat lower level of statistical significance with regard to the variable of abdominal posture assessment (APA) and the variable of chest posture assessment (CPA) is most likely an outcome of a weaker impact of the program on the abdominal and chest muscle system, which indicates that the program was implemented for a too short period of time to be capable of triggering any significant transformation of these posture segments, which is

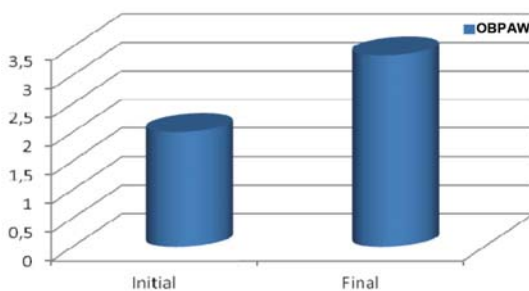


FIGURE 1. Comparison between the overall initial and final assessments of body posture (Wolonski method). OBPAW, Overall Body Posture Assessment by Wolonski method.

perhaps also suggestive of a need to include additional exercises and workouts in the program that would deal specifically with these body parts alone.

Generally speaking, there has been a decrease of the standard deviation in almost all variables in both the partial and the integral defining of the posture status, which had a direct impact on the overall body posture assessment (Figure 1).

The low level of statistical significance with regard to the variable of head posture assessment (HPA) is a result of a very small deviation from the standard value in this test observed at the initial testing in most of the respondents. Thus the implemented program was not capable of making any significant corrections in this regard either. The rates of statistical significance point to the fact that there are significant differences in almost all variables when it comes to the initial and final series of testing. Accordingly, the program of combined kinesiological activities conducted on the treated sample of respondents proved to be an efficient transformational process for most of the variables included in the survey.

DISCUSSION

The body posture is the main precondition for good health, normal growth and development in general. It is quite important that the elimination and prevention activities are initiated as early as possible and with the youngest age categories possible. The combined physical training programmes that include strength and muscle stretching exercises, particularly with regard to the postural antigravity muscles, should help in the prevention of health problems that could occur later in life, since incorrect or improper posture constitutes the basis for further deterioration of health. As is widely known from practice, in the kinesics-therapy of children with defective body posture, as well as in the therapeutic treatments and procedures in general, there is a very important role of the actions designed in order to achieve a full degree of control over the applied motion treatments. It is also important to stress the crucial role of a timely detection of deviations from proper body posture, which is definitely the starting point for the success in correcting the resulting postural changes. An early diagnosis is regarded as the most important element of a successful treatment. In order to identify the moment of occurrence of a postural disorder, regardless of the cause of its occurrence, this problem has to be examined from the very moment of inclusion of children into a new environment or kindergarten. Thereafter, selection of the adequate kinesics-therapeutic programs – in this case through the application of the hydro-kinesis therapy and swimming, through hard and concerted work of physical education teachers, medical doctors, parents and children – can result in the desired levels of success in correcting a bad posture. The most important role in forming and maintaining a proper posture is played by muscles as an active part of the movement apparatus. The weakness of certain muscle groups and their excessive and unilateral strain can cause the occurrence of a number of various disorders in the spinal cord, chest, upper and lower extremities, and particularly in the foot. The therapy that focuses on correcting the postural disorders and deformities in children is often difficult, strenuous, painful, discouraging and uninteresting for children. On the other hand, the physical training programs that include strength exercises and muscle stretching, specifically of the group of postural antigravity muscles,

should help in the prevention of health problems that may occur later in life. The outcomes of this research clearly show that all respondents have absolutely improved in terms of the grades awarded from their body posture assessment. Similar conclusions were also reached by other authors who believe that it is possible to improve the body posture to a considerable extent by implementing adequate motion/movement programs (9-13). In order to make higher quality changes of a muscle-ligament apparatus in the preschool and early school age children in whom certain deviations from the correct posture have been identified (e.g. kyphotic, scoliotic or lordotic posture), it would be necessary to organize specialised additional programs of corrective gymnastics that would be performed under the control of physical education teachers and physiotherapists, in a specially designated and specialized facilities covered with adequate floor-padding, and equipped with appropriate devices and equipment.

CONCLUSION

It can be concluded that a combined program of corrective gymnastics with games and exercises in water had significant effects on improving the muscle tone in the respondents, which in turn had a direct impact on improving their body posture, both in terms of all of the individually surveyed body parts and in overall terms. The results of this research also provide an opportunity of their comparing with the effects of other research projects and programs that set the same or similar objectives. Also, this research needs to initiate further activities associated with undertaking closer studies examining the treated subject matters, all aimed at enabling a timely diagnosis and control of the said disorders and their curbing through the focused exposure to a number of efficiently programmed corrective exercises and workouts.

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