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EFFECT OF GYMNASTICS TRAINING ON DYNAMIC BALANCE ABILITIES IN 4-6 YEARS OF AGE CHILDREN

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ABSTRACT

The aim of this study was to investigate 12 weeks gymnastics training effect on dynamic balance abilities in 4-6 years of age pre-school student. The research was conducted on a sample of 136 "Sevgi" kindergarten students, 4 to 6 years who's attended to this investigation as volunteerly. Volunteer criteria have been performed in accordance with the ethical standards of the Declaration of Helsinki. All the subjects and their parents gave their written informed consent prior to the study. While experimental group's children were applied gymnastics training program one hour and two days in a week during 12 weeks, control group were participated daily school program. Physical and strength characteristics and dynamic balance abilities were evaluated to investigate the effects of gymnastics training programs on preschool children.For dynamic balance measurement Techno-body PROKIN 200W (Italy) was applied in order to measure dynamic equilibrium (30-second disequilibrium and slalom tests). For strength measurement abalakov jump and long lump height value were used.While the effect of gymnastics balance was significant in both dynamic balance measurement ($p<0,001$), slalom and equlibrium test. Gender effect weren't shown in dynamic balance abilities. And also, dynamic balance didn't correlate with gender, gymnastics training, heigth, weight, sarjent jump and long jump. The gender effect was significant only on motor abilities. Consequently, gymnastic training effects on 4-6 years of age pre-school children were significant in balance.

Key words: Pre-School, Gymnastics, Dynamic Balance, strength

1. INTRODUCTION

Children are not "small adults". Their body and their mentality are quantitatively but also qualitatively different from the adults ones, and they must be therefore considered not just a smaller, but different (Ricotti, 2011). That's why we should train them not like aduts. The everyday activities require that children master different motor skills. The purpose of movement education in the kinder garten is to ensure comprehensive and harmonious development of children by developing and consolidating their motor abilities as well as helping them to gain the skills and experience useful in sport and everyday activities (Malina, 2001; Haga, 2007). In the early childhood years, children begin to learn a group of motor skills known as fundamental motor skills. Fundamental motor skills are composed of locomotor skills and object control skills. Locomotor skills involve moving the body through space and include skills such as running, galloping, skipping, hopping, sliding, and leaping (Haywood & Getchell, 2005). If children cannot proficiently run, jump, catch, throw, etc., then they will have limited opportunities for engagement in physical activities later in their lives because they will not have the prerequisite skills to be active (Haga, 2007). Applied gymnastics can promote the development of coordination, strength, muscular endurance, flexibility and balance in children (Bressel et al., 2007).Gymnastics, is a sport that demands maintain balance while preserving the aesthetic value of the exercise. To help meet these stringent demands, balance training should be a significant part of gymnastics training (Cohen, 2002). Also, most teachers would agree that gymnastics is an important activity for the healthy growth and development of children.

In the another view, one of the main components of coordinative abilities is balance. This ability is influenced by a complexity of factors, that are sensory information (from somatosensory, visual and vestibular systems), joint range of motion (ROM), and strength (Akt;Ricotti 2011) and it is responsible for the correct execution of complex sport movements, as well as for protection against injuries.

In light of the increasing popularity of gymnastics and majority of the practitioners start training at a very young age, there is a need to examine the impact of gymnastics training on balance and strenght development in children. This study aimed to: (1) identify the developmental status of balance and strenght in children as compared to non gymnastics, and (2) explore the effect of gymnastics training on balance and sensory development in 4-6 year-old children.

2. MATERIAL AND METHODS

2.1. Participants

136 healthy children were included in this study. This study was conducted in "Sevgi kindergarten" gymnasium with the colabaration of Mersin University. All the subjects and their parents gave their written informed consent prior to the study. They gave their informed consent for the experimental procedure as required by the Helsinki declaration (1964). All subjects presented normal motor function and without any neurological or motor disorders suspected.

2.2. Procedure

The participants were taken into the "Sevgi kindergarten" gymnasium one time for the tests. Prior to testing, participants were familiarized with the balance instrument and practice sessions were applied on the testing procedures to decrease the change of a learning effect occurring during testing. The tests were performed in the same hours of the days (10 AM to 1 PM) when their bodies were rested and the necessary precautions were applied to prevent the influence of the environmental factors such as noise and temperature. First, participants heights were measured by means of portable stadiometer (Holtain Ltd, UK.) participant's weights were measured by an electronic scale (Seca 770 Wedderburn, GmbH, Germany) without having clothes (light clothing with a weight of approximately 0.1 kg). Explosive power of upper thigh; measured with abalakov jump meter and long jump values with meter. And then dynamic balance tests were performed.

2.3. Dynamic balance test

Dynamic balance measurements were made by using Tecno Body PK200WL. After explaining the tests to the participants, data entry (height, weight, age) and the calibration of the instrument were made. The feet of the subjects were placed on the balance platform nakedly (in a fashion that the distance between feet was 10 centimeters and the projection of the maximum point of the medial arcs was on the x-axis). At the end of each test, the subject was requested to rest (the rest duration 2-4 minutes) while the instrument was being calibrated again. No feedback was given to the subject during the measurements except the necessary cases (http://www.tecnobody.it) (Fousekis, 2012).

2.4. Slalom test with 30-second time

In this test the patient sees some balls-objectives that come against. The patient's scope is to hit the objectives and follow the blue ideal line. At the end of the test the software provides two results: caught up objectives and the perimeter error. The caught up objectives shows the objectives hit by the patient regarding the total objectives of the test. The blue line represents the ideal route. When the patient succeeds to touch a square, this becomes green; in the negative, the square becomes red. The perimeter error shows the patient's ability to stay on the blue ideal line. The error is calculated on how much perimeter in more has been store clerk regarding the ideal perimeter (in percentage). Every children balance two times and best score were used to analyze dynamic balance slalom test. In figure 1 shows the slalom test procedure.

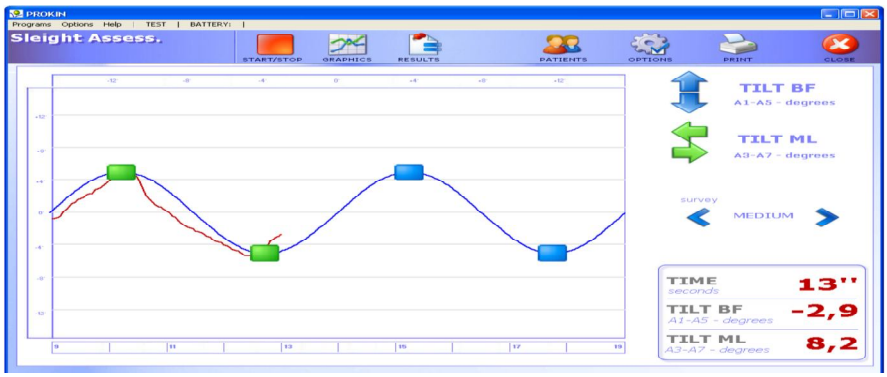

Fig. 1. *Slalom test procedure. Test was conducted antreio-posterior direction*

2.5. Equlibrium test with 30-second time

After the feet of the subjects were placed and they gained their balance on the platform test was started. The test consists in trying to move in a reference circle defined by the user in 30-second time. If children lose balance or leave tests before time finished test was repated. Test applied twise and best result condacted. In figure 2 shows the equlibrium test procedure. For children easy aparatus was used. Test result was evaluated according to 5 parameters. These were explained in this way.

1. Primeter length=The number of total degrees done during the exercise.
2. Area gap percentage=The percentage of the area included in the drawn on flat view trace in respect to the reference circle.
3. Medium speed=The average number of covered degrees for second.
4. Medium equilibrium center-AP=The average among the values reached on backward-forward axis.
5. Medium equilibrium center-ML=The average among the values reached on medium-lateral axis.

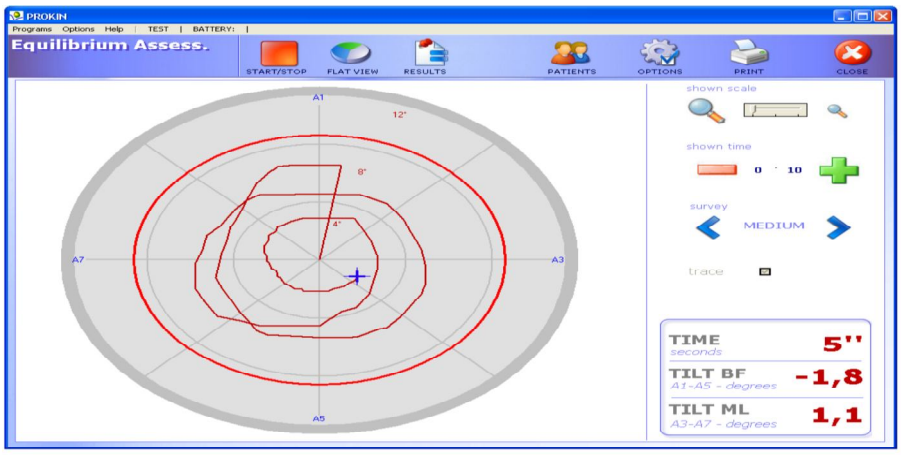

Fig. 2. *Disequlibrium test procedure*

2.6. Statistical Method

Descriptive statistics were done for weigth, heigt, long jump, high jump, dynamic balance values according to gender and gymnastics situations. According to participants gender and gymnastics training situation for all five variables equlibrium test and two variables slalom test results were evaluated multi-varied analysis of variance Hotelling's Trace section for assess the ability to dynamic balance. Significance level was chosen as $p<0.05$. To determine the association between the values of dynamic balance and strength variables, weigth, height Pearson's product moment correlation coefficient (r) was used. SPSS for windows was used for the analyses.

3. RESULT

According to gender and gymnastics training participation descriptive statistics (aritmetic mean and standard deviation) were given in Table 1. Dynamic balance slalom test perimeter error and disequlibrium test primeter length values coorelation with weigth, height, long jump and high jump values were given in table 2. Respectively were given Equlibrium dynamic balance Hotelling's Trace corelasyon Results in table 3, slalom dynamic balance Hotelling's Trace corelasyon Results in table 4

Table 1. Age, heigt and weigth of participant aritmetik mean and standart deviation values

	Boys						Girls					
	Trained Groups			Untrained Groups			Trained Groups			Untrained Groups		
	n	X	SD	n	X	SD	n	X	SD	n	X	SD
Ages (years)	46	5.59	0.54	20	5.6	0.5	47	5.36	0.67	23	5.65	0.57
Heigt (cm)	46	114.20	5.29	20	112.15	8.96	47	112.32	5.76	23	113.83	6.73
Weigth (kg)	46	20.87	2.88	20	21.73	5.50	47	20.64	3.38	23	22.06	3.93
Long Jump (cm)	46	93.22	16.60	20	80.7	22.68	47	89.62	16.04	23	73.43	16.42
High Jump (cm)	46	20.39	5.105	20	16.55	5.02	47	18.64	4.26	23	17.35	5.64
Slalom PE (cm)	46	251.72	72.99	20	266.8	108.54	47	252.63	85.53	23	198.13	52.92
EquilibriumPL(cm)	46	505.33	216.4	20	681.89	190.47	47	473.39	193.7	23	779.58	236.77

According to Table 1, childrens who participate 12 week gymnastics training, long and high jump values and also dynamic balance values were found better than nonparticipants.

Table 2. Dynamic balance tests coorelations with some variables

			Long jump	High jump	Weigth	Heigth
Boys	Trained group	Slalom PE	-.077	-.141	-.122	-.136
		Disequlibrium PL	-.173	-.163	-.036	.020
	Untrained group	Slalom PE	-.375	-.256	-.006	-.194
		Disequlibrium PL	-.037	.005	.029	.132
Girls	Trained group	Slalom PE	.224	.042	.030	-.081
		Disequlibrium PL	-.129	.009	-.066	-.133
	Untrained group	Slalom PE	.302	.126	.261	.412
		Disequlibrium PL	.256	.167	-.210	-.204

Table 3. Equlibrium dynamic balance Hotelling's Trace corelasyon Results

Equlibrium Test	Multivariate Tests	Value	F	Hypothesis df	Error df	Sig.
Research-Control	Hotelling's Trace	7.942	203.321 (a)	5.000	128.000	.000
Gymnastics	Hotelling's Trace	.461	11.791 (a)	5.000	128.000	.000
Gender	Hotelling's Trace	.026	.677 (a)	5.000	128.000	.642

Table 4. Slalom dynamic balance Hotelling's Trace corelasyon Results

Slalom Test	Multivariate Tests	Value	F	Hypothesis df	Error df	Sig.
Research-Control	Hotelling's Trace	10.489	686.998 (a)	2.000	131.000	.000
Gymnastics	Hotelling's Trace	.372	24.345 (a)	2.000	131.000	.000
Gender	Hotelling's Trace	.039	2.583 (a)	2.000	131.000	.079

Both trained group and untrained group dynamic balance coorelation with weigth, height, long jump and high jump values according to gender were not significant in Table 2. While the effect of gymnastics training on equilibrium and slalom dynamic balance was significant (P=.000, p<0.001) (Table3 and 4), similarly result showed that both slalom and equlibrium test in Table 3and 4 gender effect didn't significant (P= 0.642, p<0.001 P= 0.079, p<0.001), As a result there were significant coorelation between gymnastics training and balance Gender effect weren't shown in dynamic balance abilities. And also, dynamic balance didn't correlate with gender, gymnastics training, heigth, weight, sarjent jump and long jump. The gender effect was significant only on motor abilities.

4. DISCUSION

In literature there were balance asssesments in dfferent ages and branches of sport evaluate postural differences in other sports (such as, judo, soccer, dance, basketball, gymnastic, surfe, swimming, golf) (Leroy, 2000, Grigorenko 2004, Hrysomalis 2006,Hugel 1999,Paillard 2006, Perin 2001, Vuillerme 2001, Vuillerme 2004) In our study 4-6 years of ages children gymnastics training effect was studied.

Some researchers found dynamic balance increases according to different sports participation (Udermann, 2004, Sahli, 2013., Matsuda et al., 2008; Hrymallis, 2011; Vuillerme and Nouger, 2004; Akan et al., 2008; Sirmen et al. 2008; Bressel, 2007; Paillard et al., 2002, 2006,Kayapınar 2010). Through a number of studies it was revealed that as the number of years of training increase, the ability to control balance is also affected positively (Paillard et al., 2006). Similarly to the literature in our study disequilibrium and slalom dynamic values of 12 weeks trainined gymnastics group increased when compared with those in the control group. In spite of participating in the gymnastics training program for a short time, the dynamic balance skills of the athletes were affected positively. However, at some other branches of sports, the number of years of training has no effect at all (Paillard et al., 2002). In Granacher et al (2011) studies training on balance, leg strength and balance in children 6-7 years of age in order to assess the impact of parameters given by a 4-week balance training, but did not find a statistically significant improvement.

In spite of increase in dynamic balance, gender differences were not found in our study, In researches studying gender effect in balance skills, no standardized results were obtained so far. Perrin et al., (1998) did not detect any gender effect during their research touching on the static and dynamic balance control of judo athletes and dancers. In our studies was found similar result as Perrin. The results of the mentioned study are supported with the research conducted by Kolleger et al. (1992) on the same age group. However, Ekdalh et al. (1989) found out that females demonstrate better balance postures than males. Golomer et al. (1997) put forth with their study conducted on dancers and acrobats that females have better balance values in comparison to males.

In this research after 12 week gymnastics training both balance and strength parameter were increased. There should be further research for the balance and body compositions evaluations after the strength training program for different sports.

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