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Improving the Pupils' Balance Through Rhythmic and Movement Games

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Abstract

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The increasingly sedentary children's activities (laptop, computer, tablet, video games) have led lately to an alarming number of overweight children. This can affect their posture and balance, which may lead to some gait problems or low success in motor activities. Purpose: The aim of this research was to determine the balance level of elementary school children and provide some physical exercises to improve their coordination. Methods: 60 elementary school children aged 6 to 7 years were selected to participate in this study. The conducted research used the Y Balance Test Kit. The subjects were tested before and after our intervention. To assess the balance, we used 4 methods for lower limb balance (right and left anterior and posterior) and we observed some difficulty in the execution of the first test for most subjects. For 12 weeks (two times per week), the subjects were included in a program of physical exercises designed to intervene particularly in improving their balance. Results: The conclusion of the research was that the recorded values were better than the initial ones, and the average differences were statistically significant at $p < 0.05$ level of significance.

Keywords: Balance; children; games; Y Balance Test.

1. Introduction

The increasingly sedentary children's activities can affect their posture and balance, which may lead to some gait and balance problems. Specific studies have revealed evidence that the appropriate amounts of physical activity lead to adequate motor skill development during the preschool years (Burgi et al., 2011; Eliakim et al., 2007). The preschool years are dominated by large somatic changes - the children's body constitution has changed and the level of motor performance has rapidly evolved.

Preschool age is regarded as an important period for developing children's physical activity habits and, in turn, to achieve well-developed fundamental motor performance.

The ability to maintain the body balance implies a stable position and regaining balance after a movement or other situations. The decisive role in maintaining the body balance comes to the quality of the vestibular analyser and the kinaesthetic analyser.

The development of postural stability is critical for the acquisition of motor skills by the children. The term ‘balance’ refers to the ability of an individual to hold or maintain a position or a posture. A balancing task can be classified as either static, which refers to the ability to maintain an upright posture and maintain the centre of gravity within the limits of support (Geuze, 2003), or dynamic (moving within a posture). Human balance depends on the coordinated integration of sensory input from the vestibular and visual systems. Related information from the proprioceptive, vestibular, visual, and cognitive systems is integrated and assessed to maintain the static balance.

It is extremely important for children to develop an optimal postural control/stability. They need to practice a variety of challenging exercises especially in regards to dynamic balance, because it is crucial in being competent with physical skills later on. Throwing, catching, jumping and other gross motor activities require a child to be able to maintain their centre of gravity.

Considering that the preschool period is a key-moment in learning motor skills, intervention programs composed of fundamental motor skills, posture exercises and games are highly recommended.

Against this background, the aim of the research was to determine the balance level in elementary school children and provide some physical exercises to improve their coordination.

2. Materials and methods

A group of 60 children (aged 6-7 ± 0.5 years) participated in the study for 12 weeks. Twice a week, they took part in working programs that mainly had in their structure games with exercises. The exercises they did were: walking on the bench with various other tasks to execute, races, “musical statues” finishing on one leg, taking various balance positions when hearing a sound. The balance of the research subjects was assessed before and after the program implementation (in the 12^{th} week).

All subjects were healthy and none of the participants had any physical disabilities. The exclusion criteria were: subjects who refused to be assessed and those whose parents did not agree to sign the consent form. The subjects’ parents signed a consent informing them about the goals, testing procedure and work.

For the balance assessment, we used two tests (one for the static balance and the other for the dynamic balance). The former was the Flamingo test. Testing is performed in standing on one leg on the ground, the other leg is bent and held back by the arm from the same part of the body, and the other arm helps the child to maintain the balance. For the placement in the correct position, the subject was assisted by volunteers designated for this purpose. It was considered as the starting point of the test when the support of the volunteer stopped. Test run time was 1 minute, and timing was interrupted when the balance was lost (the back leg lost connection with the hand or the other foot sole was moved from the ground). Two repetitions of the test were performed, and the best result was recorded.

The latter test used was Y Test Balance (Fig. 1). This is a screen of dynamic balance which requires standing on one leg, while the other leg reaches in anterior, posteromedial and posterolateral directions.

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The distance travelled by pushing the device is measured in centimetres. In this study, it was used the right and left anterior and right and left posterolateral direction.

Fig. 1. The Y Balance Test

2.1. Statistical Analysis

The statistical data is presented as group mean, standard deviation and standard error mean. To determine whether the working programs are valid, we used the Statistical Package for Social Science, version 21. The significance level was set at p< 0.05.

3. Results

Table 1 shows the results for the right anterior Y Balance Test, whose mean of 47.17 (SD = 9.33 cm) in the initial test has increased up to 54.31 (SD = 8.51 cm) in the final one, post implementation of the working programs that included movement games. The anterior Y Balance Test recorded statistically significant differences between the first and second means, at a threshold of p< 0.05, which validates the proposed exercise.

Table 1. Paired samples statistics – Right anterior Y Balance Test (YBT)

	Mean	N	Std. Deviation	Std. Error Mean
Right Anterior YBT T1	47.17	60	9.33	1.73
Right Anterior YBT T2	54.31	60	8.51	1.58
t	-9.552	Sig. (2-tailed) 0.001*		

*p< 0.05

For the left anterior Y Balance Test (Table 2), it can be observed the paired samples statistics that shows better values in the final test. The first mean is 45.75 (SD = 7.92 cm), while in the second test, the subjects achieve the mean of 52.06 (SD = 7.90 cm), a value that indicates a better balance on left leg after the program.

Table 2. Paired samples statistics - Left anterior Y Balance Test (YBT)

	Mean	N	Std. Deviation	Std. Error Mean
Left Anterior YBT T1	44.75	60	7.92	1.47
Left Anterior YBT T2	52.06	60	7.90	1.46
t	-8.926	Sig. (2-tailed) 0.001*		

*p< 0.05

For the right posterior Y Balance Test (Table 3), a paired samples t-test was conducted to see the effect of exercise applied. It was revealed a statistically significant difference between the second balance test (M = 65.06, SD = 14.08) and the first test (M = 69.48cm, SD = 12.19cm), t(59) = -5.68, p< 0.05 (two-tailed).

Table 3. Paired samples statistics - Right posterior Y Balance Test (YBT)

	Mean	N	Std. Deviation	Std. Error Mean
Right Posterior YBT T1	65.06	60	14.08	2.61
Right Posterior YBT T2	69.48	60	12.19	2.26
t	-5.687	Sig. (2-tailed) 0.001*		

*p< 0.05

For the left posterior Y Balance Test (Table 4), it can be observed the paired samples statistics that shows a significant difference between initial and final test. The first mean was 65.89 (SD = 15.94 cm), while in the second test, the subjects achieved the mean of 70.79 (SD = 13.01cm), a value indicating an improvement of balance in the left posterior test.

Table 4. Paired samples statistics - Left posterior Y Balance Test (YBT)

	Mean	N	Std. Deviation	Std. Error Mean
Left Posterior YBT T1	65.89	60	15.94	2.96
Left Posterior YBT T2	70.79	60	13.01	2.41
t	-4.398	Sig. (2-tailed) 0.001*		

*p< 0.05

For static balance (Flamingo test), it can be observed a better value after participation in the program. Using a paired samples t-test, it was revealed a statistically significant difference in the second Flamingo test (M = 65.89cm, SD = 15.94cm), t(59) = -4.398, p< 0.05 (two-tailed).

Table 5. Paired samples statistics – Flamingo test (YBT)

	Mean	N	Std. Deviation	Std. Error Mean
Flamingo T1	65.89	60	15.94	2.96
Flamingo T2	70.79	60	13.01	2.41
t	-4.398	Sig. (2-tailed) 0.001*		

*p< 0.05

4. Discussions and conclusions

The aim of this research was to determine the role of movement games in improving balance of the children. The changes occurred in the balance of tested subjects demonstrate the influence of rhythmic and movement games on the development of children aged 6-7 years, and argue the efficiency of the experimental intervention module in developing psychomotor skills, the average progress recorded being of 32.17% balance on the right leg and 33.16% on the left leg.

If in the first test the differences between the values recorded were better for the right leg, with high differences between the mean of right and left legs, in the final test the difference decreased, but still in favour of the right leg.

There are some studies that have shown the effect of balancing ability on some motor and sports skills during the childhood period (Singer, 1970; Ulrich & Ulrich, 1985).

The training of vestibular apparatus function is a must, because a largely developed balance provides stability relative to benchmarks and leads to a reduction in the energy expenditure, due to more economical movements. The elements of locomotor balance supplement the balance function through their morphofunctional completeness.

Other studies (Shumway-Cook & Woollacott, 2007) have proved that postural responses are more variable and slower in children of 4-6 years old than in younger children; in 9- to 10-year-olds, standing balance appears to be adult-like. Researchers believe that the variable responses in the 4- to 6-year-olds may be reflective of the disproportionate growth and change in the body form during ages 4 to 6 (Peterson, Christou, & Rosengren, 2006). Hardy et al. (2010) consider that playing funny and skill-based games will help prepare the children for participating in a variety of physical activities with greater success and enjoyment.

Initially, the Y Balance Test (YBT) has been proposed as a screen for injury risk, but there is limited research examining the connection between injuries and YBT (Smith, Chimera, & Warren, 2015). Also, the asymmetry of >4cm suggests impaired balance and a potentially high injury risk (Plisky et al., 2006).

However, in this research, we used the YBT to determine the improvement of dynamic balance of the children. Therefore, in this experiment, the rhythm and movement games have successfully contributed to the development of both static and dynamic balance, but the asymmetry still persists in most of the subjects even at the end of the program. That is why, as a next step, we intend to develop some working programs which might help reduce this asymmetry.

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