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The effect of jumping rope training on static balance in male and female students with intellectual impairment

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ABSTRACT

The main purpose of this study was to examine the effect of jumping rope training on the static balance in students with intellectual impairment. 60 students 14-24 ages were used the random sampling method and students were divided into the experimental groups and the control groups. The experimental groups performed rope training for 45 minute, three days per week, for 6 weeks. The control group continued usual activities. Assessment of static balance of participants was carried out as follows using the Sharpened Romberg Test. score given to each individual was the time they could maintain a stable state with open and then with closed eyes. The test was conducted before and after the training. The paired t-test and independent t-test were used in the statistical analyses for the test results. The results of the comparison in the posttest showed that there is a significant difference only in the female group's Romberg test performance with eyes open, between the control and experimental groups after the training course. We conclude that the jump rope workout, have specific advantage, since these exercises are of the dynamic activities, which causes vigor in the people, while strengthening the pivotal muscles.

Key words: jumping rope training, static balance, intellectual impairment

INTRODUCTION

Intellectual disability is a complex dysfunction difficult to define accurately; it considerably hinders the functioning of people suffering from it in all spheres of their lives, affects their mental sphere and behavior, is disturbing both self-perception and interpersonal relations, which to a considerable degree decreases the quality of coexistence in society.

Mental retardation negatively affects the life of a disabled person also by lowering their motor development, which is manifested by poor visual and motor coordination, limited precision of movements, inhibition and difficulties in learning new forms of activities.

Persons with intellectual disability are worse at performing motor tasks which require combination of two activities (tossing and catching a ball, performing run-up jumps, tossing a ball up in the air after a leap); they also often have difficulties in developing praxis skills. Additionally disturbed body sensibility and poor spatial orientation

considerably decrease the level of static and dynamic balances, which is manifested by awkward movements and increases the risk of falls. The above mentioned results in worsening the performance of everyday self-management activities and decreases chances to participate in the life of a group of healthy peers or a possibility to find at least simple gainful employment. All these factors often make persons with intellectual disability alienated from society and experience lack of acceptance, which further decreases their self-assessment and motivation.

As a result, it is important to select a physical activity that is suitable for students with intellectual impairment. The activity must not be constrained by the weather or the setting, is interesting and, inexpensive, and can be easily conducted (Chen, 2010). Therefore, adopting an experimental design, 6-week jump rope training was administered in students with intellectual impairment.

MATERIALS AND METHODS

Participants

The experiment comprised a total of 60 participants with mild intellectual disability, students of a Special Education and Care Centre. The groups consisted of 30 females and 30 males, 14–24 years and were randomly assigned to experimental and control groups.

The jumping rope training was administered 45 minutes in each session. The random sampling method helped to divide students into the experimental (N=30) and control (N=30) groups, and all students went through a pre-test of static balance. Participants in the experimental group were then provided with 6 weeks of jumping rope training, and those in the control group were asked to keep regular hours. A post-test of static balance was performed after the 6-week training intervention.

Assessment of static balance of participants was carried out as follows using the Sharpened Romberg Test. The participant was asked to stand straight with naked feet, putting one foot in front of the other and his or her arms crossed upon the chest; the score given to each individual was the time he could maintain a stable state with open and then with closed eyes (Paula & Yim-Chiplis Laura, 2000). Because the participants were unaware of the scoring, they were asked to repeat the task three times (in order to control for the plateau effect) before the main test; next, in a separate trial, they performed the task for another three times, for which an average score was calculated and considered as an index for their ability to maintain balance.

Training prescriptions in the experimental group

Exercise pattern

Jumping rope was the primary activity in this experimental study. Students had the rope go around once per jump and did 8 cycles in every training session. A cycle was composed of 2 minutes of jumping rope and 2 minutes of rest, which took approximately 35 minutes to complete 8 cycles. In addition, the students performed warm-up and relaxation stretching exercises, which included stretches of the neck, arms, waist, leg muscles, ankles, and wrists. Both warm-up and relaxation stretches took 5 minutes, leading to a total of 45 minutes per training session.

Exercise intensity

The goal for exercise intensity was to reach between level 11 (Fairly light) and level 15 (Hard), based on Borg's Rating of Perceived Exertion (Borg, 1962); where the scales went from 6 to 20, and the total score could be categorized into 15 levels. Students had the rope go around once per jump and did 8 cycles in every training session. A cycle was composed of 2 minutes of jumping rope and 2 minutes of rest. A special education teacher consulted on students' perception toward exercise.

Exercise duration and frequency

Students in the experimental group were provided with a 6-week jumping rope training program, delivered 3 times a week, for 45 minutes each time. Students performed 8 cycles of training in each session, where a cycle was composed of 2 minutes of jumping rope and 2 minutes of rest.

Data Analysis

Baseline characteristics are presented using descriptive statistics. Using paired t-test to compare the static balance between pre-test and post-test of the experimental groups. Independent t-test was used to examine differences in items of static balance between the experimental and control groups.

RESULTS

Table 1: Mean (SD) static balance for male groups, Independent t- test for difference within group (Sig) and paired t-test difference between group (Sig)

Romberg Static Balance	Groups				Difference within Group		Difference between Group
	Pre		Post		Independent t- test		paired t-test
	Exp (n=15)	Con (n=15)	Exp (n=15)	Con (n=15)	pre	post	Exp
With open eyes	59.67 (0.40)	59.24 (0.77)	59.87 (0.25)	59.04 (1.45)	1.73 (0.10)	2.17 (0.05)*	-1.19 (0.25)*
With close eyes	58.09 (2.20)	56.22 (2.63)	59.33 (0.68)	57.11 (3.19)	2.11 (0.04)*	2.64 (0.02)*	-2.29 (0.04)*

The results of the female subjects' performance in the Romberg pretest with eyes closed, showed that there is a significant difference between the two groups (sig -0.03) indicating that the performances of the two groups before the beginning of the training program, are not in the same level. This issue was observed in the case of male subjects doing the Romberg test performance with eyes closed (sig-0.04). However, the results of the test with eyes open , were absolutely the same as the results of the test with eyes close , in such a manner that in the female group pretest , there was a significant difference (sig -0.01), while in the male group , the results were different, demonstrating the homogeneity of the subjects (sig -0.10)

Table 1: Mean (SD) static balance for female groups, Independent t- test for difference within group (Sig) and paired t-test difference between group (Sig)

Romberg Static Balance	Groups				Difference within Group		Difference between Group
	Pre		Post		Independent t- test		paired t-test
	Exp (n=15)	Con (n=15)	Exp (n=15)	Con (n=15)	pre	post	Exp
With open eyes	59.60 (0.40)	58.82 (1.01)	59.89 (0.24)	59.56 (0.41)	-2.78 (0.01)*	-2.69 (0.01)*	-3.16 (0.01)*
With close eyes	58.93 (1.16)	57.07 (2.90)	59.78 (0.30)	59.02 (2.68)	-2.32 (0.03)	1.09 (0.29)	-3.60 (0.00)*

The results of the post-test showed that between the Romberg with eyes closed and Romberg with eyes open, it is only in the female group's Romberg with eyes open that a significant difference is observed after the training course between the control and experimental groups (sig -0.01). However, in the male group better results were obtained, and a significant difference was observed in the Romberg test with eyes close (sig -0.04) and Romberg with open eyes (sig -0.05) between the male control and experimental groups.

DISCUSSION AND CONCLUSION

The results of the comparison in the posttest showed that there is a significant difference only in the female group's Romberg test performance with eyes open, between the control and experimental groups after the training course. Nevertheless, in the male group better results were obtained and it was observed that there is a significant difference in the Romberg test with eyes closed and Romberg test with eyes open, between the control and experimental group. Also, the correlative t-test results for investigating the effect of training on the research groups, showed that there is a significant difference between the two measuring stages in the female subjects in the Romberg test with eyes closed and the Romberg test with eyes open, in both the control and experimental groups. The results of this test in the male group showed that the training has no significant effect on the Romberg test with eyes open, and just the effect of the training on the Romberg test with eyes close, was observed.

According to the results of the present study, Jankowicz et al (2012) conducted a study on the effect of physical training on static balance in young people with intellectual disability. The study was done on young male and female subjects. The internal program lasted for three months. The result of the study showed that the use of unstable surfaces improves deep sensibility in people with mild mental retardation. In another study, Yilmaz et al (2009) did a research in order to investigate the effects of water exercises and swimming on physical fitness of children with mental retardation. The age range of the male subjects was 12 to 14 years old. The results showed that these exercises, significantly improves the balance in the male subjects. Also, Smith et al (2005) used the training

intervals for improving the balance in the people. The results of their research, conducted for determining the effect of balance exercise on their performance like balance, showed that the balance exercises (3 times a week, for 12 weeks), significantly improves the static balance in the people. In general, the results of these studies is compatible with the results of the present study, but the point one should consider most, is that in the said studies, the gender of the subjects is ignored, while in the present study, the balance was investigated in both male and female subjects. Also, in case of comparing the groups, the male subjects had more progress. Considering the fact that the literature of field of balance is not broad enough, we should resort to the studies done on the healthy people, which indicate that the male subjects, are in a better position in case of balance, compared to the female ones (Edwards, 2011). In this respect, the results of the present study, also confirmed these results and one can observe that the weaker performance of the female subjects in case of the balance in people with mental retardation, was also confirmed which is of course a possibility. More details indicated that with omitting the sight data, or in other words with manipulating the sight, the male subjects' performance was more deteriorated, which shows the dependence of the male subjects on the sight data, but this issue was not observed in the female subjects. Also, it seems that the jump rope workout, as of using the important muscular pattern, that is the anti-gravity muscles (the muscles which play important roles in keeping the static balance), has a great role in keeping the balance. On the other hand, considering the hormone secretion and the muscular differences between the male and the female, it seems that in case of these jump rope exercises, the male subjects' better performance, be due to the gender differences. Another important point is the subject's skill in doing the balance test. Although these subjects are the healthy ones, the conducted studies in case of validating the subjects' age range are limited. In any case, Lahtinen, in a research done in 1986, has confirmed the stork test in the mental retarded patients, while it may be the lack of the required skill in the female subjects, which has led to the insignificance of the results.

According to the results of the present study, Smith et al (2005), used the training intervals for improving the balance in the people. The results of their research, conducted for determining the effect of balance exercise on their performance like balance, showed that the balance exercises (3 times a week, for 12 weeks), significantly improves the static balance in the people. Also, it seems that the jump rope work-out, as of using the important muscular pattern, that is the anti-gravity muscles (the muscles which play important roles in keeping the static balance), has a great role in keeping the balance. On the other hand, considering the hormone secretion and the muscular differences between the male and the female, it seems that in case of these jump rope exercises, the male subjects' better performance, be due to the gender differences. The results of the present study showed that one can suggest these exercises in order to improve the (static) balance. However, the researchers believe that the jump rope workout, have specific advantage, since these exercises are of the dynamic activities, which causes vigor in the people, while strengthening the pivotal muscles.

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