

THE EFFECT OF TWO DIFFERENT EXERCISES OF RUNNING ON STATIC BALANCE IN THE FORM OF EIGHT- WEEK EXERCISE BY THE BALANCE BOARD

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ABSTRACT

The purpose of this study was the effect of two different exercises of running on static balance in the form of eight- week exercise by the balance board that 65 young healthy female were selected by non-probability sampling method and they were divided into three groups by random method. The first group included 25 people that first; they did exercise of running forward and then balance board exercises. The first group also included 25 people that first; they did exercise of running backward and then balance board exercises. The third group included 15 people that they only did exercises by the balance board. For each of the groups, exercise was repeated for 6 weeks and 3 times per week. These tests were measured in four stages and at intervals of two weeks. In general, it is not seen a significant difference in the mean values of the test after 6 weeks between the three groups. But a significant difference was observed in A, B and D tests in the three groups at the end of second week that this difference was because of mean values of A, B and C tests in the group of running backwards. We can conclude that two weeks running backwards, facilitate the effects of the balance board exercise on static balance.

Keywords: *Balance Board, Static Balance*

INTRODUCTION

The balance control is a reflection mechanism that is formed by harmony of three systems. These systems are including visual system, vestibular system and somatosensory system (Bernier *et al.*, 1995). In order to maintain balance during the move, body should be in a stable situation and the center of gravity is kept on the support base. Balance is preserved by the motions of the ankle, knee and hip and it may be disturbed when the motions are not done correctly and softly and with a coordinated motion method. These three balance systems will work as a combination and all of them are important in the implementation of coordinated and correct status. A disturbance in a system will be compensated by other systems. In some cases, one of the information systems may be disturbed. In this situation, it is necessary two other systems provide accurate information as the replacement afferent system (Bernier & Perron, 1998).

So, to prevent sport injuries can be a special emphasis on increased activity in somatosensory system afferents. In recent years, many therapists in the treatment of lower limb injuries are emphasized on using closed kinetic chain exercises. This issue is based on observed information and experiences that show closed kinetic chain exercises is more efficiently, safer and more functional than open kinetic chain exercises (Prentic, 1999).

There are techniques that will create a closed kinetic chain exercises condition as an index. One of these techniques is walking and running backwards. In general, both walking and running backwards and walking and running forward is used in the rehabilitation. However it is thought that walking and running backwards may have extra benefits to walking and running forward.

According to the observations and research that has been done, it seems that one of the benefits of walking and running backwards than walking and running forward is a more impact on the balance (Samarko, 1995). Exercises with balance board are one of the other techniques that can be done in a closed kinetic chain and have a significant effect on people's balance (Bernier *et al.*, 1998). In this study, considering that running backward and exercise on a balance board has effect on somatosensory and

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vestibular systems, we was studied the effectiveness of combining two running backward and balance board exercise on functional tests of static balance in healthy people.

MATERIALS AND METHODS

Methodology

The purpose of this study was to investigate the issue that which one of running forward and running backwards exercise is caused more facilitate of effects of the balance board exercises on control of the static balance. Method of study in this research was semi experimental study. The target population consisted of all young healthy females between 13 to 17 years (mean, 1.18 ± 15.3 year) that were not looking a certain sporting activities as persistent and professional forms. The study population included 65 girls' students of guidance and high school who were all healthy. And to find out the health of lower limb joints performance, examination and clinical observation and also completed of questionnaire forms were done.

These people were selected by voluntarily and non-probable and then, divided by simple random and without replacement, they were divided into three groups of Control group (Con), Backward running group (BR) and Forward running group (FR). People of three groups showed no significant difference in terms of age, height and weight (table 1). First group members were conducted practice of running forward for 10 minutes and then they were done the balance board for 15 minutes. Second group members were conducted practice of running backward for 10 minutes and then they were done the balance board for 15 minutes. The balance board exercises were done in two ways:

Person by using both legs was stood on the board as straight as possible from first week until the end of third week and he was done Dorsey's motion and (inversion) flexion, plantar flexion, inversion and then by eversion rotational motion leads a board to left, forward and right. Person was done these motions by bent knees (half squat) from fourth week until the end of sixth week. In addition he was stood by dominant leg on boards and tried to keep the balance and in the next step, he was done with closed eyes (Prentice, 1999). In this project, we used to a multi- balance board with a sphere radius of 12.5 cm and a height radius of 7.5 cm and a plate radius of 22 cm. For each of the groups, exercise performed for 6 weeks and 3 times per week. In this project, for measuring rete of progress of static balance, we were used to functional test of static balance include standing on dominant leg as straight as possible (A), standing on dominant leg as straight as possible on a soft surface (B), standing on dominant leg (half squat) on a hard surface (C) and standing on dominant leg (half squat) on a soft surface (C). These tests were performed with closed eyes and person bend non-dominant leg at knee angle of 90 angle and put their hands on the chest. This test was measured in 4 stage sat intervals of 2 weeks. These tests criteria was the maximum time (in seconds) that a person could maintain their status and balance without open their eyes, non-dominant leg put the ground, Change the location of dominant leg, open their hands and or used body compensatory motions and lower limb (standard stopwatch was used to record the time from the nearest hundredth of a second) (Zachazewski *et al.*, 1996). We used to clouds (foam) with thickness of 15-20 cm to make soft surface.

In this study, we used statgraphics software to analyze data. In addition, the following statistical tests were used to analyze data:

1. Descriptive statistics by using indicators of central tendency and dispersion, frequency distribution tables and charts for each of the variables studied in all three groups.
2. One way analysis of variance for exam testing between the groups studied.
3. Analysis of variance with multiple measurements to evaluate each of tests in different weeks in three groups.

RESULTS AND DISCUSSION

Results

Participants in Group FR were 25 persons with a mean age of 14.96 years. Participants in the group BR were 25 persons with a mean age of 15.16 years, but in the control group, two persons were excluded

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from the study without change of exercise courses and finally 13 persons were done exercise course completely with a mean age of 15.31 years.

Table 1 show briefly one way analysis of variance to compare mean of variables and various tests in different weeks between the three groups. The results show that at the end of sixth week was no significant difference in various tests (A, B, C and D) between the three groups. There is a significant difference in B test between the three groups at the end of fourth week that this difference was because of mean of BR group. A significant difference was observed in A, B and D tests at the end of second week that this difference was caused by mean of the group BR.

Discussion

Unfortunately, despite the importance of static balance in athletes, there is no a comprehensive training program in this field. This study is done because of a lack of research in this field. The only research that has been done in this field, is the research of Mr. Taghipur and Mrs. Fakharian and colleagues, (1999, 2000). They conducted two separate researches on young healthy boys and girls in 2008, which were divided into two groups. The first group was done exercise running forward (15 minutes) and the second group was done exercise running backward (15 minutes) for 6 weeks. In general, this studies showed that 6 weeks of running forward and running backward exercises can be caused an increase in the functional test time of static balance (standing on dominant leg half squat on soft surface) in both groups. But there was no significant difference between the two groups that this case has been matched with the results of Present study.

Deduction results from recent research are:

1. According to the significance of A, B and C tests at the end of the second week between the three groups, we can be concluded that backward running exercise (than to running forward) for two weeks will be facilitate the effects of balance board exercises on functional tests of A, B and D. So when there is a short time (two weeks) to improve static balance, it is better that running backward used with balance board exercises.
2. According to figures 1, 2 and 3 and with reminding this point that value of A test is more than C test and value of C test is more than D test until the end of the second week. But value of C test will be more than A test by changing the balance board exercises (with knees bent) at the end of the fourth week and value of D test is more than B test. So, it seems that if the purpose of exercise is further increasing the muscle spindle function, it may be better done with knees bent balance board exercises.
3. Mode of progression tests values in the last two weeks is more than the third and fourth week and the first two weeks (in all groups). So, to achieve an appropriate result, it is better, running backward will be done with balance board exercises for at least 6 weeks.
4. In general, the purpose is an exercise program to faster achieve of a person to optimal performance level. In this study, it became clear that in the group BR recovery process is faster and more than the FR and control groups. Thus, it seems that to improve static balance in healthy people is better to used running backward exercises with balance board exercises.

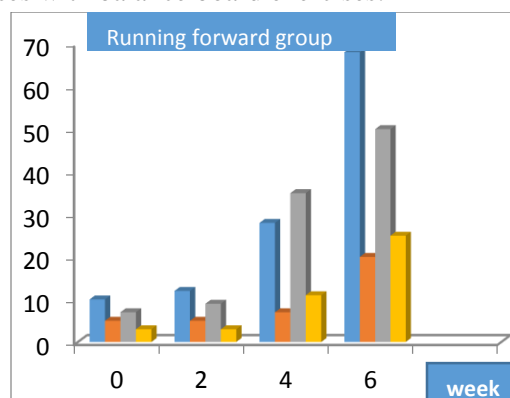


Figure 1: Compare Mean of Different Tests in Forward Running Group

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Table

Result	Meaningfulness Level	F Factor	Mean	Variable	Result	Meaningfulness Level	F Factor	Mean	Variable
Nonmeaningful	0.2293	1.534	14/55:FR 16/96:BR 13/28: Con	B ₆	Nonmeaningful	0.6455	0.441	14.96 :FR 15.16 :BR :Con15.31	Age
Nonmeaningful	0.7417	0.300	5/85:FR 6/33:BR 6/66: Con	C ₀	Nonmeaningful	0.8720	0.137	49 : FR 48.88 :BR 50.23 : Con	Weight
Nonmeaningful	0.1244	2.158	7/78:FR 9/73:BR 7/4:Con	C ₂	Nonmeaningful	0.5459	0.611	168.68 : FR : BR 164.44 157 : Con	Height
Nonmeaningful	0.3788	0.987	29/52:FR 30/57:BR 24/55: Con	C ₄	Nonmeaningful	0.7766	0.254	7.54 :FR 7.93:BR 7.17:Con	A ₀
Nonmeaningful	0.0872	2.542	48/78:FR 58/76:BR 41/84:Con	C ₆	Meaningful (FR-BR) (BR-Con)	0.0063	5.529	9.12 :FR 12.97:BR 8.77: Con	A ₂
Nonmeaningful	0.7954	0.23	1/98:FR 2/09:BR 1/98:Con	D ₀	Nonmeaningful	0.1070	2.221	11.24:FR 30.05:BR 21.38: Con	A ₄
Meaningful (FR-BR) (BR-Con)	0.0033	6.288	7/4:FR 3/38:BR 2/33:Con	D ₂	Nonmeaningful	0.2057	1.624	68.67 :FR 77.69 :BR 54.27 :Con	A ₆
Nonmeaningful	0.1478	1.974	7/4:FR 7/93:BR 6/22:Con	D ₄	Nonmeaningful	0.3576	1.046	2.4:FR 2.71 :BR 2.57 :Con	B ₀
Nonmeaningful	0.1448	1.996	18/99:FR 22/24:BR 16/08:Con	D ₆	Meaningful (FR-BR) (BR-Con)	0.0015	7.249	2.93:FR 3.96 :BR 2.81 :Con	B ₂
					Meaningful (FR-BR) (BR-Con)	0.0023	6.719	:FR5.52 7.43 :BR 5.46 :Con	B ₄

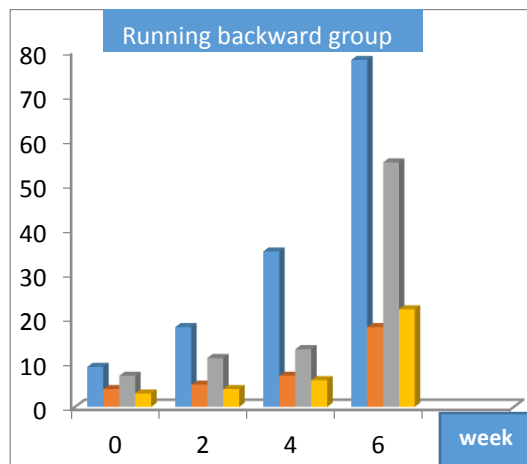


Figure 2: Compare Mean of Different Tests in Backward Running Group

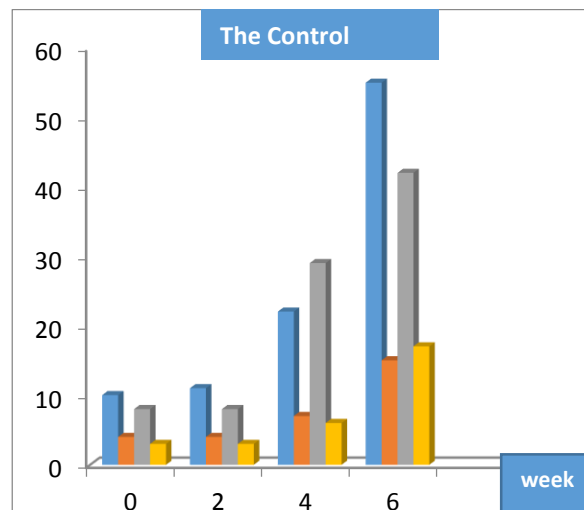


Figure 3: Compare Mean of Different Tests in the Control Group

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