

## **Impact of corrective exercises on the power and balance of adolescent girls suffering from scoliosis**

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### **ABSTRACT**

*The present research has been conducted with the aim of assessment of the impact of corrective exercises on the change of power and balance of adolescent girls suffering from scoliosis. For this purpose 30 students among those referred to Corrective Exercise Center of Tehran Dist. 4 Education Board within the age range of 13-16 years were selected. Masculine power was measured by dynamometer device and the balance was tested by balance plate. Testees participated in corrective exercise plans for a period of 6 weeks, each week four sessions of one and a half hours each. After completion of the plan, pair t-test was used for verifying significance of the rate of impact of corrective motions on dependent variables and for comparing the data before and after accomplishment of corrective e motions. For statistical analysis we used SPSS 16 software. The result of analyses showed that there was a significant difference between variables of power and balance before and after exercises; and in total we can conclude that corrective motions would cause an improvement in power and balance of scoliotic girls.*

**Key words:** Scoliosis, Corrective Motions, Power, Balance

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### **INTRODUCTION**

Spine is an important part of skelet on which is stretched throughout the body in the form of an "S". This column is responsible for major protection of body in different activities and plays the main role in straightness of the body. Whereas function of this skeletal structure depends on the functions of the relevant muscles and nerves, individual with appropriate power, strength, flexibility and balance of muscles would less impose to abnormalities of spinal column. Therefore, lack of movement, inactivity, or excessive and inappropriate exercises in long-run would lead to decrease or demolition of power and strength of masculine balance. Therefore muscles would not be able to maintain natural figure of the body and the individual would be affected by physical impairments resulting from natural deformation of bones and postural abnormalities. Minute abnormality of scoliosis type in spinal column would cause change and abnormalities in kyphosis of the hunchback and natural lordosis of the waist (back) and neck in spinal column and would lead to damage [1]. Scoliosis is a common deformity in children and adults. Such deformity would be very important in children because it would decrease while they are growing and would end to numerous problems such as respiratory malfunctions, masculine weakness (myopathy), weakness of joints and articulations, and appearance abnormalities. Therefore, if scoliosis deformities are diagnosed and undergone to treatment timely, their exacerbation would be prevented and they would largely be corrected [2]. Antony (2002) reported, as the result of his research on young adults, that adolescent scoliosis is the common form of deformity of limbs and it would include more than 70% of such disease. [3] Achievements by Atman et al (2007) on the effects of corrective motions on treatment of scoliosis revealed that corrective motions would be effective on increase in masculine power [4]. In their studies, Pincatt et al (2007) assessed the power factor in children suffering from

scoliosis. Their achievements revealed that masculine power of trunk and thigh would decrease in such persons; and such decrease in power would be a reason of scoliosis in these children. Also, they suggested strenuous exercises for weak muscles of thigh and trunk as the result of their studies [5]. McIntyre et al (2008) suggested rotational exercises for correcting scoliosis; and showed that such exercises would be effective on decreasing side deviation of spinal column and stability of it in 20-40 degree scoliosis after 8 months of exercise. This group suggests rotational exercises for correcting scoliosis [6]. Negrin et al (2008) studied corrective exercises and stated that doing corrective exercises would decrease deviation angle of spinal column; and would eliminate needs to brace [7].

## MATERIALS AND METHODS

The present semi-empirical study is a clinical trial among girls within the age range of 13 to 16 suffering from scoliosis. Clients of Corrective Motions Center of Tehran Dist. 4 Education Board were selected randomly. They were selected after screening and checkups on random basis from the persons affected by positional scoliosis -30 persons – and on their own volition as volunteers for studies. They filled up health form with their full satisfaction. They were invited to the location of tests after we made sure they are not suffering from cardiovascular diseases in order to implement envisioned pretests. They became familiar with modality of tests after measurement of their heartbeats, heights and weights. Then they performed pretest including precise assessment of scoliotic situation via chess sheet, measurement of back muscles' powers via mechanical dynamometer, and their balance via balance plate. At the next phase, the testees participated in corrective exercises plan for a total period of six weeks, four sessions a week one and a half hours each.

### Statistical Analysis Methods

For analysis and description of data, descriptive statistical methods including frequency tables, mean, and standard deviation were used. For comparing data before and after accomplishment of corrective motions pair t-test was used. Significance level of tests were considered on the confident levels of 95%,  $\alpha < 0.5\%$ , and  $p > 0.5\%$ . SPSS 16 was used for statistical analysis of data.

### Achievements

**Table 1. Specifications of Individuals (Testes) Taking Part in this Research**

Age	Weight (kg.)	Height (m)	Frequency
14.43 ± 1.10	57.43 ± 4.70	158.83 ± 4.44	30 persons

**Table 2 – Results of pair t-test of the variables of back opener muscles and balance**

Variable	Before test	After test	Degree of Freedom	t	Significance level
	Average (standard deviation)	Average (standard deviation)			
Strength of back opener muscles	44.33 ± 7.73	51.83 ± 6.49	29	-9.54	0.00

Pair t-test showed that the average of power of back opener muscles was 44.33 before corrective motions and reached to 51.83 after doing that. According to these achievements the difference has become significant statistically.

Also pair t-test showed that the average of balance was 13.87 before corrective motions and reached to 21.10 after doing that; that it is also significant statistically. At this research we used pair t-test for comparing data before and after corrective motions and for analyzing the effect of independent variable on dependent one.

## CONCLUSION

The present research has been conducted with the aim of assessment of the impact of corrective exercises on the change of power and balance of adolescent girls (13-16) suffering from scoliosis. After doing corrective motions for a total period of 6 week, 4 sessions a week, and each session of one and a half hours, the intensity of scoliosis of testees was decreased. Furthermore, the rate of factors of power and balance of the persons under study was significantly increased as showed by results of tests and comparing them with the results of pretests. The studies relating to balance showed that scoliosis is a 3 dimensional abnormality of spine and the thorax which would end to change in relations between skeletal components, in spinal anatomy, and symmetry of trunk; and would change walking pattern in patients. Also it would change body's center of gravity and modality of distribution of weight on lower limbs. Therefore, we would inference that scoliotic patients have lesser balance in comparison with their healthy peers[8]. Focus et al (2013) analyzed the effects of exercises on the reduction of rate of progress (chiefly in

early adolescence time) and betterment of curvature of spine. They suggested that implementing corrective motions together with exercises would decrease curvature of spinal column and improvement of power and balance [9]. In their research, results show that the impact of corrective motions in the group under research is statistically significant and show increase in balance. In the current research the results are also complied with that research because the balance is less before corrective motions but after it we would see some changes in balance. Fozokoz et al (2011) studied the impact of exercises on treatment of scoliosis in adolescents and found that sport exercises would decrease scoliosis exacerbation; and would cause decrease in using brace and finally would improve power, movement, and balance in patients [10]. Mahboubeh Karbalaei (2010). In a Study on the impact of corrective motions on flexibility and power of positional scoliotic adolescent girls results show that doing corrective exercises would improve flexibility, power, and maximum oxygen usable by scoliotic girls [11]. In our research we didn't use orthotic device. However, our results show that by doing strenuous exercises, the power of back muscles has increased. In another research Pincatt et al (2007) studies power of scoliotic children. Their results showed that power of thigh and trunk has decreased in these persons; and decrease in strength would be a reason of scoliosis. Results of the present research are also complied with that research because power of muscles before corrective motions was lesser than their power after doing that. By doing corrective motions, positive changes in power of back muscles were seen and this positive impact on expansion of thorax and flexibility was also seen. Also Atman et al (2005) studies the impact of corrective motions on treatment of scoliosis; and found that corrective motions would be effective on increase of power of muscles of patients. Comparison of results of our research with the results of Atman et al represents that both results tally with each other; and selected scoliotic persons achieved more power and strength in their back muscles after they did corrective motions. Considering that the general goal of this research is assessment of impact of a period of corrective motions on balance and strength of adolescent scoliotic girls of 13-16 years, after doing corrective motions for a period of 6 weeks, the rate of intensity of scoliosis of testees decreased; meanwhile, the rate of such factors of power and balance increased in testees as shown by results of tests and comparison of them with the results of pretests. Therefore, in the light of results and eventual impacts of these motions we can conclude that: 1- Improvement of the said factors would be occurred via repetition of motions which were done opposite to gravity. 2- Whereas these persons have not done corrective motions, they would have high potential for their strength being improved. 3- Exercises were of isotonic type; therefore, further to moving vertebral articulations, it provided increase in strength. As to balance, improvement of masculine power was probably effective on preservation of masculine status. Meanwhile, proprioception as the result of correction of scoliosis deformities was also effective on balance.

Whereas a factor of disturbance or decrease of balance is displacement of center of gravity, we would conclude, as a probability, that center of gravity has moved to natural position as the result of six weeks of corrective exercise.

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