COMPARISON OF DYNAMIC BALANCE IN NORMAL AND OVERWEIGHT STUDENTS THROUGH Y BALANCE TEST

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HIGHLIGHTS

- Balance plays a pivotal role in all levels of activity and the performance of daily tasks. Y-balance test is used for the testing of dynamic balance. It is reliable for the evaluation of dynamic balance and stability of the lower limbs.

- The anterior reach distance of right leg of group with normal weight individuals is (53.53±8.12) and group with overweight individuals is (60.40±7.67). Increase BMI shows significant results in the anterior direction. The anterior reach distance in overweight individuals is quite greater than normal weight individuals

ABSTRACT
Objective:
The objective of this study was to compare the dynamic balance in normal and overweight students through y balance test.

Method:
This study recruited 30 participants of either sex participants were also categorized as normal weight (n=15) and overweight (n=15) according to the BMI. Dynamic balance was analyzed by Y balance test in anterior, postero-medial and postero-lateral directions. Comparison of all variables was entered in SPSS and after testing normality, independent sample t test was applied for mean difference keeping p value of 0.05 as significant.

Results:
Mean age of the male subjects was 22±1.00 years and female were 21.81±1.41 years. The anterior reach distance of right leg of group with normal weight individuals is (53.53±8.12) and group with overweight individuals is (60.40±7.67). The difference between these groups in anterior reach distance was statistically significant (p-value 0.024), but not with the postero-medial and postero-lateral directions.

Conclusion:
Increase BMI shows significant results in the anterior direction. The anterior reach distance in overweight individuals is quite greater than normal weight individuals. On the other hand, no significant difference is seen in posterolateral and posteromedial directions.

Key words: Overweight, Normal weight, Postural balance, Y balance test

Introduction

Balance plays a pivotal role in all levels of activity and the performance of daily tasks.[1] Dynamic balance, state to maintain the equilibrium during movement phase, relates to the ability to maintain the stability while there is alterations in the base of support.[2, 3] The cerebellum plays a significant role in dynamic balance regulations and limb movements to occur in an appropriate way.[4] Y-balance test is used for the testing of dynamic balance. It is reliable for the evaluation of dynamic balance and stability of the lower limbs[5]. It is the modified version of star excursion balance test organized to refine the repetitive measurements and to systematize the test performance[6]. Y balance test has good reliability in determining the balance deficits and asymmetries and helps out the individuals to return to sports and perform activities of daily living.[6] There are many associated factors with disturbed balance weight is one of the factor. [7] Control of dynamics and secured physiological system is essential in order to sustain balance. The individuals having high BMI cannot utilize proprioceptive information due to the decline in the capacity.[8] Postural stability decrease in the obese individuals that have greater BMI due to large degree of sway.[9] Y balance test and BMI are important variables for determining fear of fall in participants.[10] The Limited number of studies have investigated the dynamic balance in overweight individuals.[11] To the best of researchers' knowledge no study so far has compared the dynamic balance between normal and overweight individuals using Y-Balance test. It would be baseline study for Pakistani population mainly in normal and overweight individuals.

METHOD:

The subjects were recruited on the basis of inclusion criteria and exclusion criteria and counseled about the study procedure. The purpose and procedure of study had explained to the patient. Then consent form was provided to each subject. After signing the consent, basic demography like weight, height and leg length were noted. Then the subjects were demonstrated about the test and properly instructed about how to perform Y Balance test. In Y-balance Test, the measuring tapes marked in centimeters were placed in the anterior, posteromedial and posterolateral directions on the floor in such a way that each posterior direction was positioned at 135 degrees and the angle between them was 90 degree. In star excursion balance test, the six trials were performed in with three attempts in eight directions that consumes a lot of time but in Y-balance test it is reduced to three directions that is quite.[12]

The subjects were asked to stand on one leg with hands on wings of ilium and try to reach out in three directions that are anterior, posteromedial and posterolateral with the other knee in semi flexed position. After reaching out in each direction, the subjects were asked to return to the initial point while maintaining the balance on the other limb. The maximum reach distance was recorded with the measuring tape.in centimeters. Three repetitions were performed in each direction. A 10 second interval was allowed between attempts to reduce fatigue. All Y-BT attempts were performed in the sequential manner: the first in the anterior direction; the second one in the posterolateral direction; the last one in the posteromedial direction. The three repetitions in each direction were performed first with the right lower limb and then with the left. The leg length was measured with the measuring tape from anterior superior iliac supine to the medial malleolus for each participant in the supine position. The whole procedure took only five minutes. The recorded reach distance was divided by the limb length and multiplied by 100

for the normalized reach distance. In order to determine composite reach distance, the sum of the maximum reach distances in each 3 direction is divided by three times of the limb length and multiplied by 100. The analysis of the results was done by using the following formula:

$$Reach\ distance = \frac{\sum maximum\ reach\ distance\ in\ 3\ directions}{3\ time\ of\ relative\ length\ of\ the\ limb} \times 100$$

RESULTS:

A total of 30 participants 27(90%) females and 3(10%) males were recruited for this study. Average age of male was 22±1.00 years whereas average age of female was 21.81±1.41years. There was no statistically significant difference between age of male and female (p-value 0.828). In group of normal weight individuals, 1(33.3%) was male and 14(51.9%) were females While, in group of overweight individuals, 2 (66.7%) were male and 13(48.1%) were females. There was no statistically significant difference between genders as shown in table-3. The anterior reach distance of right leg of group with normal weight individuals was (53.53±8.12) and group with overweight individuals was (60.40±7.67).The difference between these groups was statistically significant (p-value 0.024).

Independent sample T-Test

	Normal	Over weight	p-value
Year	22.13±0.99	21.53±1.64	0.236
Leg Length Right	87.07±4.15	84.80±4.36	0.156
Anterior(cm)	53.53±8.12	60.40±7.67	0.024*
Postero Lateral(cm)	54.20±8.51	55.93±5.81	0.520
Postero Medial(cm)	45.27±9.00	41.80±7.78	0.269
Composite(%LL)	58.62±8.11	62.16±7.12	0.215
Leg Length Left	87.00±4.02	84.80±4.36	0.162
Anterior(cm)	56.27±8.85	58.40±7.28	0.477
Postero Lateral(cm)	53.27±7.40	51.87±7.20	0.604
Postero Medial(cm)	45.40±9.05	41.53±7.58	0.215
Composite(%LL)	60.14±8.17	60.01±7.64	0.965

Independent sample t test, p-value significant at 0.05

DISCUSSION

In the current study, we tested the individuals with varying BMI in terms of their dynamic balance performance. This study compares the dynamic balance of normal and overweight individuals through Y balance test in three directions anterior, posteromedial and posterolateral.

The significant differences were found in the right anterior direction as the center of pressure transfers within the base of support[13]. No significant difference is seen with other reach directions on the basis of BMI. The efficiency of dynamic balance in overweight individuals was quite less compared to the healthy children and significant difference was seen in the anterior direction. The marked difference in anterior direction may be due to alterations in the body mechanics that cause the increase in the pelvic tilt and alters the functions of the lower limb due to abnormal fat deposition which impairs the posture and cause instability. Furthermore, the isometric strength of the muscles specifically the knee flexors and knee extensors of right and left side varies with the altered BMI status.[14]

In the previous study, Y balance test was done in the young healthy adults for the reference values where the males showed better performance in the anterior, posterolateral and posteromedial direction and the composite score of males was higher than females.[5] Through our study, we observed that right anterior reach distance of overweight individuals was higher as compared to normal weight individuals. Another study finds that the changes in the anteroposterior directions are related to the body mass index.[8] In the present study, no marked difference is seen in the posterolateral and posteromedial directions in both normal and overweight individuals in the dynamic conditions except in the right anterior direction in which the

overweight individuals have greater anterior reach distance.

CONCLUSION:

The Y balance test is easy to use measuring tool to check the dynamic performance of normal and overweight individuals. Based on the results, reach distance difference is achieved in anterior direction. The anterior reach distance in overweight individuals is quite greater than normal weight individuals which shows the greater significance in the anterior direction. On the other hand, no significant difference is seen in posterolateral and posteromedial directions.

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