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ORIGINAL ARTICLE

Comparison of Static and Dynamic Stability in Undergraduate Physiotherapy Student of Hyderabad And Jamshoro Sindh

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ABSTRACT

Background: Basic daily activities include balance and coordination. Lack of balance can be a major risk factor of injuries related to daily activities. The classification of balance is static balance and dynamic balance.

Objectives: this report has been undertaken to compare the static and dynamic stability of undergraduate physiotherapy students of Hyderabad and Jamshoro Sindh.

Methodology: A cross-sectional comparative method of research was considered for the study. Data was collected from multiple specialized physiotherapy departments related to undergraduate physiotherapy education in colleges of Jamshoro & Hyderabad. 252 students were randomly selected. Convenient sampling (purposive) was used. For static balance selected tests was Single limb stand tests with I- eyes, II- with eyes closed. For dynamic balance measurement Y-balance test has been performed using three directions anterior, posteromedial (PM), posterolateral (PL). The mean of Y-balance test has been calculated by measuring three times for each participant and values has been standardized by using the following equation: measured value / leg length x 100.

For comparison in static and dynamic stability Paired T-test was selected as a tool for evaluation. SPSS version 22 was used.

Results: The findings of this research shows the mean of static balance in relation to dynamic balance as -.15873, it also shows the standard deviation of static stability in comparison with dynamic stability as 0.69618. The P-value of static balance in comparison to dynamic stability was 0.000 that is < 0.05.

Conclusion: There is certainly a true difference between static stability and dynamic stability of undergraduate physiotherapy students of Hyderabad and Jamshoro Sindh.

Introduction

Basic daily activities include balance and coordination, alterations in mechanics of foot can affect static and dynamic stability (static or dynamic balance).[1] Lack of balance can be a major risk factor of injuries related to daily activities.[2] The classification of balance is static balance and dynamic balance.[3] Strength of muscles are important for maintaining normal posture and stability, to maintain stability and to prevent falls muscle forces with kinematic adjustments, especially around the knee and the ankle, are used [4] From a biomechanical point of view static and dynamic balance are entirely different from each other, such as in static condition maintenance of balance is often set as an inverted pendulum with the controlled value is the projection on COG,[5] while in dynamic balance during gait, still require control over COG but does not require COG to lie within area

delimited by the foot.[6] Static balance can be tested by asking the subject to stands on single limb with eyes open and with the eyes closed.[7] Dynamic balance can be tested by using lower quarter y-balance test which is performed in anterior, posteromedial, and posterolateral directions, the Y-balance test has built on previous research suggesting redundancy in the 8 directions of SEBT to develop a more time-efficient test that evaluates dynamic limits of stability and asymmetrical balance in only three directions and it takes lesser time to complete and have high interrater and intrarater reliability.[8] Plisky et al was the first who reports that anterior reach asymmetry of more than 4cm and composite reach distance less than 94% of limb length were predictive of lower extremity injury.[9] Dynamic balance was considered as positive if composite score difference between both limbs were less than 4cm, dynamic balance was considered as negative if composite score difference between two limb were 4cm or greater.[10]

The previous study found athletes and divided them among the groups including the pronated foot group, supinated foot group & normal foot group.[3] one of the study investigated the connection of foot size, balance and foot posture.[11] The other study showed no significant change in center of balance, the function of foot type or postural sway.[12]

The process description of the physical therapist include treatment of numerous quantity of patients i, treatment of a huge quantity of sufferers in office timing, working in a static position for an extended period of time, carry out identical actions repeatedly together with bending & twisting of the back.[13] Hence due to the absence of transparency in the background of the research about the difference of static and dynamic stability in physiotherapy students this study has focused on the comparison of static and dynamic stability in undergraduate physiotherapy students.

Methodology

A cross-sectional comparative method of research was considered for the study of 725 undergraduate physical therapy students multiple specialized physiotherapy departments related to undergraduate physical therapy education in colleges of Jamshoro & Hyderabad, the sample size was determined by using Raosoft calculator with confidence level 95%, margin of error 5%, and response distribution 50%, the estimation of sample size of undergraduate physical therapy students turned into about 252. The sampling technique which has been proposed to collect data was convenient purposive with the permission of participants. All the participant included in the study had ordinary cognitive function, in the event that they have been freed from scoliosis.[14] The participants had been excluded from the study who had asymmetric toes which inclined participants to be volatile whilst static stability test[9], any participants having >10mm shortening inleg length[15], participants having consistant ache in lower extrimity &those participants who had surgical procedure of lower extremity in period of 6 months which effects stability or related neurological circumstance which disturbs subject's capacity to maintain stability.[14]

Leg Length

Leg length was determined by participants consent to lie supine on couch with legs straight, investigator stands by the side of the limb to be tested, investigator palpates the Anterior Superior Iliac Spine (ASIS) and places the measuring tape at ASIS till medial malleoli and records the reading in centimeters to be used in y-balance formula.

Figure 1: Shows participant's measurement of leg length Static Balance.

The researcher requested to the participants to assume standing position barefooted on the ground with ease, and assume cross arm position with both upper

extremities in cross arm position, flex the non-dominant lower extremity at the knee. The participant maintained this posture for 15 seconds with open eyes followed by closed eyes, the assessor notes the static balance, every participant were examined twice with the help of static balance test and the finest performances were noted for computations.[15]

Figure 2: Shows subject standing on one limb with eyes open

Figure 3: Shows subject standing on one limb with eyes closed.

Dynamic Balance

Lower quarter Y-balance test was performed by each subject to test dynamic stability. The investigator asked Participants to stands barefoot at the center of the Y-balance on one leg while placing both hands over the waist and reach to the point as far as possible with the free leg in three directions anterior, posteromedial (PM) and posterolateral (PL). The same process was repeated for a contralateral leg.[15]

Figure 4: Shows starting position of participant for y-balance test

Figure 5: Shows Anterior reach of participant during y-balance test.

Figure 6: Shows Posterolateral reach of participant during y-balance test

Figure 7: Shows posteromedial reach of participant during y-balance test

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Maximum reach of each participant were recorded in all there directions which was used in Y - Balance formula to get an estimated dynamic balance as follow:

$$\frac{(\text{Anterior} + \text{Posteromedial} + \text{Posterolateral})}{3 \times \text{Limb length}} \times 100$$

According to standards, the trial was not being counted if a:

1. Participant failed to maintain a single limb stand
2. Participant touched down on the reached foot
3. Participant become unable to return to starting position

Results

The size of the sample for this study was calculated to be was n=252 undergraduate physical therapy students. To evaluate the mean of participants with static and dynamic stability either positive/negative. In the table, I the mean of static balance is M=1.3571 on the other hand mean for dynamic stability is M=1.5159. (Table II) indicates the sample correlation of static & dynamic stability as -0.007 which results in weak negative correlation among both variables. Table III suggests the static stability in relation to dynamic stability is -.15873, it also shows the standard deviation of static balance in relation to dynamic stability as 0.69618, table III also shows p-value of static balance in relation to dynamic stability and is found to be highly significant, as the calculations of the study shows the P-value 0.001 that is highly significant and is much less than 0.05 and there is certainly a true difference found in comparison of static and dynamic stability of undergraduate physiotherapy students. (Figure 1) shows that out of 252 undergraduate

students 78 participants have positive static stability and 44 have positive dynamic stability while 84 participants have negative static stability and 46 participants have negative dynamic stability.

Table I: Showing standard deviation & mean of two groups

Paired Sample Statistics			
	Mean	N	Std. Deviation
Static stability of respondents	1.3571	252	0.48011
Dynamic stability of respondents	1.5159	252	0.50074

Table II: Showing sample correlation of two groups of static and dynamic stability.

Paired Sample Correlations			
	N	Correlations	Significance.
Static stability and dynamic stability of respondents	252	0.007	0.911

Table III: Results of Paired T-test shows P-value for significance level of study

	Paired differences			
	Mean	Std. Deviation	Std. Error Mean	p-value
Static stability and dynamic stability of respondents	0.15873	0.69618	0.04386	0.000

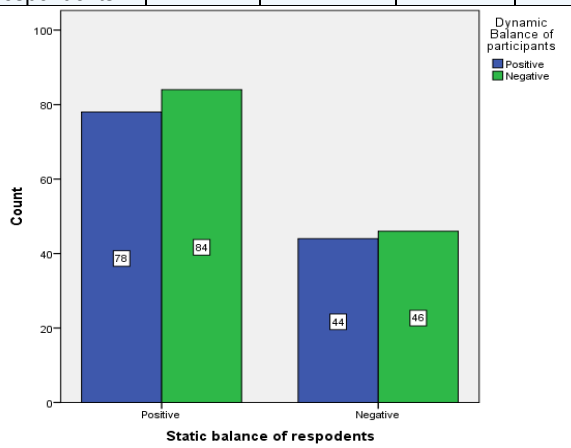

Figure No 1. Shows grouped Bar chart of the two groups having static and dynamic balance either positive or negative.

Discussion

The preliminary purpose of this studies was to determine the comparison and ultimately difference of static and dynamic stability in undergraduate physiotherapy students. The result of this study shows that there is certainly true difference found between static and dynamic stability of undergraduate physiotherapy students, as the p-value is 0.000 which is statistically significant. Mahsa Hakimipour, Elahe Fadaee investigated the result of this study showed that static and dynamic balance levels in athletes among these groups including flat foot group and high arched foot are significantly lower than athletes in normal foot group. [3]

In 2005 a research identified the relation of balance with foot posture and foot size. According to results after detecting and resolving foot stance issues, stability deficiencies may be minimized in sports student for achievement in their sports performance. Furthermore, early identification, with suitable management may reduce the elderly incidence of fall.[11]

In 2005 another study determines no significant change in postural sway or center of stability and function of foot type. In addition, their suggested results shows that postural stability of static and dynamic balance are affected by foot type and foot posture were associated with each other although static balance was minimally affected by foot type.[12]

Limitations of study: This study is based on Y-balance kit but due to unavailability of kit we make y-balance kit via sticky tape, we may have more accurate results if we had Y-balance kit.

While collecting samples, we did not categories participants on the basis of gender therefore we can have more accurate data according to gender.

Strengths of study: The method leads to more understanding of the problem raised through this research writing because finding shows the relationship of static and dynamic balance.

The results of the study were calculated precisely and carried out carefully. The participants correct their balance via knowing their level of stability.

Conclusion

The present study findings suggest that static and dynamic stability in participating undergraduate physiotherapy students in Hyderabad and Jamshoro are highly significant therefore there is certainly true difference found between static stability with respect to dynamic stability. It can be used in clinical practice for diagnosis of usually balance related conditions. It can be used to identify relation of symptoms.

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