International Journal of Research and Review
[Indexed, Peer-Reviewed Journal]
Volume 13; Issue: 9; September 2026
Website: www.ijrrjournal.com
Research Paper E-ISSN: 2349-9788; P-ISSN: 2454-2237

Correlation Between Static and Dynamic Balance in Healthy Young Adults

Nidhi Panchal[1], Aanal Brahmbhatt[2]

[1]Assistant Professor, Shree M. M. Shah Physiotherapy College, Mahemdavad, Gujarat, India
[2]Internship Student, Shree M. M. Shah Physiotherapy College, Mahemdavad, Gujarat, India

Corresponding Author: Nidhi Panchal

DOI: https://doi.org/10.52403/ijrr.20260930

ABSTRACT

Introduction: Static and dynamic balance involve different postural control demands and are influenced by the integration of visual, vestibular, and somatosensory information. Although both forms of balance contribute to functional performance, the relationship between static and dynamic balance in healthy young adults remains insufficiently understood.
Aim: To determine the correlation between static and dynamic balance in healthy young adults.
Methodology: A cross-sectional study was conducted among 40 healthy young adults. Static balance was assessed using the Single Limb Stance Test, Romberg Test, and Tandem Stance Test, while dynamic balance was assessed using the Y Balance Test (YBT). The YBT was performed in the anterior, posteromedial, and posterolateral directions, and composite scores were calculated for both lower limbs. The Shapiro–Wilk test was used to assess the normality of the data, followed by Pearson's correlation coefficient to determine the relationship between static and dynamic balance.
Result: Healthy young adults demonstrated good static and dynamic balance performance. The mean Y Balance Test composite scores were 83.8 ± 13.5% and 87.4 ± 14.1% for the right and left lower limbs, respectively. Pearson's correlation analysis revealed weak, non-significant correlations between static balance measures and Y Balance Test composite scores ($p > 0.05$), indicating no statistically significant relationship between static and dynamic balance.
Conclusion: No significant correlation was found between static and dynamic balance in healthy young adults, suggesting that these represent distinct components of postural control. Therefore, both static and dynamic balance should be assessed independently for a comprehensive evaluation of balance performance.

Keywords: Limb length, Static balance, Dynamic balance, Postural control, Y Balance Test, Healthy young adults.

INTRODUCTION

Postural balance control is the ability to maintain the body's center of mass within its base of support and prevent loss of equilibrium[1]. Postural balance is a fundamental component of human motor behaviour. It enables the body to maintain stability while interacting with the environment. Good postural stability supports activities of daily living, athletic performance, and safe movement. Poor postural stability is associated with impaired mobility and increased injury and fall risk[2]. Nearly all daily activities require continuous postural adjustments. Effective postural control allows individuals to perform simultaneous tasks safely and efficiently. Good postural stability contributes to the maintenance of complex motor skills throughout life[3].

Postural stability is essential for maintaining steadiness during static and dynamic tasks. It depends on coordinated visual, vestibular, and proprioceptive inputs. Improving postural stability has important applications in rehabilitation[4]. Balance training enhances neuromuscular control. Improved balance may reduce the risk of lower-extremity injuries[5].

Balance plays a fundamental role in walking, stair climbing, reaching, running, and other functional activities by maintaining the body's stability during both static and dynamic tasks[6]. Static balance is the ability to maintain equilibrium while standing or sitting with the base of support remaining stationary, with only small movements of the body's center of gravity[7]. Static balance is maintained through postural control strategies that keep the body stable during quiet standing or other stationary postures[8]. Static balance refers to maintaining stability while the feet and base of support remain fixed, whereas dynamic balance involves movement of the body and changes in the base of support[9].

Dynamic balance is the ability to maintain or restore stability while the body is moving or while the base of support changes. Dynamic balance requires coordinated interaction between the visual, vestibular, and somatosensory systems. The Y Balance Test is a standardized, reliable, and clinically useful assessment of dynamic balance[7]. Dynamic balance involves maintaining stability while walking or responding to internal and external perturbations. It depends on continuous control of the body's center of mass relative to the base of support[10]. Dynamic balance reflects the ability to maintain postural control during voluntary movement. Static and dynamic balance are related but represent different aspects of postural control[09]. Dynamic balance can be measured reliably using wearable sensors and standardized clinical tests. Reliable assessment is important for rehabilitation and sports performance[11].

Balance can be assessed using clinical and instrumented methods. Clinical methods are inexpensive, quick, and widely used in physiotherapy practice.

Common static balance tests include[12]:

- Romberg Test
- Sharpened Romberg Test
- Tandem Stance Test
- Single Leg Stance Test

Dynamic balance can be assessed using both clinical and instrumented methods. Common clinical assessments include the Star Excursion Balance Test (SEBT), Y Balance Test (YBT), Functional Reach Test (FRT), and Timed Up and Go (TUG), whereas laboratory-based assessments use force platforms and computerized balance systems. Among these methods, the Y Balance Test is one of the most widely used because it has a standardized testing protocol, requires minimal equipment, demonstrates excellent reliability and validity, and provides a practical measure of lower-extremity dynamic postural control in healthy adults[07].

The Y Balance Test (YBT) is a standardized clinical assessment of dynamic balance derived from the Star Excursion Balance Test. It requires an individual to maintain a single-leg stance while reaching in the anterior, posteromedial, and posterolateral directions with the opposite limb. The Y Balance Test simultaneously challenges neuromuscular control, proprioception, strength, flexibility, and postural stability. Due to its excellent reliability, validity, standardized protocol, and minimal equipment requirements, it is widely used in physiotherapy, sports medicine, rehabilitation, and injury-risk screening[13].

The Y Balance Test is widely used for:

- Dynamic balance assessment
- Lower-extremity function evaluation
- Injury-risk screening
- Rehabilitation progress monitoring

- Return-to-sport decision-making
- Sports performance assessment

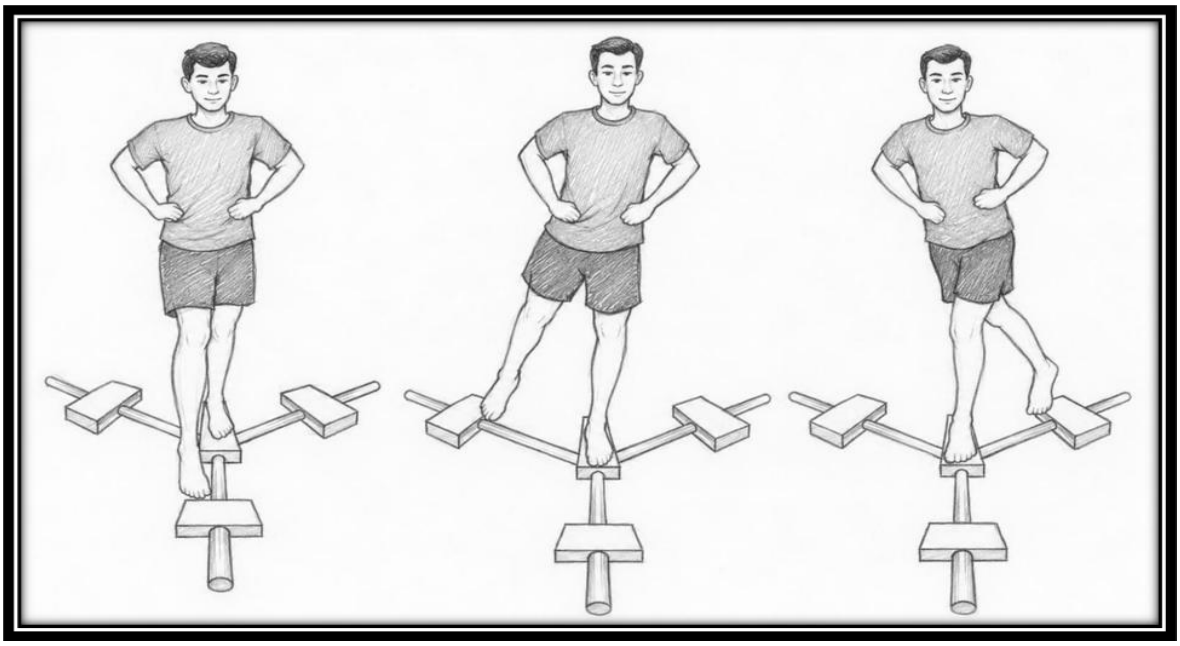


Figure 1: Y balance test

AIM OF THE STUDY

To correlate between static and dynamic balance in healthy young adults using the Single Leg Stance Test and the Y Balance Test.

NEED OF THE STUDY

Balance is a fundamental component of human movement and is essential for maintaining postural stability during both static and dynamic activities. It depends on the coordinated integration of the visual, vestibular, somatosensory, and neuromuscular systems. Efficient balance is necessary for performing activities of daily living, participating in sports, and preventing musculoskeletal injuries.

Young adults are generally considered to have optimal neuromuscular function and peak physical performance. However, differences in static and dynamic balance may still exist because these two aspects of balance involve different physiological and biomechanical mechanisms. Although numerous studies have investigated balance in athletes, older adults, and individuals with neurological or musculoskeletal disorders, relatively fewer studies have directly compared static and dynamic balance in healthy young adults using standardized clinical assessment tools.

The Single Leg Stance Test is a simple and widely accepted method for assessing static balance, whereas the Y Balance Test is a reliable and valid measure of dynamic balance and lower-extremity neuromuscular control. Comparing the results of these two assessments may improve understanding of balance performance in healthy young adults and determine whether static and dynamic balance demonstrate similar or different characteristics.

The findings of this study may provide normative information for healthy young adults and assist physiotherapists, sports clinicians, and researchers in selecting appropriate balance assessment tools. Furthermore, the results may contribute to the development of effective balance training, injury prevention strategies, and rehabilitation programs aimed at improving postural control and functional performance.

HYPOTHESIS

NULL HYPOTHESIS:

There is no significant relationship between static balance measured by the Single Leg Stance Test and dynamic balance measured by the Y Balance Test in healthy young adults

ALTERNATE HYPOTHESIS:
There is a significant relationship between static balance measured using the Single Leg Stance Test and dynamic balance measured using the Y Balance Test in healthy young adults.

OBJECTIVES
1. To assess static balance in healthy young adults using the Single Leg Stance Test.
2. To assess dynamic balance in healthy young adults using the Y Balance Test.
3. To correlate static and dynamic balance in healthy young adults.

MATERIALS & METHODS

A total of 40 healthy young adults voluntarily participated in the present cross-sectional study, comprising 21 males (52.5%) and 19 females (47.5%). The participants had a mean age of 20.6 ± 1.97 years, a mean height of 1.65 ± 0.09 m, and a mean body weight of 60.3 ± 14.7 kg. The mean Body Mass Index (BMI) of the participants was 22.1 ± 4.44 kg/m², indicating that the study population primarily consisted of individuals with a normal body mass index.
Participants were recruited from physiotherapy colleges and the surrounding community using a convenience sampling method. Before participation, the purpose, procedures, potential risks, and benefits of the study were explained to each participant. Written informed consent was obtained from all participants before data collection.

- Study Design: Cross-Sectional study
- Study Population: Young adults
- Study setting: Shree M. M. Shah Physiotherapy College
- Study duration: 3 months

Inclusion Criteria[14]:
- Healthy young adults aged 18–30 years.
- Both male and female participants.
- Willing to participate voluntarily and provide written informed consent.
- Training at least 3 days per week
- Absence of acute injuries.
- Able to understand and follow verbal instructions.

Exclusion Criteria[14]:
- Previous experience with functional training with unstable platforms or sports that develop balance and proprioceptive skills
- Neuromuscular diseases, vestibular disorders, cerebral concussions, chronic lower limb injuries or any pathology or health problem that affects balance and postural control

OUTCOME MEASURE COLLECTION:
1. Limb length (ASIS to medial malleolus)
2. Single limb stance test
3. Romberg Test
4. Tandem Stance Test
5. Y balance test

LIMB LENGTH
The participant was positioned in a supine position on a firm, flat surface with both lower limbs extended and relaxed. The pelvis was maintained in a neutral position. Using a flexible measuring tape, the distance from the anterior superior iliac spine (ASIS) to the distal tip of the medial malleolus was measured along the medial aspect of the lower limb, with the knee fully extended. The measurement was taken separately for the right and left lower limbs and recorded in centimetres[14].

SINGLE LIMB STANCE TEST
The test was performed on a firm, level surface with the participant standing barefoot. The participant was instructed to stand upright on the limb being tested while lifting the opposite foot from the floor. The non-stance knee was flexed so that the foot remained clear of the floor. The participant was instructed to maintain the position without touching the raised foot to the floor or the supporting limb. The test was performed separately for the right and left lower limbs.

The test was performed under two visual conditions: eyes open and eyes closed. During the eyes-open condition, the participant maintained visual fixation on a fixed point. During the eyes-closed condition, the participant closed the eyes after assuming the single-limb stance position. The examiner used a stopwatch to record the duration for which the participant maintained the required position. Timing began when the non-supporting foot left the floor and ended when balance was lost or the maximum permitted test duration was reached[15].

Figure 2: Single leg stance test

ROMBERG TEST

The participant was instructed to remove footwear and stand upright on a firm, level surface with the feet placed together. The arms were positioned comfortably by the sides/crossed in front of the chest, according to the standardized protocol. The participant was instructed to maintain an upright and stable standing position without moving the feet.

The test was performed under two conditions: eyes open and eyes closed. Initially, the participant stood with the eyes open and maintained the position for a maximum of 30 seconds. Subsequently, the participant was instructed to close the eyes while maintaining the same position for another 30 seconds. The examiner stood close to the participant throughout the test to ensure safety and observed any excessive body sway, stepping, opening of the eyes, or loss of balance. A 30-second maximum duration is commonly used for the clinical Romberg test. The stopwatch was started when the participant achieved the required standing position and was stopped when the participant lost the required position or when the maximum duration of 30 seconds was reached. Loss of balance was considered when the participant moved the feet, required external support, or demonstrated an inability to maintain the prescribed position. The duration for which the participant successfully maintained the position was recorded in seconds[16].

TANDEM STANCE TEST

The participant stood barefoot on a firm, level surface with the feet positioned in a heel-to-toe tandem stance, with the heel of the anterior foot touching the toes of the posterior foot. The participant was instructed to maintain an upright posture without moving the feet or requiring external support. The test was performed separately with the right leg forward and the left leg forward.

For the right-leg-forward condition, the participant placed the right foot in front of the left foot, with the right heel touching the toes of the left foot. For the left-leg-forward condition, the left foot was positioned in front of the right foot in the same heel-to-toe position. The arms were maintained in the standardized position throughout the test. The examiner remained close to the participant to ensure safety.

Timing was initiated once the participant achieved a stable tandem position and was able to maintain the required posture. The stopwatch was stopped when the participant moved either foot, lost the tandem position, required external support, or reached the maximum test duration of 30 seconds. The time maintained in the tandem position was recorded in seconds[17].

Figure 3: Tandem stance test

Y BALANCE TEST

The test was performed using a Y-shaped testing apparatus consisting of three reach directions: anterior (ANT), posteromedial (PM), and posterolateral (PL). The participant stood barefoot on the central platform with the tested limb supporting the body while the contralateral limb was used to reach in the designated direction. The participant was instructed to maintain balance on the stance limb while reaching as far as possible with the non-stance limb and gently pushing the reach indicator in the specified direction.

Before testing, the procedure was explained and demonstrated to the participant. Participants were provided with practice trials to familiarize themselves with the test procedure. During the assessment, the participant maintained the stance foot in contact with the central platform and was instructed to keep the heel of the stance limb in contact with the platform while reaching. The participant returned to the starting position in a controlled manner after each reach.

The participant performed reaches in the anterior, posteromedial, and posterolateral directions. The test was performed separately for the right and left lower limbs. The maximum reach distance in each direction was recorded in centimeters. The YBT protocol commonly uses repeated trials, with maximal reach in each direction used for analysis[14].

Figure 4: Y balance test

FLOW CHART

Participants Assessed (n = 44)

Screening According to Inclusion and Exclusion Criteria

Eligible Participants Selected (n = 40)

Assessment and Informed Consent Obtained

Collection of Demographic Information (Age, Gender, Height, Weight, BMI, Hand Dominance, Physical Activity Level)

Measurement of Limb length

Static balance tests:

- Single leg stance test
- Romberg test
- Tandem Stance Test

Dynamic balance tests:

- Y balance test

Data Entry into Microsoft Excel

RESULT

Table 1. Demographic Characteristics of Participants

VARIABLE	MEAN ± SD
Age (years)	20.6 ± 1.97
Weight (kg)	60.3 ± 14.7
Height (m)	1.65 ± 0.09
BMI (kg/m²)	22.1 ± 4.44
Right side limb length	93.3 ± 5.86
Left side limb length	93.3 ± 5.86

Table 1 represents the demographic and anthropometric characteristics of the study participants. The mean age of the participants was 20.6 ± 1.97 years, indicating that the study population consisted of healthy young adults with a relatively narrow age range.

The participants had a mean body weight of 60.3 ± 14.7 kg and a mean height of 1.65 ± 0.09 m. The average Body Mass Index (BMI) was 22.1 ± 4.44 kg/m², which falls within the normal BMI range according to the World Health Organization classification. The mean limb length was 93.3 ± 5.86 cm for both the right and left lower limbs, indicating no appreciable difference in limb length between the two sides in the study population. These anthropometric measurements were used for the normalization of Y Balance Test reach distances.

Table 2. Gender Distribution

GENDER	FREQUENCY	PERCENTAGE
Male	21	52.5%
Female	19	47.5%

Table 2 represents the gender distribution of the study participants. A total of 40 healthy young adults participated in the study, of whom 21 (52.5%) were males and 19 (47.5%) were females. The distribution indicates that both genders were almost equally represented, with a slightly higher proportion of male participants.

Table 3. Static balance tests

Variable	Mean ± SD
Right side Single limb stance test eye open	28.4 ± 4.76
Left side Single limb stance test eye open	28.4 ± 4.44
Right side Single limb stance test eye close	14.3 ± 9.04
Left side Single limb stance test eye close	14.9 ± 8.73
Romberg test wide base of support eye open	29.5 ± 3.00
Romberg test wide base of support eye close	30 ± 0
Romberg test narrow base of support eye open	30 ± 0
Romberg test narrow base of support eye close	30 ± 0
Tandem test right leg front side	29.1 ± 3.34
Tandem test left leg front side	29.5 ± 2.67

Table 3 represents the mean and standard deviation of the static balance test scores obtained from the study participants. The mean duration of the Single Limb Stance Test (SLST) with eyes open was 28.4 ± 4.76 seconds on the right side and 28.4 ± 4.44 seconds on the left side, indicating comparable static balance performance between both lower limbs under eyes-open conditions. When the test was performed with eyes closed, the mean duration decreased to 14.3 ± 9.04 seconds on the right side and 14.9 ± 8.73 seconds on the left side. This reduction suggests that removal of visual input reduced participants' ability to maintain single-leg balance.

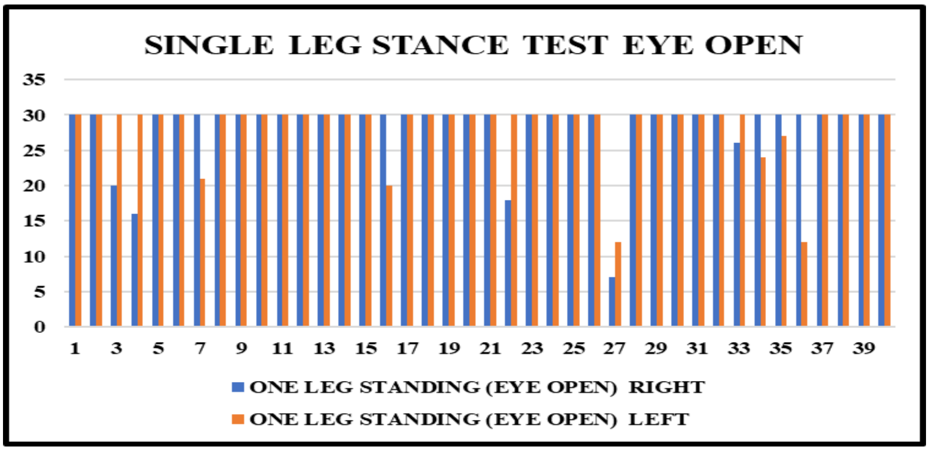
For the Romberg Test, the mean score for the wide base of support with eyes open was

29.5 ± 3.00 seconds, indicating that most participants were able to maintain the position close to the maximum test duration. In the wide base of support with eyes closed, all participants maintained the position for the full 30 seconds (30.0 ± 0.0 seconds). Similarly, during the Romberg Test with a narrow base of support, all participants achieved the maximum score of 30.0 ± 0.0 seconds, indicating excellent static balance under the test conditions.

The Tandem Standing Test (right foot forward) showed a mean duration of 29.1 ± 3.34 seconds, suggesting that most participants successfully maintained tandem standing for almost the full duration of the test. The Tandem Standing Test (left foot forward) showed a mean duration of 29.5 ± 2.67 seconds.

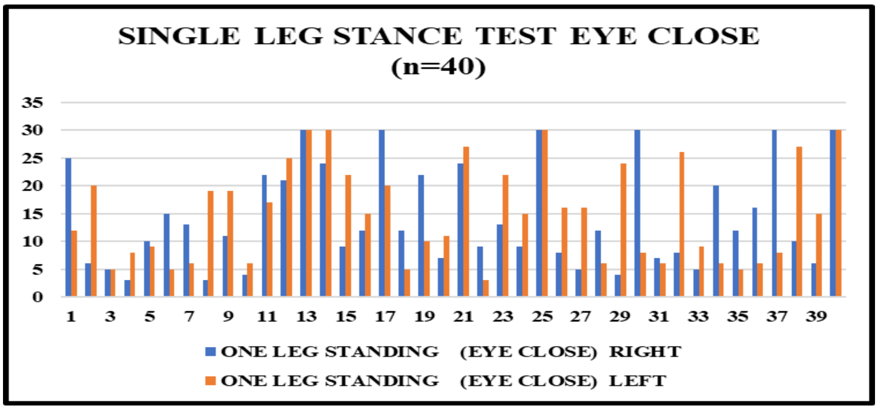
Overall, the findings indicate that healthy young adults demonstrated excellent static balance, particularly during the Romberg and Tandem Standing Tests, whereas performance on the Single Limb Stance Test declined under eyes-closed conditions.

Graph 1 illustrates the Single Leg Stance Test (eyes open) scores of all participants for the right and left lower limbs. Most participants maintained the single-leg stance for the maximum duration of 30 seconds on both sides. A small number of participants demonstrated shorter stance times, indicating individual variability in static balance performance. Overall, the right and left lower limbs showed similar performance.



GRAPH 1: Graphical Representation of Single Leg Stance Test with Eye Open

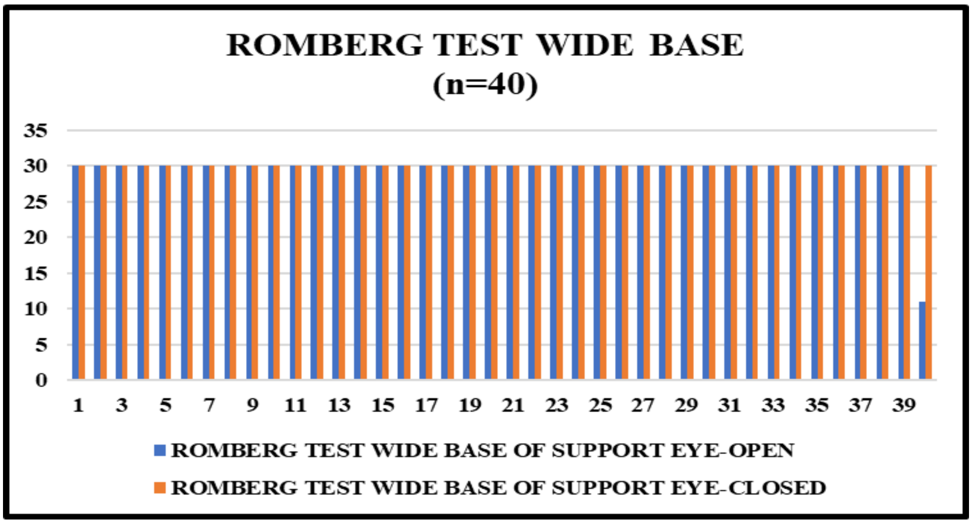
Graph 2 shows the Single Leg Stance Test (eyes closed) scores of all 40 participants. Balance performance varied widely, with stance times ranging from 3 to 30 seconds. Compared with the eyes-open condition, participants-maintained balance for shorter durations under eyes-closed conditions, indicating the importance of visual input in maintaining static balance.



GRAPH 2: Graphical Representation of Single Leg Stance Test with Eye Close

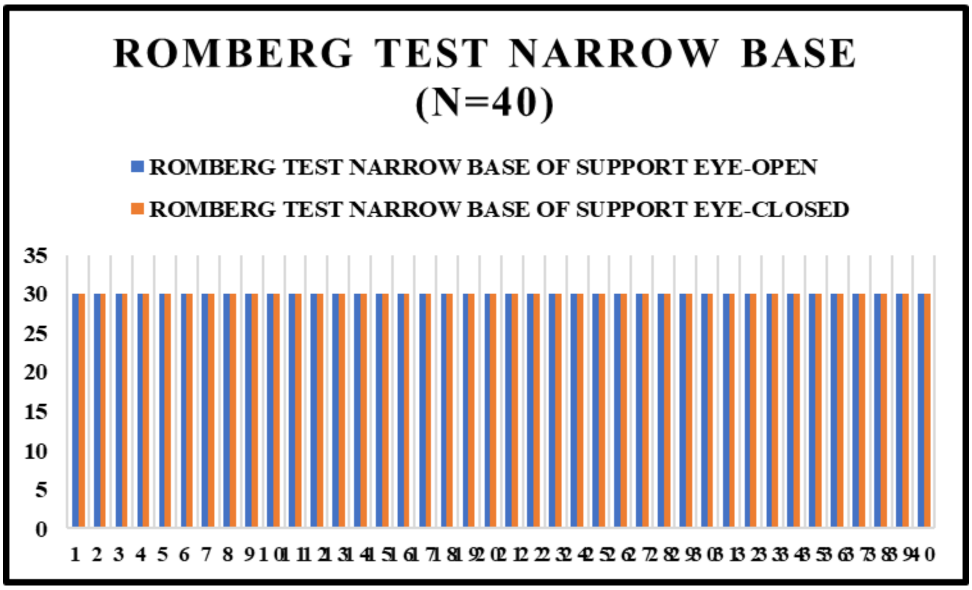
Graph 3 presents the performance of the participants on the Romberg Test with a wide base of support under eyes-open and eyes-closed conditions (n = 40). Almost all participants maintained the Romberg position for the maximum test duration of 30 seconds in both conditions. During the eyes-open condition, 39 participants maintained the position for the full 30 seconds, while one participant maintained the position for 11 seconds, resulting in a mean score of 29.5 ± 3.00 seconds. During the eyes-closed condition, all 40 participants successfully maintained the Romberg position for the maximum duration of 30 seconds, resulting in a mean score of 30.0 ± 0.0 seconds.

These findings indicate that the participants demonstrated excellent static balance during the Romberg Test with a wide base of support. The absence of variability in the eyes-closed condition suggests that the task was not sufficiently challenging for healthy young adults, leading to a ceiling effect.



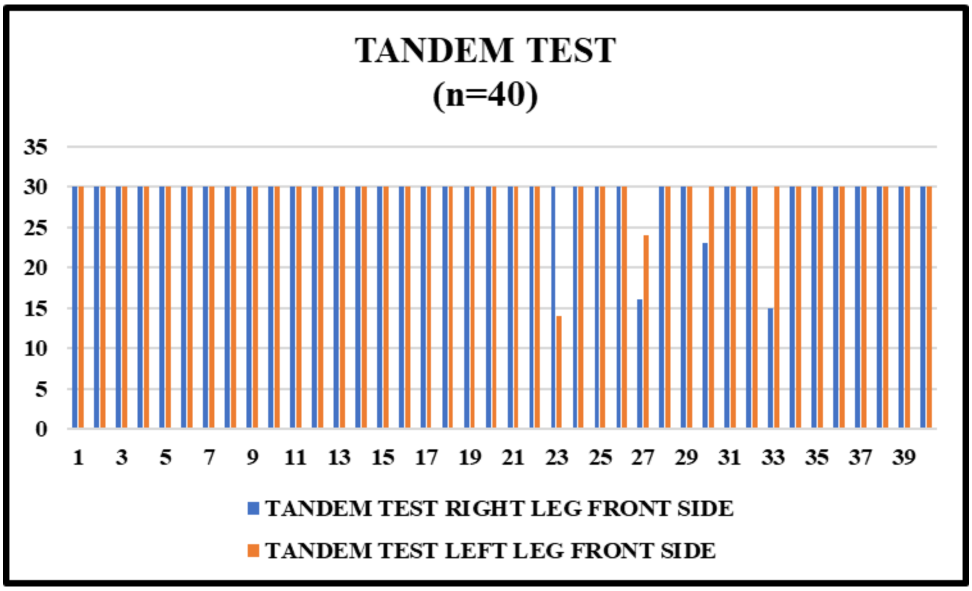
GRAPH 3: Graphical Representation of Romberg test with Wide Base of Support

Graph 4 shows the Romberg Test (narrow base of support) performance under eyes-open and eyes-closed conditions. All participants maintained the test position for the full 30 seconds in both conditions, resulting in identical scores. This indicates excellent static balance but also demonstrates a complete ceiling effect.



GRAPH 4: Graphical Representation of Romberg test with Narrow Base of Support

Graph 5 shows the Tandem Standing Test scores for all participants with the right and left leg positioned anteriorly. Most participants maintained the tandem stance for the maximum duration of 30 seconds, while only a few participants demonstrated shorter balance times. The findings indicate good static balance with minimal differences between the two testing positions.



GRAPH 5: Graphical Representation of Tandem test

Table 3. Dynamic balance tests

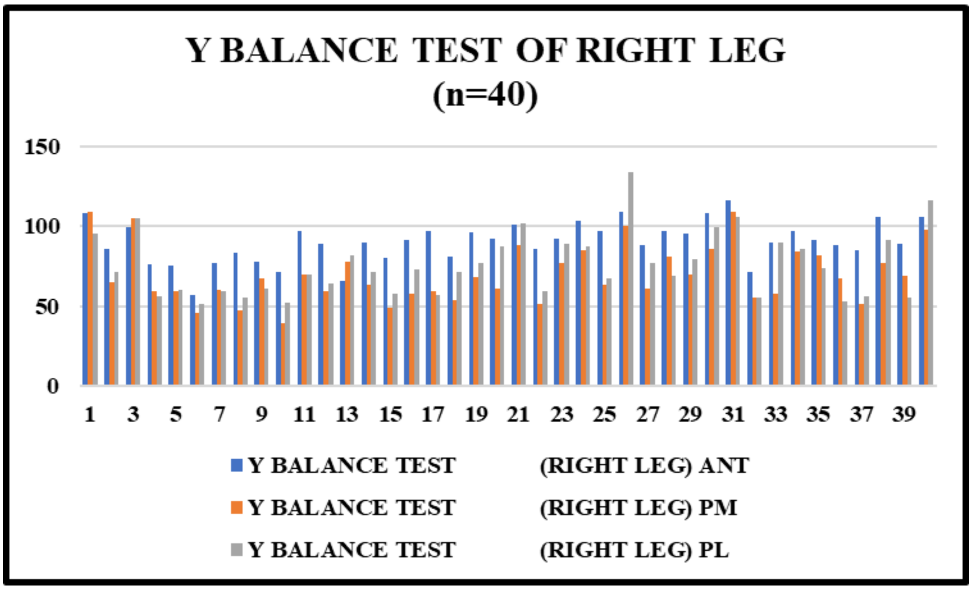
Variable	Mean ± SD
Y balance test right side ANT	90.1 ± 12.7
Y balance test right side PM	69.6 ± 17.7
Y balance test right side PL	75.4 ± 19.7
Y balance test left side ANT	93.6 ± 14.1
Y balance test left side PM	72.5 ± 19.5
Y balance test left side PL	80.1 ± 20.3
Composite score of right side	83.3 ± 13.3
Composite score of left side	87.4 ± 14.1

Table 4 presents the descriptive statistics of the Y Balance Test (YBT) scores for the right and left lower limbs in the anterior (ANT), posteromedial (PM), and posterolateral (PL) reach directions, along with the composite scores.

The mean anterior reach distance was 90.1 ± 12.7 cm for the right lower limb and 93.6 ± 14.1 cm for the left lower limb. The posteromedial reach distance averaged 69.6 ± 17.7 cm on the right side and 72.5 ± 19.5 cm on the left side. The mean posterolateral reach distance was 75.4 ± 19.7 cm for the right side and 80.1 ± 20.3 cm for the left side.

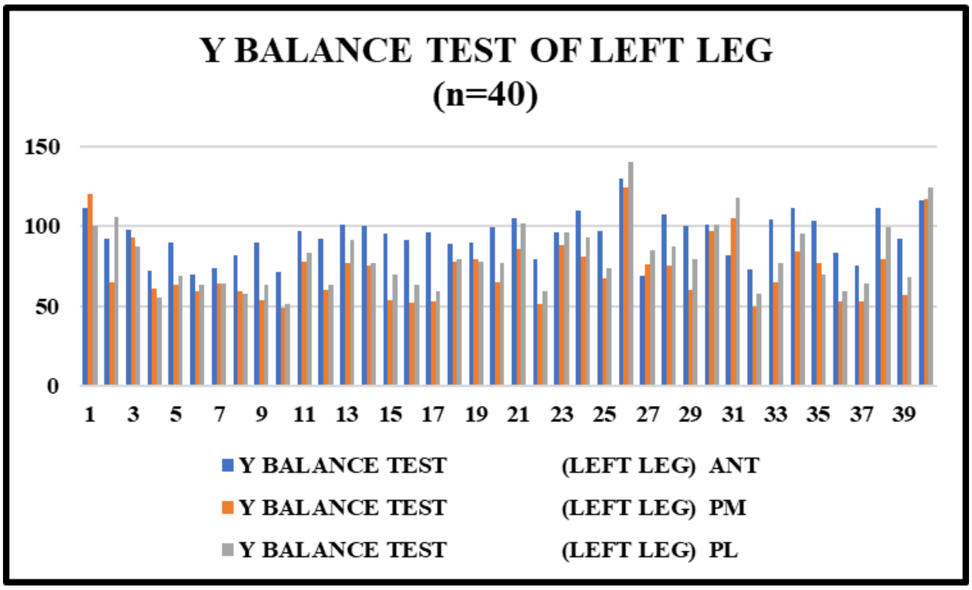
The mean composite score was 83.3 ± 13.3% for the right lower limb and 87.4 ± 14.1% for the left lower limb. Overall, the left lower limb demonstrated slightly higher reach distances and composite scores than the right lower limb across all reach directions.

Graph 6 presents the Y Balance Test performance of the right lower limb in the anterior, posteromedial, and posterolateral directions. The anterior direction demonstrated the highest mean reach distance (90.1 ± 12.7 cm), followed by the posterolateral (75.4 ± 19.7 cm) and posteromedial (69.6 ± 17.7 cm) directions. Considerable inter-individual variation in reach distances was observed across all three directions.



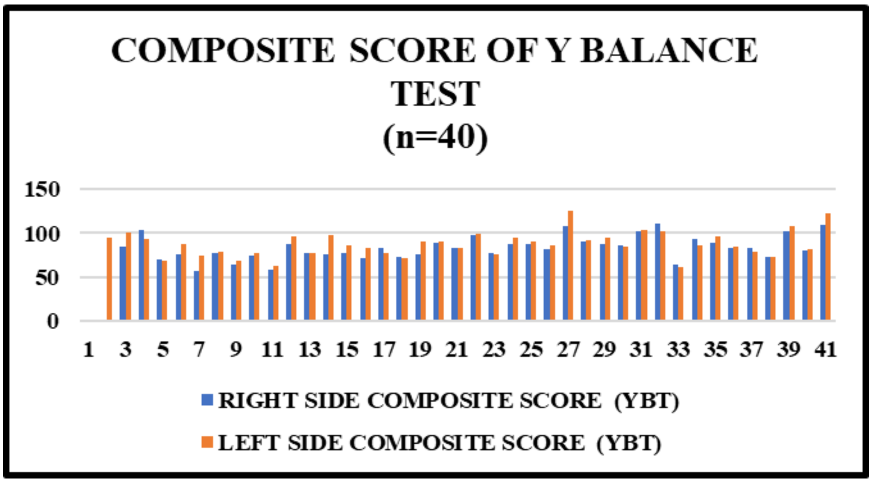
GRAPH 6: Graphical Representation of Y Balance test of Right Leg

Graph 7 presents the Y Balance Test scores of the left lower limb in the anterior, posteromedial, and posterolateral directions. The anterior reach direction showed the highest mean reach distance (93.6 ± 14.1 cm), followed by the posterolateral (80.1 ± 20.3 cm) and posteromedial (72.5 ± 19.5 cm) directions. Individual variations in reach distances were observed across all three directions.



GRAPH 7: Graphical Representation of Y Balance test of Left Leg

Graph 8 presents the composite scores of the Y Balance Test for the right and left lower limbs. The left lower limb demonstrated a slightly higher mean composite score (87.4 ± 14.1%) compared with the right lower limb (83.3 ± 13.3%). Although individual variability was observed, the overall dynamic balance performance was good in the study population.



GRAPH 8: Graphical Representation of Composite Score of Y Balance test

Table 4: Shapiro wilk test (n = 40)

Descriptives	Right Side Composite Score (YBT)	Left Side Composite Score (YBT)
Mean	83.8	87.4
Std. error mean	2.13	2.23
Standard deviation	13.5	14.1
Minimum	56.7	61.2
Maximum	111	125
Shapiro-Wilk W	0.975	0.971
Shapiro-Wilk p	.520	.390

Table 4 presents the descriptive statistics and results of the Shapiro–Wilk normality test for the right and left Y Balance Test (YBT) composite scores among the study participants (n = 40).

The mean composite score of the right lower limb was 83.8 ± 13.5%, with scores ranging from 56.7% to 111%. The left lower limb demonstrated a slightly higher mean composite score of 87.4 ± 14.1%, with values ranging from 61.2% to 125%.

The Shapiro–Wilk test was used to assess the normality of the composite score distributions. For the right composite score, the Shapiro–Wilk statistic was W = 0.975 with a p-value of 0.520. For the left composite score, the Shapiro–Wilk statistic was W = 0.971 with a p-value of 0.390.

Since the p-values for both variables were greater than 0.05, the null hypothesis of the Shapiro–Wilk test was not rejected, indicating that the composite score data were approximately normally distributed. Therefore, the assumption of normality was satisfied, and Pearson's correlation coefficient was considered appropriate for examining the relationship between static balance and dynamic balance.

Table 5: Pearson Correlation with Y Balance Test (n = 40)

Static Balance Test	Compared With	Pearson's r	p-value	Interpretation
One Leg Standing (Eyes Open) – Right	Right YBT Composite	-0.036	0.825	No significant correlation
One Leg Standing (Eyes Open) – Left	Left YBT Composite	0.092	0.574	No significant correlation
One Leg Standing (Eyes Closed) – Right	Right YBT Composite	0.136	0.403	Weak positive, not significant
One Leg Standing (Eyes Closed) – Left	Left YBT Composite	0.210	0.194	Weak positive, not significant
Tandem Test (Right Leg Front)	Right YBT Composite	-0.203	0.209	No significant correlation
Tandem Test (Left Leg Front)	Left YBT Composite	-0.100	0.539	No significant correlation

Table 5 presents the Pearson correlation coefficients between the static balance tests and the Y Balance Test (YBT) composite scores among the study participants (n = 40). The Single Leg Standing Test (Eyes Open) demonstrated no statistically significant correlation with the YBT composite scores on either side. The correlation between the right eye-open Single Leg Standing Test and the right YBT composite score was very weak and negative ($r = -0.036$, $p = 0.825$). Similarly, the left eye-open Single Leg Standing Test showed a very weak positive correlation with the left YBT composite score ($r = 0.092$, $p = 0.574$). Both correlations were not statistically significant ($p > 0.05$).

The Single Leg Standing Test (Eyes Closed) demonstrated weak positive correlations with the YBT composite scores. The right eye-closed Single Leg Standing Test showed a weak positive correlation with the right YBT composite score ($r = 0.136$, $p = 0.403$), while the left eye-closed Single Leg Standing Test showed a slightly stronger weak positive correlation with the left YBT composite score ($r = 0.210$, $p = 0.194$). However, neither correlation reached statistical significance ($p > 0.05$).

The Tandem Standing Test also demonstrated no statistically significant relationship with dynamic balance. The right leg forward position showed a weak negative correlation with the right YBT composite score ($r = -0.203$, $p = 0.209$), whereas the left leg forward position showed a very weak negative correlation with the left YBT composite score ($r = -0.100$, $p = 0.539$). Both findings were not statistically significant.

DISCUSSION

The present study investigated the relationship between static and dynamic balance in healthy young adults using the Single Leg Stance Test (SLST), Romberg Test, Tandem Standing Test, and Y Balance Test (YBT). The findings demonstrated that participants exhibited good static and dynamic balance performance. Although weak positive correlations were observed between the eyes-closed SLST and YBT composite scores, none of the static balance tests showed a statistically significant correlation with dynamic balance. The YBT composite scores were normally distributed, supporting the use of Pearson's correlation analysis.

The participants represented healthy young adults with a mean age of 20.6 years and a normal mean BMI of 22.1 kg/m². The study included both male and female participants in nearly equal proportions, providing a balanced sample for evaluating static and dynamic balance.

The participants maintained excellent balance during the eyes-open Single Leg Stance Test, whereas balance time decreased considerably under the eyes-closed condition. This finding highlights the important role of visual input in maintaining postural stability. When vision is removed, greater dependence is placed on vestibular and somatosensory inputs to maintain balance.

The anterior reach direction demonstrated the greatest reach distance, whereas the posteromedial direction showed the lowest reach distance. These findings agree with previous studies, which reported that the posteromedial reach requires greater neuromuscular control and hip stability.

The present study found no statistically significant relationship between static balance and dynamic balance. Although both assessments evaluate postural control, they represent different functional abilities. Static balance assesses the ability to maintain a stable posture with minimal movement, whereas dynamic balance requires continuous adjustments of the center of mass during movement.

Similar findings were reported by Gribble et al., who suggested that static and dynamic balance represent different components of postural control[14]. In contrast, Plisky et al. reported a modest association between balance measures in athletic populations. These differences may be explained by variations in participant characteristics, testing methods, and physical activity levels[14].

Hrysomallis (2007), suggested that static and dynamic balance involve different neuromuscular mechanisms and therefore may not demonstrate a strong relationship[18].

According to Paillard and Noé (2015), postural control should be evaluated under different testing conditions because static and dynamic tasks challenge the sensory, motor, and central nervous systems in different ways. Therefore, good performance in a static balance test does not necessarily indicate superior performance during dynamic balance tasks[19].

Although the participants demonstrated good performance on the Single Leg Stance Test, this did not translate into a significant correlation with Y Balance Test composite scores. While Springer et al. (2007) established the SLST as a reliable measure of static balance, the present findings suggest that static balance performance alone may not predict dynamic balance performance in healthy young adults, indicating that these assessments evaluate different aspects of postural control[20].

In summary, the present study demonstrated that healthy young adults exhibited good static and dynamic balance performance. Although the participants maintained excellent balance during the Single Leg Stance Test under eyes-open conditions and achieved satisfactory Y Balance Test composite scores, no statistically significant correlation was observed between static and dynamic balance measures. These findings suggest that static and dynamic balance represent distinct components of postural control and should be assessed independently in clinical practice. The results contribute to the growing body of evidence supporting the use of multiple balance assessment tools to obtain a comprehensive evaluation of postural stability in healthy young adults.

CONCLUSION

The present study investigated the correlation between static and dynamic balance in healthy young adults using the Single Leg Stance Test, Romberg Test, Tandem Standing Test, and Y Balance Test. The findings demonstrated that participants exhibited good static and dynamic balance performance. However, Pearson's correlation analysis revealed no statistically significant relationship between static balance and dynamic balance. These results indicate that static and dynamic balance represent different aspects of postural control and should be assessed independently.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: We acknowledge the support of our parent institute Shree M. M. Shah Physiotherapy College, Mahemdavad for providing technical support and various sports academies around Ahmedabad and Mahemdavad, Gujarat, India for providing contact details of participants. We heartfully thank all the study participants for sparing their valuable time for this study.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Rizzato A, Paoli A, Andretta M, Vidorin F, Marcolin G. Are Static and Dynamic Postural Balance Assessments Two Sides of the Same Coin? A Cross-Sectional Study in the Older Adults. Front Physiol. 2021 Jun 29; 12:681370. doi: 10.3389/fphys.2021.681370. PMID: 34267673; PMCID: PMC8277194.
2. Guzmán-Muñoz E, Montalva-Valenzuela F, Garcia-Carrillo E, Castillo-Paredes A, López-Gil JF, Narrea Vargas JJ, Yáñez-Sepúlveda R, Concha-Cisternas Y. Postural Balance and Human Movement: An Integrative Framework for Mechanisms, Assessment, and Functional Implications. J Clin Med. 2026 Mar 28;15(7):2588. doi: 10.3390/jcm15072588. PMID: 41976890; PMCID: PMC13072877.
3. Haddad JM, Rietdyk S, Claxton LJ, Huber JE. Task-dependent postural control throughout the

lifespan. Exerc Sport Sci Rev. 2013 Apr;41(2): 123-32. doi: 10.1097/JES.0b013e3182877cc8. PMID: 23364347; PMCID: PMC3608710.

4. Ghai S, Ghai I, Effenberg AO. Effects of dual tasks and dual-task training on postural stability: a systematic review and meta-analysis. Clin Interv Aging. 2017 Mar 23; 12:557-577. doi: 10.2147/CIA.S125201. PMID: 28356727; PMCID: PMC5367902.
5. Zech A, Hübscher M, Vogt L, Banzer W, Hänsel F, Pfeifer K. Balance training for neuromuscular control and performance enhancement: a systematic review. J Athl Train. 2010 Jul-Aug;45(4):392-403. doi: 10.4085/1062-6050-45.4.392. PMID: 20617915; PMCID: PMC2902034.
6. Onofrei RR, Amaricai E. Postural Balance in Relation with Vision and Physical Activity in Healthy Young Adults. Int J Environ Res Public Health. 2022 Apr 20;19(9):5021. doi: 10.3390/ijerph19095021. PMID: 35564412; PMCID: PMC9105214.
7. Lesch KJ, Tuomisto S, Tikkanen HO, Venojärvi M. Validity and Reliability of Dynamic and Functional Balance Tests in People Aged 19-54: A Systematic Review. Int J Sports Phys Ther. 2024 Apr 1;19(4):381-393. doi: 10.26603/001c.94612. PMID: 38699672; PMCID: PMC11065456.
8. Pollock, A.S.; Durward, B.R.; Rowe, P.J.; Paul, J.P. (2000). What is balance? Clinical Rehabilitation, 14(4), 402–406. doi:10.1191/0269215500cr342oa
9. Kiss R, Schedler S and Muehlbauer T (2018) Associations Between Types of Balance Performance in Healthy Individuals Across the Lifespan: A Systematic Review and Meta-Analysis. Front. Physiol. 9:1366. doi: 10.3389/fphys.2018.01366
10. Siragy T, Nantel J. Quantifying Dynamic Balance in Young, Elderly and Parkinson's Individuals: A Systematic Review. Front Aging Neurosci. 2018 Nov 22; 10:387. doi: 10.3389/fnagi.2018.00387. PMID: 30524270; PMCID: PMC6262057.
11. Baker N, Gough C, Gordon SJ. Inertial Sensor Reliability and Validity for Static and Dynamic Balance in Healthy Adults: A Systematic Review. 2021; 21(15):5167. 10.3390/s21155167
12. Xiao, F., Su, E.L., Zulkapri, I. et al. A review and evaluation of balance training methods for young adults: mechanisms, applications, and effects. Sport Sci Health 22, 133 (2026). 10.1007/s11332-025-01633-1
13. Plisky P, Schwartkopf-Phifer K, Huebner B, Garner MB, Bullock G. Systematic Review and Meta-Analysis of the Y-Balance Test Lower Quarter: Reliability, Discriminant Validity, and Predictive Validity. Int J Sports Phys Ther. 2021 Oct 1;16(5):1190-1209. doi: 10.26603/001c.27634. PMID: 34631241; PMCID: PMC8486397.
14. Plisky PJ, Rauh MJ, Kaminski TW, Underwood FB. Star Excursion Balance Test as a predictor of lower extremity injury in high school basketball players. J Orthop Sports Phys Ther. 2006 Dec;36(12):911-9. doi: 10.2519/jospt.2006.2244. PMID: 17193868.
15. Springer BA, Marin R, Cyhan T, Roberts H, Gill NW. Normative values for the unipedal stance test with eyes open and closed. J Geriatr Phys Ther. 2007;30(1):8-15. doi: 10.1519/00139143-200704000-00003. PMID: 19839175.
16. Mancini M, Horak FB. The relevance of clinical balance assessment tools to differentiate balance deficits. Eur J Phys Rehabil Med. 2010 Jun;46(2):239-48. PMID: 20485226; PMCID: PMC3033730.
17. Schedler S, Kiss R, Muehlbauer T. Age and sex differences in human balance performance from 6-18 years of age: A systematic review and meta-analysis. PLoS One. 2019 Apr 9;14(4): e0214434. doi: 10.1371/journal.pone.0214434. PMID: 30964877; PMCID: PMC6456289.
18. Hrysomallis C. Relationship between balance ability, training and sports injury risk. Sports Med. 2007;37(6):547-56. doi: 10.2165/00007256-200737060-00007. PMID:17503879
19. Paillard T, Noé F. Techniques and Methods for Testing the Postural Function in Healthy and Pathological Subjects. Biomed Res Int. 2015; 2015:891390. doi: 10.1155/2015/891390. Epub 2015 Nov 12. PMID: 26640800; PMCID: PMC4659957.
20. Springer BA, Marin R, Cyhan T, Roberts H, Gill NW. Normative values for the unipedal stance test with eyes open and closed. J Geriatr Phys Ther. 2007;30(1):8-15. doi: 10.1519/00139143-200704000-00003. PMID: 19839175.

How to cite this article: Nidhi Panchal, Aanal Brahmbhatt. Correlation between static and dynamic balance in healthy young adults. *International Journal of Research and Review*. 2026; 13(9): 305-320. DOI: *https://doi.org/10.52403/ijrr.20260930*

******