

# NORMATIVE VALUES FOR THE ROMBERG TEST IN HEALTHY YOUNG POPULATION IN PUNE

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## ABSTRACT:

Balance impairments are very common finding among patients experiencing disease or trauma. Romberg is often included in the suite of tests used to assess balance in ataxia caused due to abnormal proprioception in many neurological conditions. Romberg test assesses static standing balance. A positive Romberg test suggests that the ataxia is sensory in nature that is fully depending on loss of sense (proprioception). The Romberg test is a test of the body's sensation of positioning (proprioception), which need healthy functioning of the dorsal columns of the spinal cord. It is used as an indicator for neurological decompression sickness. Romberg test is used to assess ataxia caused due to abnormal proprioception in many neurological conditions but literature still lacks the norms through which the decision could be reached, hence there is a need to establish the normative values for the same. The aim of our study is to generate and establish normative values for the Romberg test standing balance on firm surface in healthy young population of the age group 18 to 35 years.

**KEYWORDS:** Balance, Romberg Test, Dynamic Balance, Static Balance.

## INTRODUCTION

Injury or falls in many populations is associated with Poor balance or Postural Control, and consequently is been considered as a critical component of common motor skill. (1, 2, 3) Balance is generally defined as the ability to maintain body's center of gravity within its base of support and can be categorized as Static and Dynamic balance. Static Balance can be defined as the ability to sustain the body in static equilibrium or within its base of support. (4, 5) Dynamic Balance is believed to be more challenging because it requires the ability to maintain the equilibrium during a transition

from a dynamic to static state. (6) Both static and dynamic balance requires integration of Visual, Vestibular and Proprioceptive inputs to produce an efferent response to control the body within its base of support. An interruption or deficit in any part of the sensorimotor system can result in loss of balance which can result in an injury. (7, 8)

Balance Impairment is widely held to be contributing factor in many falls. Several observational studies have found significant association between impaired balance and falls. Standing balance impairment is widely held to be a contributing factor to falls, is a component falls risk screening tools, and how motivated the development of balance-retraining programs for the reduction of falls. (9)

The clinical and research applications of balance assessment are endless. Several methods of balance assessment have been proposed for clinical use. Assessment of balance is considered as one ingredient in the decision-making process, especially in the cases of head injury and lower extremity musculoskeletal injury. Also, assessment of balance and postural control was traditionally being focused on the geriatric population from the start rather than the normal healthy individuals. Many of the balance assessment techniques provide quantitative and qualitative measures. The Balance assessment can be done via subjective methods and objective methods. In subjective method, while checking static balance-Rhomberg test is traditionally been used. The Romberg test for measuring static aspects of balance is used in variety of settings. For this test, the subject stands with feet together, arms at the side, and eyes close. In normal cases, a person can stand motionless in this position, but a tendency to sway or fall to one side is considered to indicate a loss of proprioception. (10) Rhomberg test is considered as a qualitative assessment of static balance, because a considerable amount of stress is required to make the subject sway enough for an observer to characterize the sway. A positive Romberg test is indicative of a loss of proprioception that can occur with posterior column lesion in the spinal cord. (e.g cervical spondylosis, tumor, degenerative spinal cord disease, tabes dorsalis) and peripheral neuropathy. If unsteadiness occurs in standing with eyes open (e.g the patient with cerebellar ataxia or vestibular dysfunction) the Romberg test is not appropriate. The tandem rhomberg test requires placement of one foot in front of the other (heel to toe). (11) Balance is influenced by a host of factors. Many of these factors are relevant to individual performance and should be considered in clinical decision making. Various system evaluations should be done.

Researchers have studied many of the balance parameters in an attempt to establish normative data for western countries. It is important for the clinicians to understand and use the normative data in setting baseline for their patients and also for future research.

Romberg test is used to assess ataxia caused due to abnormal proprioception in many neurological conditions but literature still lacks the norms through which the decision could be reached, hence there

is a need to establish the normative values for the same. The aim of our study is to generate and establish normative values for the Romberg test standing balance on firm surface in healthy young population of the age group 18 to 35 years.

## **MATERIALS AND METHODS**

**Study Design:** Analytical study

**Sampling Technique:** Convenient sampling

**Target study sample:** Young adults 18 to 35 years of age

**Sample size:** 400

## **INCLUSION CRITERIA**

Age: 18 to 35 years

Both male and female

## **EXCLUSION CRITERIA**

1. Having vestibular condition.
2. Neurological condition affecting balance.
3. Impaired sensations in foot.
4. Systemic Illness
5. Musculoskeletal injuries in lower limb.
6. Non-co-operative/ unwilling.

## **MATERIALS USED:**

Stopwatch, Record sheet, graph sheet, pen, pencil.

## PROCEDURE

Permissions were taken from concerned institutional from ethical committee, Department of Physiotherapy, Tilak Maharashtra Vidyapeeth, Pune. Different centers were approached and permission was obtained prior to the study. Then 400 subjects were selected on the basis of inclusion and exclusion criteria. The aim and study were explained to the patient and written consent. A pilot study was conducted and errors were resolved with approval of the guide. Subjects were asked to maintain the standing position blindfolded and were asked to report any discomfort. Romberg test time was measured using a stopwatch.



## STATISTICAL ANALYSIS

Normality of the data was tested and statistical analysis was done using SPSS v17. Charts and tables were made using excel and word. Various parametric and non-parametric tests were applied according to the normality test at  $p=0.05$ .

## RESULT

The average values of the demographic data in terms of Age (years), Height (m), Weight (kg), BMI ( $\text{kg}/\text{m}^2$ ) are as follows;  $24.7 \pm 3.9$  years,  $1.6 \pm 0.2$  m,  $58.6 \pm 12.1$  kg and  $22.2 \pm 4$  kg per m square (Table 1). The population comprised of 46 percent females and 54 percent males and 14 percent were left hand dominant and 86 percent were right hand dominant. We in our study found out that the average times in minutes for the Romberg test in healthy normal individual of age 18 to 35 years range is  $9.8 \pm 4.9$  min giving us the range of 4.9-14.7 minutes. Also it is seen that the Romberg test is poorly and negatively correlated to the Base of Support (-0.012) at  $p = 0.05$ . (Table 2)

AVERAGE $\pm$ SD	Age (years)	Height(m)	Weight(Kg)	BMI ( $\text{kg}/\text{m}^2$ )
	$24.7 \pm 3.9$	$1.6 \pm 0.2$	$58.6 \pm 12.1$	$22.2 \pm 4$

Table 1 Average values of the demographic data (n=400)

Table 2 Table showing mean values for Romberg test in seconds and base of support along with their correlation

AVERAGE $\pm$ SD			Pearson's correlation
		BOS ( $\text{cm}^2$ )	

	ROMBERG TEST (minutes)		
	9.8±4.9 (586.6±292.4 seconds)	702.7±62.1	-0.01253

## DISCUSSION

Romberg is often included in the suite of tests used to assess balance in ataxia caused due to abnormal proprioception in many neurological conditions. Romberg test assesses static standing balance. It was developed to screen for myelopathies and neuropathies with associated sensory dysfunction, yet has become used as a part of the suit of static balance tests. The Romberg test is a test of the body's sense of positioning (proprioception), which requires healthy functioning of the dorsal columns of the spinal cord. It is used as an indicator for neurological decompression sickness.

In our study the sample size was 400 in the age group 18-35 years and the average value was 24.7±3.9 years, average height was found to be 1.6±0.8 and average BMI was 22.2±4 kg/m sq. Study population comprised of 54% male and 46% female participants.

We also found out the Romberg test is moderately correlated to the BMI of the participants (-0.5161) and poorly and negatively correlated to Base of support suggesting the anthropometric values apart from the various balancing systems also affects the ability to balance the standing position in closed eyes and the time to do so decrease with increasing BMI. It is out of scope of our study to find out the exact proportions to which the anthropometric measures are going to affect the balance which we wish to continue in forthcoming studies. The major errors met in the beginning were that participants understanding to the test which were refined in the pilot studies and re performed with instructions kept common to everyone, "relax and stand" and "if any discomfort felt let us know". Many of the participants reported that they experienced anxiety to hold the position further and some found it

uneasy to stand with closed eyes. Mostly felt a sensation in the end durations of maintaining the position.(8)

One of the studies done in an age group above 40 years with modified Romberg test; the time to failure decreased with increasing age across all gender and race/ethnicity categories. It was also noted that once individuals went below a time to failure of 20 seconds, there was a significant greater than three-fold increase in the odds of falling. And there was a noted difference in the rates of change across demographic groups (6).

In another study by, Bos̃tjan Mlaker underwent a study “A novel tool for the assessment of dynamic balance in healthy individuals to evaluate the reliability of a newly developed dynamic balance measurement system that is portable and allows researchers and clinicians to adjust the difficulty of the balance task. The study also included a comparison of the evaluated test with two popular clinical balance tests, the Sharpened-Romberg test and the single limb stance test. He underwent a study of age group Thirty-six male athletes (mean (SD) training experience: 13.0 (2.8) years) were included in the intra-session reliability study. Group 2: Twenty physical education students (eight males and 12 females) were included in the inter-session reliability study he found out that The results of the Kolmogorov–Smirnov normality test suggest that the residuals of all three CBB scores were normally distributed ( $KS = 0.4–0.6$ ; all  $p > 0.7$ ). In contrast, the residuals for the Sharpened–Romberg test and one-leg standing balance test deviated from a normal distribution ( $KS = 1.6–1.9$ ;  $p < 0.05$ ). In contrast, all three balance scores recorded on CBB revealed approximately symmetrical distributions of the results. (2,35)

Another study done by Yuri Agrawal concluded that time to failure decreased with age. He also mentioned that once the patient goes below 20 seconds, there is tremendous increase in odds of falling. This correlated with the results presented in our study as well. Along with this we also considered differences in normal levels by age, gender and race, and evaluate how performance on this test predicts standing balance. The motivation of this study is to assistance or to support the clinician in clarify or to explain a patient’s performance on the Modified Romberg test and in predicting a given individual performance on Romberg test of standing balance. (36)



**CONCLUSION:** The range of the Romberg test for young healthy population of age 18-35 years is 4.9 – 14.7minutes

•Limitation:

Sample size was chosen according to convenience, with less time and pandemic being the major factors for this.

Future Scope of study:

Studies within higher age groups, presenting comparisons between male and female to understand if gender affects the Romberg test and various factors affecting Romberg test are planned for further understanding of the topic

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