Inter-Rater Reliability Of Time-in-balance Test Among Young Individuals With Ankle Instability.

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ABSTRACT: **Background:** TBT use to measure static balance which determines for how long a person can stand on one leg with eyes open & closed. Although reliability of TBT is high, there is no evidence of inter-rater reliability. **Objective:** To study inter-rater reliability of time-in-balance test among young individuals with ankle instability. **Method:** A total of 40 subjects which were between 20-30 years of age, having ankle instability included in the study. Subjects with neurological, ontological and other musculoskeletal injuries were excluded. 2 rater evaluated all subjects in 3 trials with eyes open and closed. Score of best out of 3 was taken for analysis. **Result:** The inter-rater reliability was excellent in both: eyes open (0-98) and eyes closed (0-99). **Conclusion:** With experienced and knowledgeable raters, TBT shows very good inter-rater reliability.

Key Words: Ankle instability, Inter-rater reliability, Time-in-balance test, Young individual.

I. INTRODUCTON

During daily living activities as well as in leisure and competitive sports, ankle joint is the second most commonly injured joint. Among all the injuries, lateral ankle sprain is the most common injury which will cause ankle instability in 20-40% of cases [1]. Apart from this, medial ankle sprain, rupture of ligaments and ankle arthritis also causes ankle instability. Muscular weakness, tightness of Achilles tendon, forefoot or rear foot deformities are most important predisposing factors for ankle instability [3]. Ample of sports like ballet dancing, skating, gymnastics, football, basketball are also more prone to cause ankle injuries and instability. MRI, CT scan and stress X-ray are common choice of investigation for ankle instability [4].

Static as well as dynamic postural control assessment in young individuals is necessary to calculate risk of injury, patients' state after injury and to evaluate treatment which was used to treat that injury. There are various tests available for evaluating balance for instance foot lift test, balance error scoring system, star excursion balance test, force plate tests. Time-in-balance test is used to measure how long a patient can maintain balance on single leg with eyes open and eyes closed. It is found from meta-analysis that TBT is more accurate in identifying balance deficits from rest of the static balance tests along with force plate outcome measures [2].

Clinical evaluation test should be reliable to make judgments about the "soundness" of the research in relation to the application and appropriateness of the methods which is to be applied and the integrity of the final conclusion [5]. In quantitative research, there are two types of reliability: inter-rater (measurement remain same despite of different researchers) and intra-rater (measurement remain same over time done by same researcher) [6]. Among these, inter-rater reliability has greater importance in clinical practice [7].

Currently, there is a study which states that TBT is a highly reliable method of assessing static balance. However, there is no such study found which shows inter or intra rater reliability of this test. So, aim of this study is to measure inter rater reliability of time-in-balance test among young individuals with ankle instability.

Null hypothesis: Inter-rater reliability of TBT is less among young individuals with ankle instability.

Alternative hypothesis: Inter-rater reliability of TBT is high among young individuals with ankle instability.

II. MATERIALS AND METHOD

In this descriptive laboratory study, 40 subjects (male-18, female-22, age = 24.4 years, affected leg: right-31, left-9) from the Parul Sevashram hospital, India were taken for the study. Subjects who is between 20-30 years with history of "giving away" in only one ankle were included in the study. Subjects with neurological, otological or other musculoskeletal injuries or diseases were excluded from the study. Before the study, written consent is taken.

III. PROCEDURE

Before the actual testing, both raters had underwent for proper training from same instructor and practiced at testing site using a script and a proper demonstration. After proper training of raters, all participants scheduled for testing for next two days at two different sites according to their convenient time.

On first day rater-1 and on second day rater-2 assessed all 40 subjects individually for their TBT performance after taking their past history of ankle injury, other necessary investigations and demonstrating the whole procedure of testing.

Test was performed on a single leg without wearing shoes or socks and placing both the hands on the hips with eyes open and closed with 3 trials of each. Subjects were required to remain as motionless as possible on their affected

lower extremity for 60 seconds after the starting command. Rest of 2 minutes was given after each trial. Test was stopped by rater on command if subject loses his/her balance which was defined as movement of the weight bearing foot or touching of the non-weight bearing foot on to the ground which was indicated by rater before 60 seconds using stopwatch. Out of 3 trials, the best time for each vision condition were used for analysis [10].

IV.   RESULT

Statistical analysis was done using two-way random reliability test in SPSS 20.0 version. Inter-rater reliability is the variation between two or more raters who measure the same participants. There were two measures: with open eyes and closed eyes. Data was merged from two different sites during two days.

Cronbach's alpha for eyes open was calculated 0.98 with mean of 48.73 and SD of $\pm$ 7.832 by rater-1 and 49.15 with SD of $\pm$ 7.315 by rater-2. Also, mean and SD for closed eyes were 21.1, $\pm$ 6.563 and 21.45, $\pm$ 6.288 by rater-1 and rater-2 respectively, whereas Cronbach's alpha was 0.99.

Cronbach's $\alpha \geq 0.9$ is consider as excellent internal consistency; $\alpha \geq 0.8$ good, $\alpha \geq 0.7$ acceptable, $\alpha \geq 0.6$ questionable, $\alpha \geq 0.5$ poor, $\alpha < 0.5$ unacceptable. According to this inter-rater reliability for all measures was excellent [9].

V.   DISCUSSION

Time-in-balance test has very high inter-rater reliability. It is a static balance assessment tool which measures the time span till one can stand on one leg with eyes open and eyes closed. There are studies which supports the use of TBT as clinical measurement tool for balance and has good reliability [8]. But, till our knowledge, there is no studies ever conducted for its inter-rater reliability that is between two or more raters.

Three trials for eyes closed and three trials for eyes open were taken. Best time was taken for analysis. On average 40 subjects can stand on one leg for 48.73 seconds and 49.15 seconds with eyes open and for 21.1 seconds and 21.45 seconds with eyes closed by rater-1 and rater-2 respectively. This shows excellent inter-rater reliability of TBT.

From the above method of checking reliability, it is concluded that despite of different study sites and investigators, as long as raters are trained by an experienced trainer and practiced with proper guidance, chances of producing consistent scores are very high.

There were less subjects for this study as well as only two raters has rated them for their TBT performance. In future, study with multiple rater (> 2 raters) and with more participants at different sites and conditions can be done to increase the reliability. Also, as an innovative method written or video instructions for both participants as well as raters can be used which can be made available for clinicians and researchers after sufficiently checking their reliability and validity.

VI.   CONCLUSION

For assessment of static balance, TBT is found to be highly reliable test. Inter-rater reliability of TBT with eyes open is 0.98 and with eyes closed is 0.99. In different sites as well as when assessed by multiple raters, the test has produced almost same scores. Therefore, TBT should be used as one of the clinical assessment tool for measuring the time-span an individual can maintain balance on one leg with eyes closed and open.

VII.   ACKNOWLEDGEMENT

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