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Introduction

Each year one in every three adults over the age of 65 experience a fall resulting in serious injury and in some instances death. In this population, falling injuries are the leading cause of death and are associated with the greatest number of nonfatal injuries and trauma hospital admissions. Since balance and muscle performance decreases as one ages, it is vitally important to assess these factors as part of a comprehensive strategy to monitor and predict fall risk. Previous data analysis of the Repetitive Step Test (RST) has shown that there is a significant performance difference between non-fallers and recurrent fallers in particular stepping conditions, and that significant inter-limb differences exist in non-fallers.

Purpose/Hypothesis

To determine the test-retest reliability of the RST in community dwelling older adults. We hypothesize that the RST will exhibit good or excellent test-rest reliability.

Subjects

24 community ambulators with and without a fall history (12 males, 12 females) ages ≥ 65 yo, mean age 77.1 years

Materials

Masking tape, goniometer, tape measure, gait belt and stop watch (see Fig. 1).

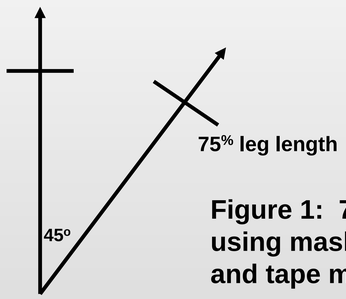

Figure 1: 75% RST grid design using masking tape, goniometer and tape measure.

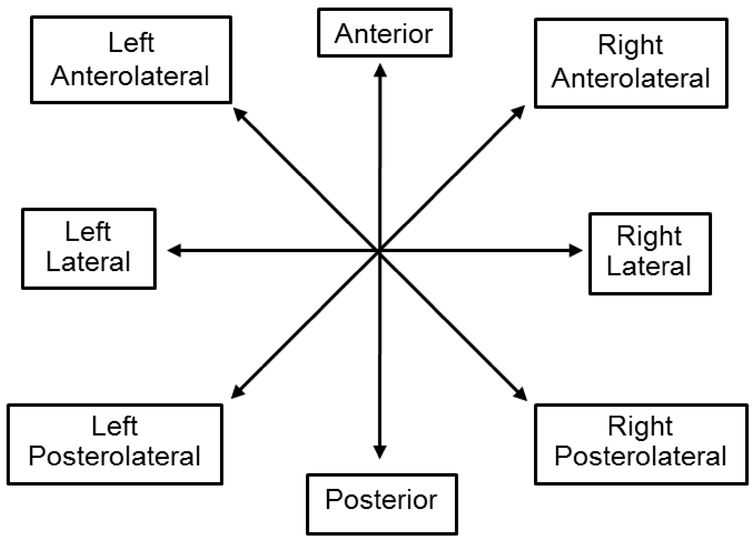

Figure 2: All RST step directions.

Direction	ICC *	MDC
50% Sum Angular	0.92	7.89
75% Sum Angular	0.95	6.04
50% Sum Linear	0.95	9.61
75% Sum Linear	0.96	8.45
50% Sum Total	0.95	15.65
75% Sum Total	0.97	11.86

Figure 3: Intraclass correlation coefficient (ICC 2,2) was used to calculate the reliability between day 1 and day 2 for the 50% and 75% leg length after summing the angular, linear, and total directions, * = $p < 0.001$. Minimal detectable change (MDC) was also calculated for all stepping combinations.

Methods

Each subject performed a dynamic balance stepping protocol bilaterally in 10 directions at 50% and 75% of their right leg length (see Fig. 2). Leg length was determined by measuring the distance from R ASIS to R medial malleolus. Subjects were asked to safely step with full weight shift to a marked line as many times as possible in 15 seconds. Step direction was randomized. Subjects returned 5-7 days later and repeated the protocol. Scores from day 1 and day 2 were compared to assess test-retest reliability.

Results

An Interclass Correlation Coefficient (ICC 2,2) was used to calculate the reliability between day 1 and day 2 for the 50% and 75% leg length after summing the angular, linear, and total directions. The angular summed directions for 50% and 75% leg length yielded an ICC of 0.92 and 0.95 respectively. The linear summed directions for 50% and 75% leg length yielded an ICC of 0.95 and 0.96 respectively. The total summed directions for 50% and 75% leg length yielded an ICC of 0.95 and 0.97 respectively. Minimal detectable change (MDC) was calculated for all stepping combinations (see Fig. 3) using the formula MDC = 2.77 x SEM.

Conclusion

The RST shows excellent test-retest reliability in all three forms. These findings indicate that the RST is a reliable dynamic balance measure to implement into clinical practice including its streamlined form.

Clinical Relevance

The ability to quickly assess fall risk in older adults is extremely important in order to develop an appropriate PT plan of care in a timely manner. This study has shown that the streamlined angular version of the RST taking less than two minutes to administer has excellent test-retest reliability.