An Investigation of the Reliability and Validity of the Modified Total Body Rotation Test (MTBRT) for potential use with older people

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Introduction

Volitional and automatic rotational movements are integral to the majority of functional activities we engage in during everyday life. However with increasing age physical changes in musculoskeletal structures and neuromuscular control result in reductions of body rotation, postural control and balance. These subsequently impact on the individual by restricting functional engagement and safe mobility, potentially increasing the risk of falls.

Outcome measures are required to be both valid and reliable in order to be used within clinical practice. The MTBRT is an outcome measure designed to assess the total amount of rotation that a person is capable of achieving in standing and has been used with older populations. However, limited research has previously been carried out into its reliability and concurrent validity.

Aims

- To determine the intra-rater reliability and the inter-rater reliability of the MTBRT
- To determine the MTBRT's concurrent validity compared to the Timed-Up-And-Go (TUG) test
- To explore the face validity of the MTBRT

MTBRT protocol

Tool: 2m laminated measurement scale marked out in 1 cm intervals, numbered every 5 cm; numbered from 0 at each end to 170cm [running L-R on top and R-L at the bottom of the scale]. The floor is marked with 45cm tape strips, perpendicular to the wall at each 0 mark.

Positioning: "Stand, your non-dominant side next to the wall, feet shoulder width apart, and the front of your shoes touching the line on the floor. Reach across your body with your dominant hand so that your fingertips can just touch the wall"

Instruction: "Keeping both feet on the floor, reach with your dominant hand across your body and backwards as far along the wall as you can. Keep your hand as close to the wall as possible without leaning or touching the wall. Hold for 3s"

Figure 1: Standardized starting position of the MTBRT

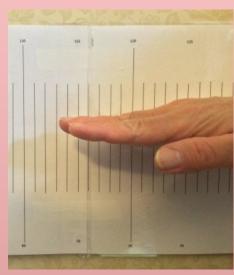Figure 2: The MTBRT , measuring rotation throughout the body

Figure 3: Measurement taken from the distal tip of the middle finger

Method

20 healthy volunteers, staff and students from Cardiff University participated in the study. Subjects were aged 20-56 years (mean 27 yrs) with exclusion criteria: any balance or co-ordination issues, unstable MSK disorders or acute exacerbations of chronic conditions. A same subject, correlation design was used. 3 collaborative undergraduate researchers gathered mean scores of the MTBRT and TUG over 3 randomised visits. Face validity was also explored through informal rater reflection. CU HCARE ethical approval was gained.

The degree of correlation was analysed using Pearson's Correlation Coefficient for concurrent validity and two-way mixed Intra-class Correlation Coefficient for intra and inter-rater reliability. Significance level of $p=0.05$, Correlation levels of 0.5 (moderate) and 0.8 (excellent) were used.

Results

Both the intra-rater reliability ($r = 0.966$, $p = 0.00$) and inter-rater reliability ($r = 1.00$, $p = 0.00$) demonstrated **excellent reliability**.

The concurrent validity, using the TUG, demonstrated a **moderate negative correlation** between the two measurement tools of $r = -0.559$ ($p = 0.01$).

All researchers felt that the MTBRT had **good face validity**.

Conclusion

The MTBRT demonstrates excellent reliability when used by single or multiple novice raters on a healthy population.

It correlates moderately with the TUG, a validated tool used with older populations. However, this study was limited by the use of a small and relatively young population of subjects.

Researcher reflections concluded that the MTBRT is a quick and easy outcome measure to use and is suitable for use in a range of different environments. It also replicates movements and activities that were found to be impacted on through the normal ageing process, so was felt to be appropriate for use with older populations.

Implications

The MTBRT has been shown to be a reliable and valid tool when tested using a small sample of young healthy adults. Further investigation into its other properties, using larger samples of older adults should be carried out to verify its appropriateness for use within clinical and research environments with the older population.

References

Stanziano, D. et al. 2010. The Modified Total Body Rotation Test: A rapid, reliable assessment of physical function in older adults. *Journal of the American Geriatrics Society* 58(10), pp. 1965-1969.