

# An exploration of the relationship of the Modified Total Body Rotation Test with the Functional Reach Test, Lateral Reach Test and Centre of Pressure measures in a healthy population

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## Background

With aging, multiple changes occur in the body affecting its structural integrity and postural control. This can lead to functional activity deficits through decreases in muscle strength, joint mobility and functional range of motion required for activities of daily living (ADL) such as functional reach.

The Functional Reach Test (FRT) and the Lateral Reach Test (LRT) which measure anterior and lateral stability are often used for the assessment of functional ability and balance. However, these measures are limited to one plane therefore do not represent the more challenging multiplanar ADLs. The Modified Total Body Rotation Test (MTBRT) (Stanziano et al., 2010) measures the ability to reach backwards through rotation in a standing position. It has been investigated for use in the USA with older populations, but to date it has not been explored for UK practice.

## Aims

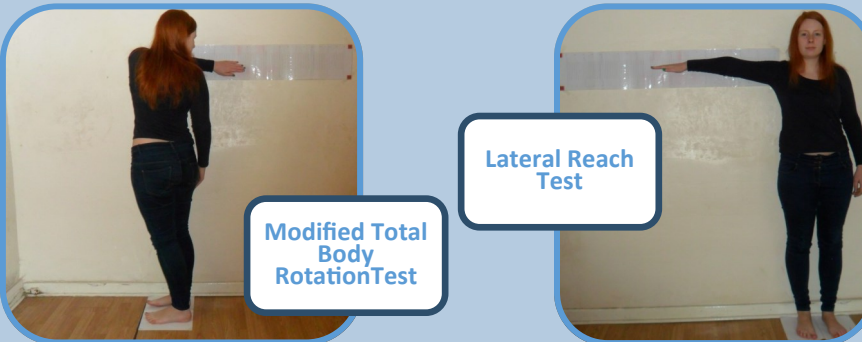
To investigate the relationship between MTBRT and FRT, LRT and Centre of Pressure total excursion (COPotex) in quiet standing.

To examine the effect of height and height normalization (% of reach/height) on MTBRT.

## Method

20 healthy adults aged 19-40 years were recruited from Cardiff University (CU). A correlational design was chosen to explore the relationship between MTBRT and FRT, LRT and COPotex. Informed consent and Ethical approval (CU HCARE Ethics Committee) were gained.

All data was acquired from MTBRT, FRT, LRT and COPotex measures in randomised order during a single session by one examiner. Each test was repeated 3 times and the mean was calculated. Height normalization was applied (reach/height as a %) to MTBRT, FRT and LRT. Pearson's Correlation Coefficient was carried out. Significance level of  $p=0.05$  and correlation level of  $r>0.5$  were used.



Modified Total Body Rotation Test

Lateral Reach Test

## Results

Correlation was high between MTBRT and LRT ( $r=0.609$ ,  $p=0.004$ ), but low between MTBRT and FRT ( $r=0.327$ ,  $p=0.16$ ) and MTBRT and COPotex ( $r=-0.231$ ,  $p=0.327$ ). MTBRT was highly correlated to height ( $r=0.618$ ,  $p=0.004$ ).

After height normalization (HN) all measures had a lower level of correlation with HN-MTBRT. HN-MTBRT was significantly, but only moderately correlated to HN-LRT ( $r=0.501$ ,  $p=0.024$ ). There was no significant relationship between HN-MTBRT and HN-FRT ( $r=0.172$ ,  $p=0.468$ ) or HN-MTBRT and COPotex ( $r=-0.133$ ,  $p=0.575$ ).



Centre of Pressure total excursion in quiet standing

## Discussion and Conclusion

The high correlation between MTBRT and LRT implies a relationship between lateral stability and rotational ability in standing. No relationship was found between MTBRT and FRT or COPotex in quiet standing indicating its lack of relationship with anterior stability and postural control in quiet standing.

Height is of importance when the MTBRT is used, more so in comparison between individuals rather than for repeated measurements of one individual. Height normalization should therefore be used in multisubject comparison.

MTBRT can be a useful tool to assess physical performance changes. Limitations of this study were the small sample size and young population which prevents generalisation to older populations. More research with bigger sample sizes and an older study population are needed.



Functional Reach Test

## References

- Hageman, P. A. et al. 1995. *Archives of Physical Medicine and Rehabilitation* 76, pp. 961-965.  
Stanziano, D. C. et al. 2010. *Journal of the American Geriatrics Society* 58, pp. 1965-1969.