

The inter-rater reliability of Mini-BESTest in ambulatory people with Multiple Sclerosis

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Background

Balance problems are complex and common in People with Multiple Sclerosis (PwMS). Many balance measurements are used in clinical practice. Several limitations of existing measures, such as ceiling effects, have been highlighted. Additionally, many do not consider all the potential complex systems involved in postural control (1). A novel balance test, the Mini-BESTest (MBT) (2,3) may be more clinically useful as it considers more balance domains. (See Figure 1 and 2). To the best of the authors' knowledge no literature has investigated the inter-rater reliability of the MBT, exclusively in MS.

Aims

To investigate the inter-rater reliability of the MBT in ambulatory PwMS.

Methods

A sample of convenience (n=52) was recruited. All participants were out-patients referred for physiotherapy with a primary diagnosis of MS, medically stable, greater than 18 years of age and able to ambulate independently with/without an aid. Participants' demographic data was collected prior to completing the MBT with Rater 1 (R1). Rater 2 (R2) then repeated the MBT. Statistical analyses were undertaken using IBM SPSS® Statistics V. 20

Figure 3: Scatterplot for Rater 1 and Rater 2 scores on the MBT

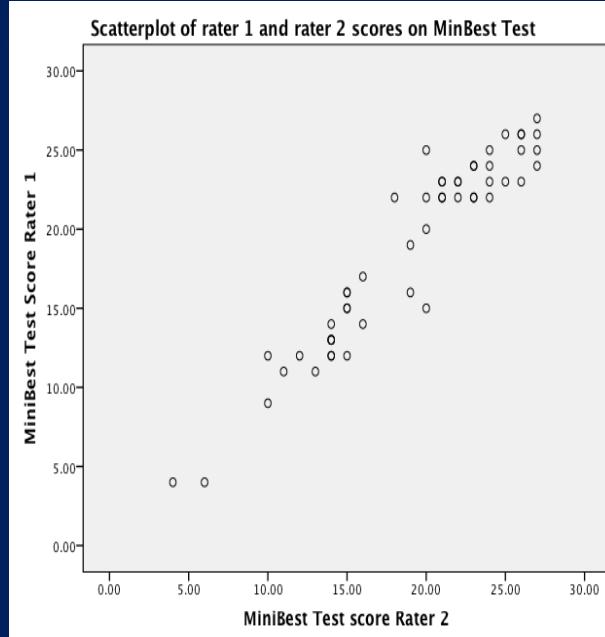


Figure 4: Bland and Altman Plot

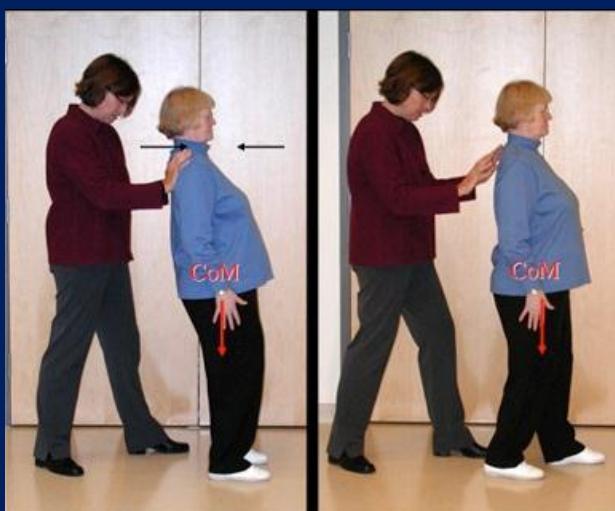
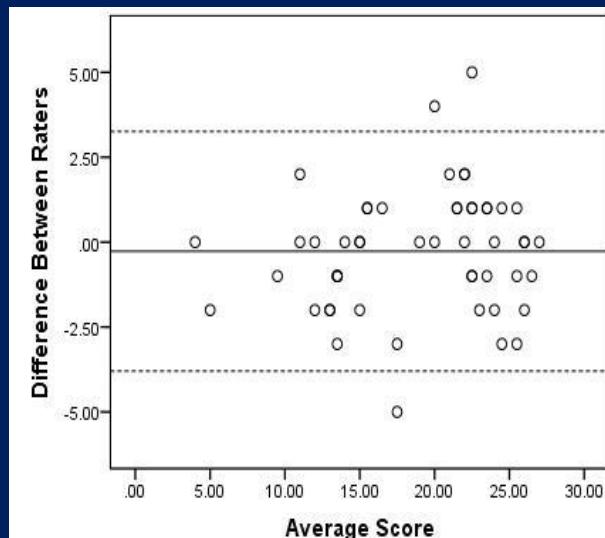


Figure 1 – Item 5, Compensatory Stepping
Figure 2 – Items for the the Mini-BESTest

Results

The majority of our sample (37 female, mean age= 45.73(5.65) years) had RRMS (42; 80.8%) and required no aid (n=32; 61.5%) or a unilateral aid to mobilise (n=11; 21.1%). The mean MBT score of R1 and R2 were 19.1 (SD 5.75) and 18.8 (SD 6.01) respectively. The mean difference between raters was 0.27 (SD 1.8; CI -2.5 +2.02; p=.816). See figure 3 and 4. The intra class correlation coefficient (ICC) was .976 (CI .92-97). The standard error of the measure (SEM) was 2.56. The minimum detectable change (MDC) of the MBT was calculated to be 7 points.

References:

1. Cameron, M. H. and Nilsagard, Y. E. (2013) 'Measurement and treatment of imbalance and fall risk in multiple sclerosis using the international classification of functioning, disability and health model', *Physical medicine and rehabilitation clinics of North America*, 24(2), 337-54.
2. Franchignoni, F., Horak, F., Godi, M., Nardone, A. and Giordano, A. (2010) 'Using psychometric techniques to improve the Balance Evaluation Systems Test: the mini-BESTest', *Journal of Rehabilitation Medicine*, 42(4), 323-31.
3. <http://www.bestest.us/>

1. SIT TO STAND	Note the initiation of the movement, and the use of the subject's hands on the seat of the chair, the thighs, or the thrusting of the arms forward.
2. RISE TO TOES	Allow the subject two attempts. Score the best attempt. (If you suspect that subject is using less than full height, ask the subject to rise up while holding the examiners' hands.) Make sure the subject looks at a non-moving target 4-12 feet away.
3. STAND ON ONE LEG	Allow the subject two attempts and record the times. Record the number of seconds the subject can hold up to a maximum of 20 seconds. Stop timing when the subject moves hands off of hips or puts a foot down. Make sure the subject looks at a non-moving target 4-12 feet ahead. Repeat on other side.
4. COMPENSATORY STEPPING CORRECTION - FORWARD	Stand in front of the subject with one hand on each shoulder and ask the subject to lean forward (Make sure there is room for them to step forward). Require the subject to lean until the subject's shoulders and hips are in front of toes. After you feel the subject's body weight in your hands, very suddenly release your support. The test must elicit a step. NOTE: Be prepared to catch subject.
5. COMPENSATORY STEPPING CORRECTION - BACKWARD	Stand behind the subject with one hand on each scapula and ask the subject to lean backward (Make sure there is room for the subject to step backward). Require the subject to lean until their shoulders and hips are in back of their heels. After you feel the subject's body weight in your hands, very suddenly release your support. Test must elicit a step. NOTE: Be prepared to catch subject.
6. COMPENSATORY STEPPING CORRECTION - LATERAL	Stand to the side of the subject, place one hand on the side of the subject's pelvis, and have the subject lean their whole body into your hands. Require the subject to lean until the midline of the pelvis is over the right (or left) foot and then suddenly release your hold. NOTE: Be prepared to catch subject.
7. STANCE (FEET TOGETHER); EYES OPEN, FIRM SURFACE	Record the time the subject was able to stand with feet together up to a maximum of 30 seconds. Make sure subject looks at a non-moving target 4-12 feet away.
8. STANCE (FEET TOGETHER); EYES CLOSED, FOAM SURFACE	Use medium density Tempa® foam, 4 inches thick. Assist subject in stepping onto foam. Record the time the subject was able to stand in each condition to a maximum of 30 seconds. Have the subject step off of the foam between trials. Flip the foam over between each trial to ensure the foam has retained its shape.
9. IN-LINE EYES CLOSED	Aid the subject onto the ramp. Once the subject closes eyes, begin timing and record time. Note if there is excessive sway.
10. CHANGE IN SPEED	Allow the subject to take 3-5 steps at normal speed, and then say "fast". After 3-5 fast steps, say "slow". Allow 3-5 slow steps before the subject stops walking.
11. WALK WITH HEAD TURNS - HORIZONTAL	Allow the subject to reach normal speed, and give the commands "right, left" every 3-5 steps. Score if you see a problem in either direction. If subject has severe cervical restrictions allow combined head and trunk movements.
12. WALK WITH PIVOT TURNS	Demonstrate a pivot turn. Once the subject is walking at normal speed, say "turn and stop." Count the number of steps from "turn" until the subject is stable. Imbalance may be indicated by wide stance, extra stepping or trunk motion.
13. STEP OVER OBSTACLES	Place the box (9 inches or 23 cm height) 10 feet away from where the subject will begin walking. Two shoeboxes taped together works well to create this apparatus.
14. TIMED UP & GO WITH DUAL TASK	Use the TUG time to determine the effects of dual tasking. The subject should walk a 3 meter distance. TUG: Have the subject sitting with the subject's back against the chair. The subject will be timed from the moment you say "Go" until the subject returns to sitting. Stop timing when the subject's buttocks hit the chair bottom and the subject's back is against the chair. The chair should be firm without arms. TUG With Dual Task: While sitting determine how fast and accurately the subject can count backwards by threes starting from a number between 100-90. Then, ask the subject to count from a different number and after a few numbers say "Go". Time the subject from the moment you say "Go" until the subject returns to the sitting position. Score dual task as affecting counting or walking if speed slows (>10%) from TUG and/or new signs of imbalance.

Conclusions

The findings of this study suggest there is a strong agreement between two raters (experienced/novice Chartered Physiotherapists) for the MBT in ambulatory PwMS. High ICC scores and low mean differences were reported. This preliminary evidence supports the use of the MBT clinically to measure balance in ambulatory PwMS. More than 7 points difference between two raters is needed to be confident that the change is greater than measurement error.