Inter-Rater Reliability of the Balance-Based Torso-Weighting Method of Altering Balance and Gait

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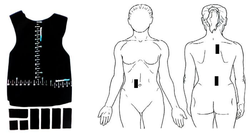
BACKGROUND

- Multiple sclerosis (MS) typically results in balance and gait deficits and increased risk of falls.
- Balance-Based Torso-Weighting (BBTW) method has been shown to be a promising intervention.[1-3]
- BBTW uses small weights (less than 2% body weight) applied in different places on a vest-like garment.

BBTW™ Vest and Weights; Sample weight placement, 3 half-pound weights



- The weights are placed to counter the direction of balance loss when a clinician manually perturbs standing balance in various directions.
- Perturbations include nudges and rotational forces in six prescribed directions at the shoulders and pelvis (Figure 1).

GAP

- No reliability studies have yet been published to examine the inter-rater reliability of assessing direction of greatest balance loss, an essential component for placing the small weights.

OBJECTIVE

- Examine the inter-rater reliability of the BBTW method with a focus on assessing direction of balance loss.

REFERENCES

1. Widener GL, Allen DD, and Gibson-Horn C. Randomized clinical trial of Balance-Based Torso Weighting for improving upright mobility in people with multiple sclerosis. *Neurorehabil Neural Repair.* 2009;23:784-791.
2. Horn KK, Allen DD, Gibson-Horn C, Widener GL. Torso-weighting produces improved standing balance and reduced falls during the Sensory Organization Test in people with multiple sclerosis. *Int J MS Care*. 2018. in press.
3. Gibson-Horn C. Balance-based torso weighting in a person with ataxia and multiple sclerosis: A case report. *J Neurol Phys Ther*. 2008;32: 139-146.

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METHODS

- Four physical therapists with various amounts of BBTW training and clinical experience assessed direction of balance loss in 10 healthy volunteers to determine where to apply weights.
- Subjects were assessed by at least two therapists.
- Therapists assessed at least six subjects.
- Each subject had 30 minutes between sessions; all weighting sessions were videotaped and completed within a four-hour period.
- Six trained reviewers then viewed videos and scored balance loss following perturbations. At least four reviewers examined videos for each therapist.

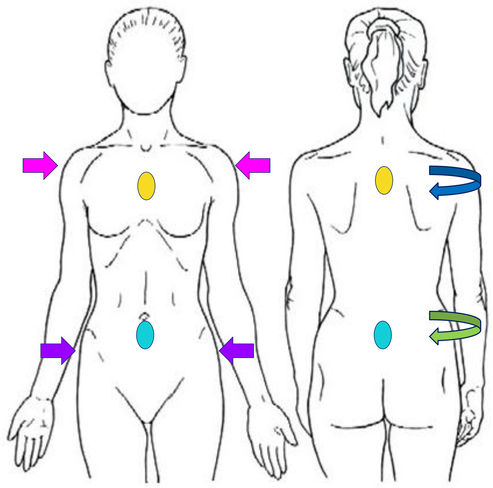


Figure 1. Location of Perturbations

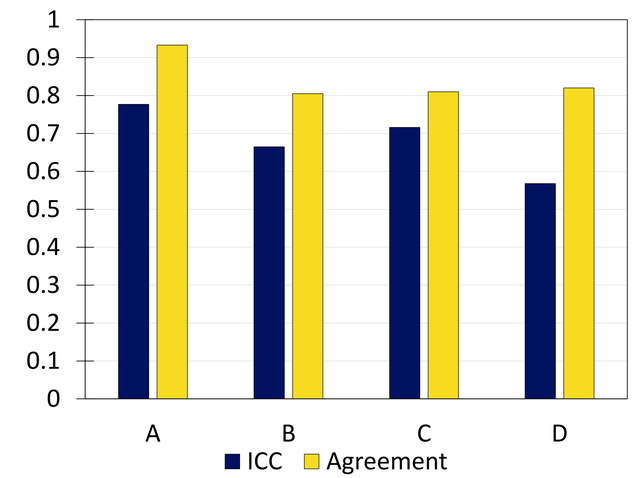
- **Score of balance loss** was rated using a rubric where 0 indicated normal, quick balance response; 4 indicated that the subject would have fallen without clinician assist following a perturbation.
- **Intra-class Correlation Coefficients** (ICC) and **measures of agreement** were assessed across reviewers for each therapist.

Scoring	ANT/POST/LAT	ROT
0	Normal; Fast	Barely Moves
1	Small Delay; Torso Moves a Little	Small Movement of Shoulder or Pelvis; No Foot Rotation
2	Ripple Effect; Torso Moves Moderately	Trunk Rotation >20 to <60 degrees; Foot Rotation <45 degrees
3	Bilat. Toes or Heels Up significantly; Torso moves wildly; Protective Step	Trunk Rotation >60 degrees; Foot Rotation equal 45 to <90 degrees
4	Fall	Foot Rotation equal to or >90 degrees

RESULTS

- Reliability of the balance loss scale was > 0.90.
- ICCs ranged from 0.57 to 0.78 within the four therapists.
- Agreement within one point for each perturbation scored on the rubric across five to six reviewers for each therapist ranged from 0.80 to 0.93.
- The highest ICCs and agreement values were consistently aligned with the most experienced therapist.

Therapist	A	B	C	D
Subjects Assessed	10	7	7	6
Secondary Reviewers	4	5	5	5



CONCLUSION

- Assessing direction of balance loss has moderate to good inter-rater reliability and good to excellent agreement.
- These results support BBTW as a promising intervention. Clinicians and reviewers can be trained to provide reliable results although intermittent review of the scoring rubric after practice assessing balance loss is recommended.