# The Incongruence of Forward, Tandem and Backward Walking in Hemiplegic Gait

Andrew Strubhar, PhD, PT, Robert Lee SPT, Rachel Derickson SPT, Josh Murphy SPT, Zach McAvoy SPT
Bradley University Department of Physical Therapy and Health Science

## BACKGROUND

Functional gait extends beyond forward movement including multi directional stepping often involves narrow-based or backward walking. Common gait assessments with individuals with chronic hemiplegia typically focus on forward gait such as the 10 Meter Walk Test. However less attention is given to gait challenges encountered in daily life such as walking with a narrow base or stepping backward. This study aimed to explore how Tandem Walking (TanW) and Backward walking (BckW) differ from standard forward walking (ForW) in individuals with Chronic Hemiplegia.

Individuals with chronic hemiplegia are generally expected to walk more slowly than age-matched and unimpaired controls. The percent difference between these groups can be used as a standardized comparison for forward, tandem and backward walking.

## PURPOSE

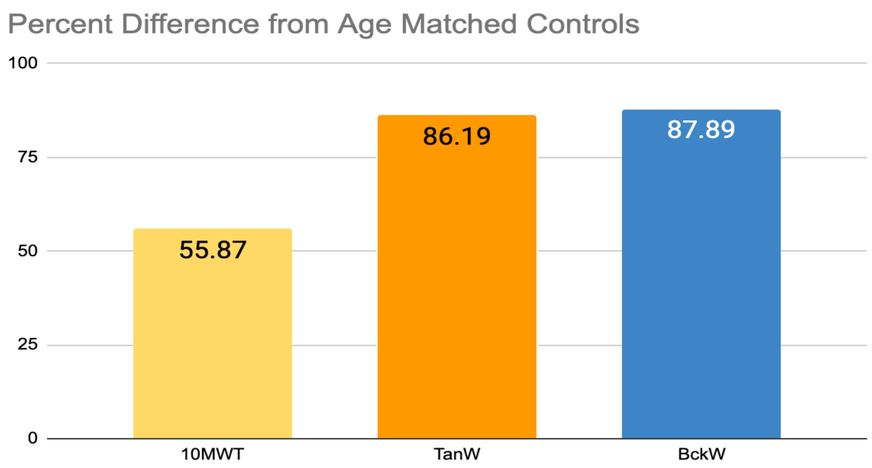
- The purpose of this study was to explore the effects of backwards walking and tandem beam walking on their ability to reveal gait impairments in individuals with chronic hemiplegia
- Hypothesis: The average percent difference in timed gait between individuals with hemiplegia and aged matched individuals would be greater for TanW and BckW than the 10 MWT, indicating that these tests could reveal gait impairment not captured by ForW assessments.

## MATERIALS AND METHODS

Eight individuals (44-65) with chronic hemiplegia along with an age-matched control group were recruited. Each participant completed 3 trials of the 10MWT, TanW, and BckW. The TanW test required walking 5 meters (3 m timed) on 2 standard 1'x4"x8' wooden boards laid end to end. The BckW test involved walking backward for 5 meters with (3 m timed). Participants were instructed to walk as quickly and safely as possible. Each individual was paired with an aged matched unimpaired participant, and the Average % Difference as calculated for each test. Repeated measures testing by used to discern a difference between the tests. (4 of the 8 subjects were previously reported in research)

PERCENT DIFFERENCE CALCULATION:
% diff = 100 x (|A-B| / (A+B)/2)
A = group with impairments and B = age-matched control group. Percent difference was applied to task speed

## RESULTS




The AVE%DIF for individuals with Chronic Hemiplegia compared to Aged-matched controls was 55.8% for the 10MWT, 86.2% for TanW, and 87.9% for BckW. A significant difference was observed among the tests ($F=5.42$, $p=0.042$). Post hoc analysis revealed significant differences between the 10MWT and TanW ($p=0.045$) and the 10MWT and BckW ($p=0.033$).

## CONCLUSIONS

- If hemiplegia had the same impact on ForW as TanW and BckW, their proportional differences should have been similar. However, the proportional differences were incongruent with TanW and BckW being greater, at 86% and 88%, respectively.
- These results suggest that TanW and BckW reveal gait impairments not detected by the 10MWT, highlighting their potential utility in assessing stepping ability beyond ForW measures.
- Our results reinforce the need for high-intensity gait training in multiple locomotor tasks when providing physical therapy to individuals with neurological impairments.
- Both tests were easy to administer and, despite their challenge, did not result in any instability requiring assistance.
- Future research could explore the predictive ability of these tests compared to ForW measures.

## REFERENCES

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