The Effect of 5 Days of Balance-Based Torso-Weighting on Mobility-Limited, Community-Dwelling Older Adults

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ABSTRACT

Research Objective(s): To determine the effect of Balance-Based Torso-Weighting (BBTW) administered via the BalanceWear orthotic (BW) worn for 5 days on mobility, gait, and balance among mobility-limited, community-dwelling older adults. **Design:** Double-blind, placebo control randomized trial over 5 days. **Setting:** Retirement facilities. **Participants:** Mobility-limited older adults [short physical performance battery (SPPB) scores 4-9/12] aged 86.00 (6.05) without progressive neurologic disorders were randomized to two groups; strategically-weighted BW (WG, n = 17) or sham-weighted BW (SWG, n = 16). **Interventions:** Regardless of group, all participants wore BW for 4-hours per day over 5 days. **Main Outcome Measure(s):** SPPB, Timed Up and Go (TUG), gait speed (GS), Functional Gait Assessment (FGA), tandem stance. **Results:** Multivariate repeated measures analysis of variance indicated a significant group x time interaction for mobility (SPPB & TUG, p = .098). Follow-up indicated an interaction for SPPB only (p = .04). Scores increased 1.25-points in WG, but were unchanged among SWG. There was no interaction for gait (FGA and GS, p = .36), yet a moderate effect size (η^2 = .08) was favorable for WG. There was a significant main effect of time (p = .02); with follow-up simple effects of time for GS and FGA ($p \leq .05$). There were no significant changes in balance measured by tandem stance. **Conclusions:** Wearing strategically weighted BW for 4-hours a day over 5 days results in improvements in mobility and gait as compared to a sham-weighted orthotic in mobility-limited community-dwelling older adults.

INTRODUCTION

Falls among older adults are a public health issue related to increased morbidity, mortality, and health care costs.[1] Impaired postural control, gait, and functional mobility are prominent risk factors for falls.[2] Exercise-based interventions vary in effectiveness on improving impairments and decreasing falls among older individuals.[3,4] Therefore, it is necessary to investigate other means to improve postural control and functional mobility, thereby decreasing fall risk among older adults. Balance-based torso-weighting Therapy (BWT) is a non-exercise treatment intervention that improves postural control, gait, and functional mobility among adults with multiple sclerosis[5-8] but has not been studied among older adults with mobility impairments without progressive neurological diseases.

METHODS

Figure 1.

Balancewear

Motion Therapeutics ®

Thirty-three participants aged ≥ 65 years with mobility disability (short physical performance battery (SPPB) score of 4-9/12)[9] were recruited from three senior living facilities. Exclusion criteria consisted of no cognitive impairment, progressive neurological disorders, or musculoskeletal deficits. Participants were pre- and post-tested on SPPB, Timed Up and Go (TUG), gait speed (GS), Functional Gait Assessment (FGA), and tandem stance time. Groups were randomized into sham BWT (SWG, n = 16) and weighted BWT (WG, n = 17). For all groups, the clinician assessed the individual's postural control systematically for resisted rotational asymmetry and responses to brisk perturbations at the trunk, shoulders, and pelvis in anterior, posterior, and lateral directions. Based on the individual's postural deficits in the WG, the clinician strategically placed small, non-obtrusive Velcro® weights in the orthotic and over the torso to enhance sensory input and muscle activation in that area of the trunk. Weights were $^1/_8$ lb (0.057 kg), ¼ lb (0.11 kg), and ½ lb (0.23 kg). Any combination of weights were placed in different positions on the garment based on individual responses.[7,10] In the SWG, participants received the postural control assessment and fabric encased polyfoam in the same dimensions as the weights. Individuals wore the BWT 4-hours per day over 5 days.

RESULTS

Multivariate repeated measures analysis of variance indicated a significant group x time interaction for mobility (SPPB & TUG, p = .098) with follow-up analyses indicating an interaction for SPPB only (p = .04). Scores increased 1.25-points in WG, but were unchanged among SWG. There was no interaction for gait (FGA and GS, p = .36), yet a moderate effect size (η^2 = .08) was favorable for WG. There was a significant main effect of time (p = .02); with follow-up simple effects of time for GS and FGA ($p \leq .05$). There were no significant changes in balance measured by tandem stance.

Table 1. Pre- and Post assessments

	Sham-Weighted Group (n = 16) (85.25 years)		Weighted Group (n = 17) (86.76 years)		p
	Pre	Post	Pre	Post	
Mobility					**.096***
SPPB (au)	5.94 (2.32)	5.94 (2.52)	5.63 (2.63)	6.88 (2.60)	**.04****
TUG (s)	17.80 (8.73)	15.15 (5.27)	19.25 (10.15)	16.79 (9.63)	.89
Tandem (s)	6.59 (8.33)	8.35 (9.04)	5.13 (7.85)	6.79 (9.20)	.97
Gait					.45
GS (m/s)	0.61 (0.26)	0.65 (0.18)	0.63 (0.19)	0.69 (0.18)	.68
FGA (au)	14.50 (5.88)	15.38 (5.24)†	13.67 (4.42)	15.93 (4.85)†	.21

Note. Values presented as mean (*SD*). SPPB = Short Physical Performance Battery; au = arbitrary units; TUG = Timed Up and Go; GS = Gait Speed; FGA = Functional Gait Assessment;; No significant difference between groups on pre-test scores, $p \geq .05$. *Indicates significant group x time interaction on pre- to post- tests analyzed by repeated measures multivariate analysis of variance, $p \leq .10$. **Indicates significant group x time interaction on follow-up repeated measures analyses, $p \leq .05$. †Indicates significant simple effect of time on repeated measures analysis of variance, $p \leq .05$.

CONCLUSION

Wearing strategically weighted BWT for 4-hours a day over 5 days results in short-term improvements in SPPB score compared to a sham-weighted orthotic in mobility-limited community-dwelling older adults. Future longitudinal investigations are necessary to determine long-term effects of BWT on mobility, fall risk, and fall rate.

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