Effects of Blood Flow Restriction Training on Enhancing Dual-Task Postural Stability in Individuals with Parkinson's Disease: A Case Study

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Summary

Blood flow restriction (BFR) training provides benefits to dual-task postural stability among individual living with Parkinson's disease (PD), but shows limited advantage for conditions of quiet-standing. No changes were in strength or balance confidence were observed.

Introduction

46% of individuals living with PD will fall within a 3-month period [1]. The high rate of falls is associated with PD progression and medication which, when combined with inactivity and deconditioning, lead to postural instability, fear of falls as well as gait disturbances [2]. While preliminary evidence suggests BFR training can effectively increase strength among those with PD [3], there is a lack of research on whether benefits extend to postural stability. This case study investigates whether 8 weeks of resistance training combined with BFR improves postural stability among individuals living with PD.

Methods

Two participants (1 male, aged 74 years & stage 1 PD; 1 female, aged 73 & stage 2.5 PD) were recruited to complete 8 weeks of resistance training. Classes consisted of leg press, leg extension and leg curl at 20%1RM, followed by squats and calf raises. During classes, the participants wore 5cm elastic BFR cuffs on their proximal thighs. Two Advanced Medical Technology Inc. force plates with NetForce Software™ were used to collect postural stability data (sway range, area, velocity and mean speed). Three 30-second trials of standing still were completed under both quiet (eyes open) and dual-task memory-recall conditions (5-second color changing screen). Secondary measures included Timed Up and Go (TUG), BIODEX isokinetic (60°/s) knee extension and flexion, and falls confidence scales. Measures were evaluated as percent change.

Results and Discussion

Both subjects demonstrated decreased sway range during dual-task conditions, while only Sub02 reduced sway in quiet-standing conditions (Table 1). This finding of larger improvements on dual-task trials was consistent across all variables. BFR has been found to increase cerebral blood flow [4]; perhaps greater vascularization improves division of attentional resources needed for postural stability. The smaller magnitude of change in Sub01 may be explained by their larger number of falls both in the month prior (n=3) and during the intervention (n=3). Sub02 did not experience any falls.

No changes were found in falls confidence scales as the participants had high baseline values. Similarly, TUG appeared to have a ceiling effect as both participants were very fit and completed pre-trials in under 7 seconds (Sub01 = 31.0%; Sub02 = -5.6%). Finally, peak flexion (Sub01 = -40.7%; Sub02 = -6.8%) and extension (Sub01 = -9.6%; Sub02 = -5.6%) strength did not improve supporting the idea of blood flow driving changes in postural stability.

Conclusions

BFR resistance training shows promise as a method to improve postural stability under conditions of cognitive demand. Greater postural stability aids in decreasing the risk of falls and prolonging independence and quality of life.

Acknowledgments

EHC was supported by Fonds de recherche du Québec – Santé – formation de doctorat. DP was supported by Canadian Graduate Scholarship – master's program, Canadian Institutes of Health Research/Instituts de recherche en santé du Canada.

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Table 1: Percent change in sway range following 8 weeks of BFR resistance training among individuals living with PD

	Quiet-Standing Trials			Dual-Task Trials		
	Pre	**Post**	**%Change**	**Pre**	**Post**	**%Change**
Mediolateral Sway Range (cm)						
Sub01	2.95	3.20	8.32	4.91	3.00	-38.91
Sub02	3.95	2.21	-44.03	4.21	2.71	-35.73
Anteroposterior Sway Range (cm)						
Sub01	2.12	2.25	6.78	2.21	2.12	-4.27
Sub02	3.95	2.41	-39.11	3.39	2.83	-16.49