

Comparison of Abdominal Compression Devices in Persons with Abdominal Paralysis Due to Spinal Cord Injury

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INTRODUCTION

Approximately 80% of individuals with spinal cord injury (SCI) experience impaired function of the abdominal musculature. Paralysis of abdominal musculature affects posture, intra-abdominal pressure, and breathing mechanics, and can cause pain. Despite research demonstrating that abdominal binders improve respiratory parameters, their long-term daily use is uncommon among individuals with SCI.

Hypothesis: Commercially available alternative abdominal compression garments may provide equal or better support and may be more attractive options for this population than traditional medical-grade binders.

The purpose of this study is to compare the effectiveness and usability of alternative commercial abdominal compression garments with the usual medical device.



Marena Recovery
MB2 Bodysuit



Leo by Leonisa
Firm Compression Tank

METHODS

Design: Single subject design. Week 1: 5 days personal binder, 2 days washout in personal binder. Week 2 & 3: 5 days in test garment (tank, suit), 2 days washout in personal binder. Test garment order was randomized for each participant.

Inclusion: SCI at or above T6, able to understand written and spoken English, current abdominal binder user when seated in wheelchair (WC), able to don binder independently or with caregiver assistance.

Exclusion: Skin breakdown in area covered by test garments, unable to sit at least 6 hours daily in WC, require mechanical ventilation when seated in WC.

Outcome Measures: Assessed in personal binder, without binder following 5 minutes acclimatization, and in test garment following 5 minutes acclimatization.

Diastolic and systolic blood pressure (DBP, SBP)
Blood oxygen saturation (SaO₂)
Forced exhalation in 1 second (FEV₁)
Heart rate (HR)

All participants were asked to fill out experience logs twice daily for 5 days per garment, including visual analog scales (VAS) regarding comfort, ease of use, appearance, and respiration.

This study received support from the University of Puget Sound School of Physical Therapy.

CLINICAL BOTTOM LINE
Abdominal compression improves respiratory function and supports SBP in individuals with chronic SCI.

RESULTS

Participants: Six participants recruited, five enrolled.

Participant Demographics					
Age	Sex	SCI Level	BMI	Years Post-SCI	Years using binder
37	M	C3-4, complete	26	13	13
28	M	C5, complete	32	1	1
65	M	C5-6, complete	23	47	15
47	M	T4, complete	26	21	9
36	F	C4-5, complete	21	17	17

Objective Findings

- Use of subjects' usual medical binder results in **significant increases** in SBP and FEV₁ compared to no binder.
- Usual medical binders support FEV₁ **significantly better** than the test garments.
- There is **no difference** in SBP between the test garments and the subjects' usual medical binders.
- There is **no significant relationship** between DBP, SaO₂, or HR between subjects' usual binders and no binder.

Paired t-tests of Differences		
FEV ₁	Personal vs all test (n=8)	p=0.034
	Personal vs none (n=15)	p=0.000
SBP	Personal vs all test (n=8)	p=0.624
	Personal vs none (n=15)	p=0.009

Experience Log Reports

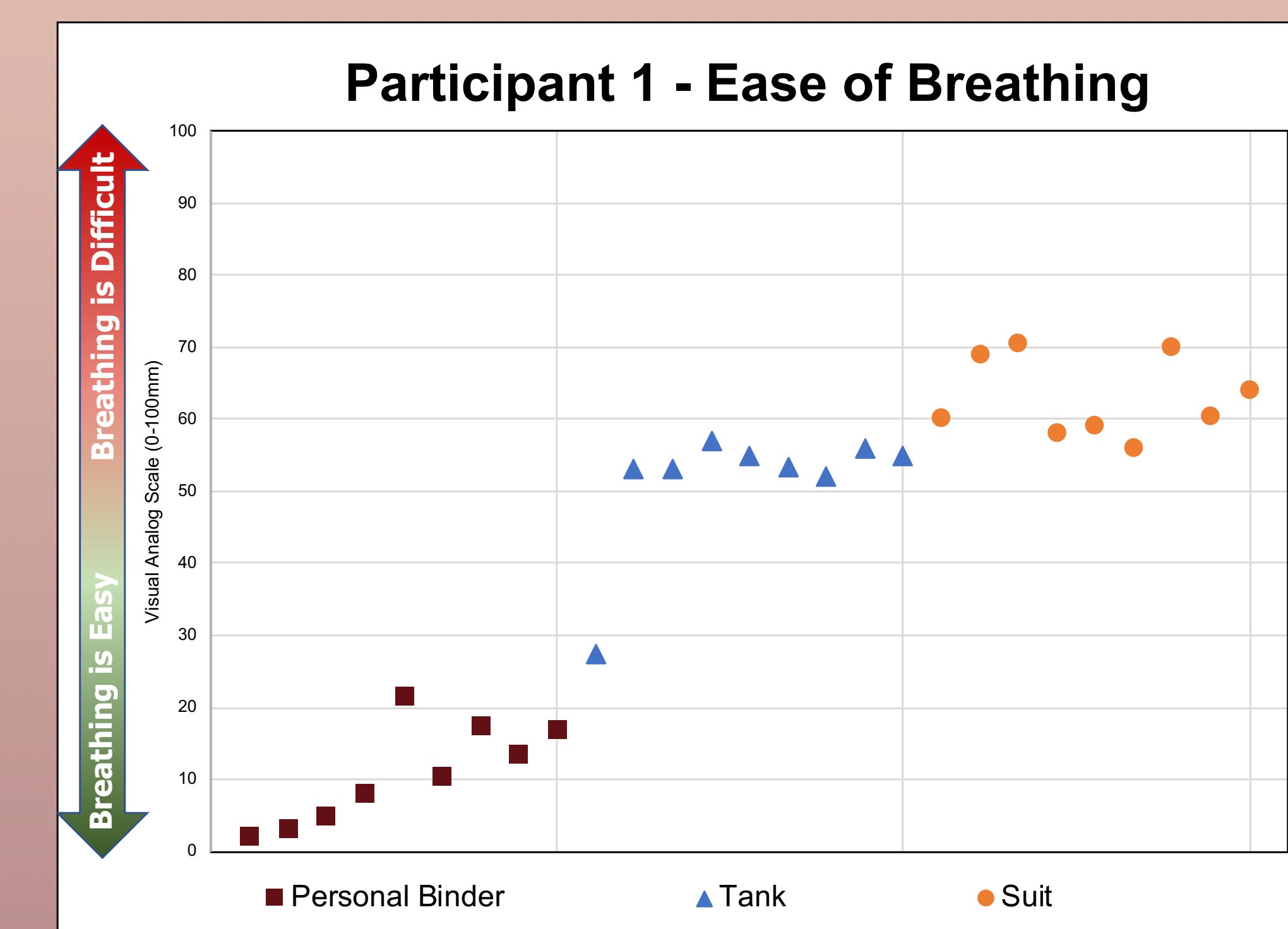
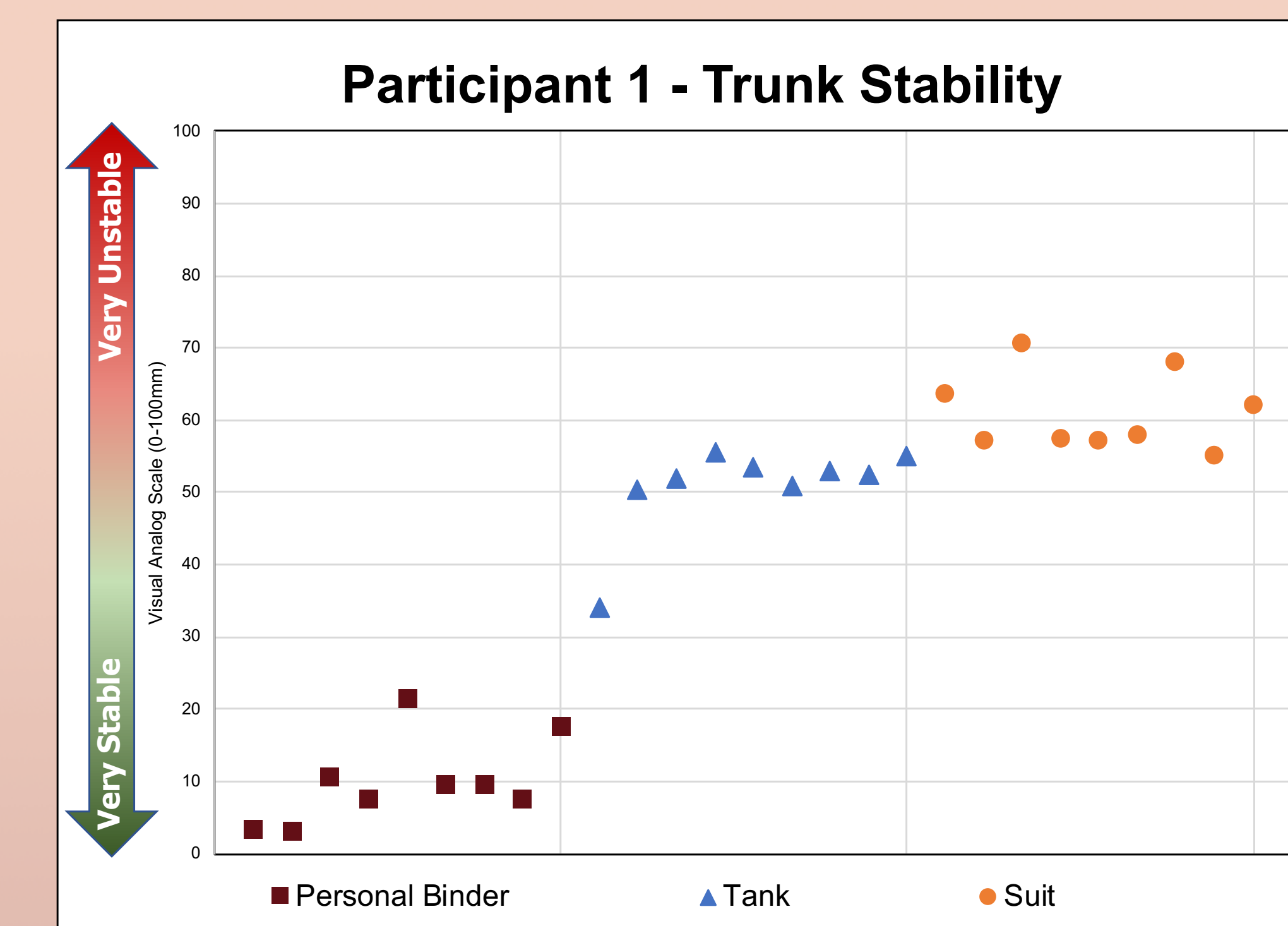
Tank

"Not as stable as my own binder."
"Cannot don/doff independently. Easier to do lying in bed, but takes extra time."
"Needed to 'work out the bugs,' but has become easier to don/doff."
"Smooth chest-to-belly transition and less pronounced chest."

Suit

"Stomach doesn't feel bound."
"Too difficult to don/doff, even with two people. Causes fatigue."
"Doesn't feel like it's compressing where it's supposed to."
"Shoulder straps scrunch my posture."

RESULTS



DISCUSSION

Outcome measures were collected on all participants. One of 5 subjects completed VAS data for all 3 weeks of the study, while 4 of 5 gave incomplete VAS data before dropping out (dropout rate = 80%). Reasons for dropout included:

- TANK: Inability to don test garment due to upper extremity ROM limitations; manufacturer's garment sizing incompatible with participant's measurements
- SUIT: Inability to independently don test garment, for those typically independent in dressing; unacceptable discomfort wearing test garment, particularly around the shoulders and genitals

There is no difference in SBP support between test garments and usual medical binders, but ease of use of these garments is a barrier to their adoption and use. Further research is needed to guide development of an attractive, easy-to-use, physiologically supportive abdominal compression garment.

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