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# 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 (SaO<sub>2</sub>)  
Forced exhalation in 1 second (FEV<sub>1</sub>)  
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 FEV<sub>1</sub> compared to no binder.
- Usual medical binders support FEV<sub>1</sub> **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, SaO<sub>2</sub>, or HR between subjects' usual binders and no binder.

Paired t-tests of Differences		
FEV <sub>1</sub>	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

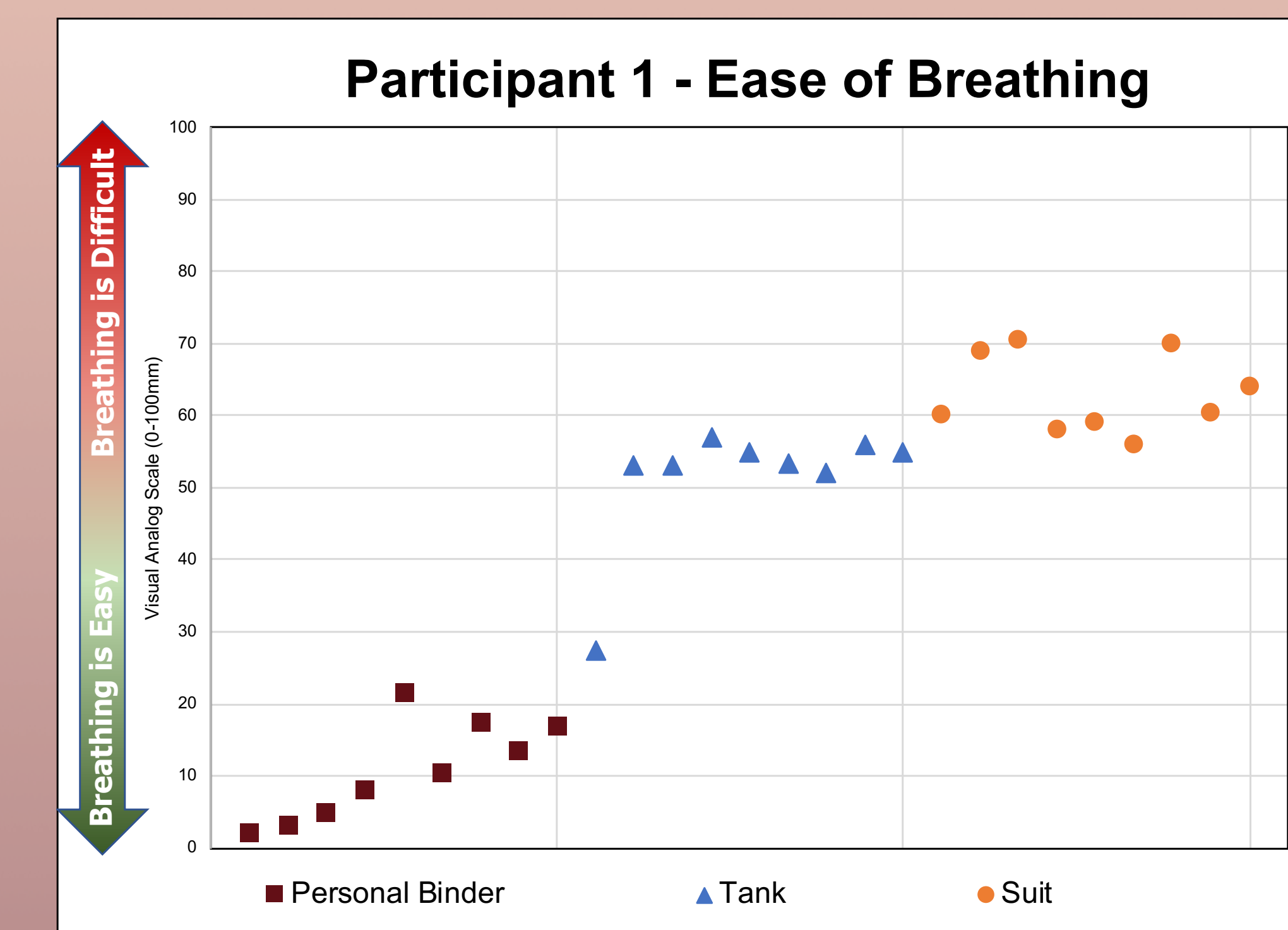
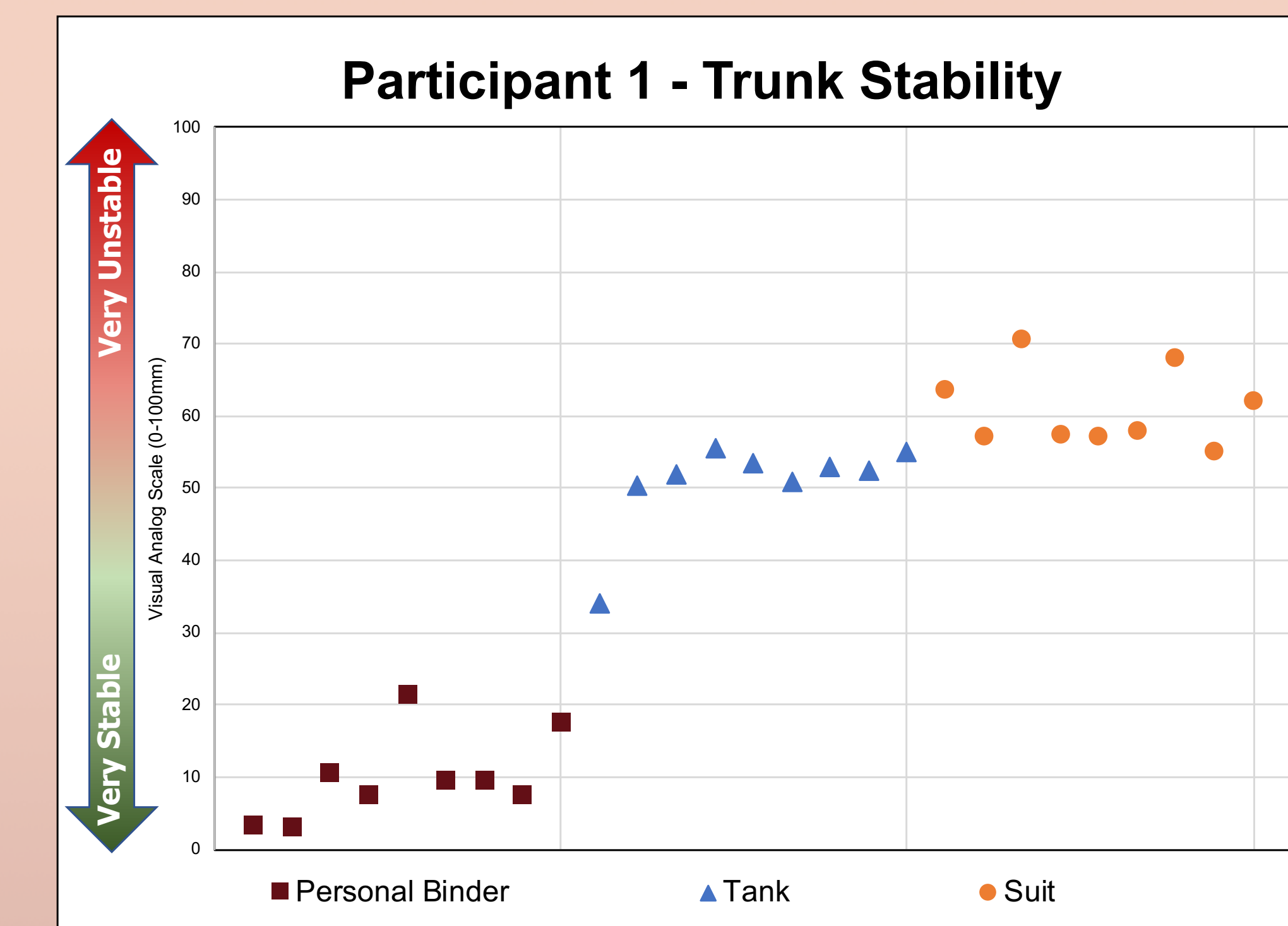
#### Tank

"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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