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

Michaela de Groot, MA, SPT; Jennifer Swartz, MA, SPT; Jennifer Hastings PT, PhD, NCS
University of Puget Sound, Tacoma WA

J. Hastings/U. Puget Sound
jhastings@pugetsound.edu

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

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

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

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.

Participants: Six participants recruited, five enrolled.

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. 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.

Diastolic and systolic blood pressure (DBP, SBP)
Blood oxygen saturation (SaO_2)
Forced exhalation in 1 second (FEV_1)
Heart rate (HR)

Paired t-tests of Differences		
FEV1	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

RESULTS

Objective Findings

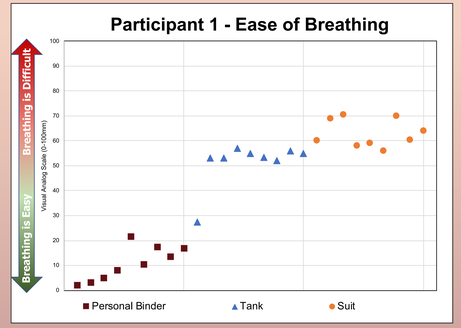
- Use of subjects' usual medical binder results in **significant increases** in SBP and FEV_1 compared to no binder.
- Usual medical binders support FEV_1 **significantly better** than the test garments.
- There is **no difference** in SBP between the test garments and the subjects' usual medical binders.
- There is **no significant relationship** between DBP, SaO_2, or HR between subjects' usual binders and no binder.

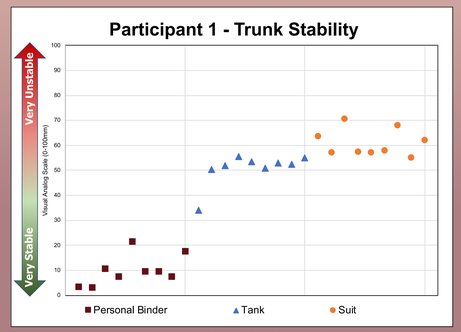
Experience Log Reports

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

CLINICAL BOTTOM LINE

- The test garments provided similar SBP support as usual medical binders.
- Although there is no difference in SBP support between test garments and usual medical binders, ease of use of test garments is a barrier to their use.
- ***Abdominal compression improves respiratory function and supports SBP in individuals with chronic SCI.***

For references and to view our e-poster, scan here