



Correlation Between Scores on the Modified CTSIB When Using the SWAY Mobile Application and NeuroCom® VSR™ Sport in Healthy Collegiate Students

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Purpose

To identify if a correlation exists between the postural sway scores on the SWAY Balance System and the NeuroCom® VSR™ Sport using the Modified Clinical Test of Sensory Interaction and Balance (mCTSIB). Identifying a correlation will provide evidence to help support the use of the SWAY Balance System as a cost-effective and portable tool for objective balance testing in the clinical setting.

Background & Significance

- Data collected from gyroscopes and accelerometers as well as force plates have been found to have a strong correlation according to various research studies. (cite)
- The Modified Clinical Test of Sensory Interaction and Balance (mCTSIB) is a tool commonly used to assess postural sway with a focus on sensory contributions.
- Few studies are available directly comparing the “score” data collected by specific systems.

NeuroCom® VSR™ Sport

- A standard for balance assessment data collection
- This system utilizes a force plate to measure postural sway.

Sway Balance™ System

- A mobile application designed to be an affordable clinical tool. Operating on Apple® products such as iPads and iPhones. This system uses the gyroscope and accelerometers within these devices to measure postural sway.

Subjects

Recruitment

- Subjects were recruited by campus-wide email and word of mouth

Exclusion Criteria

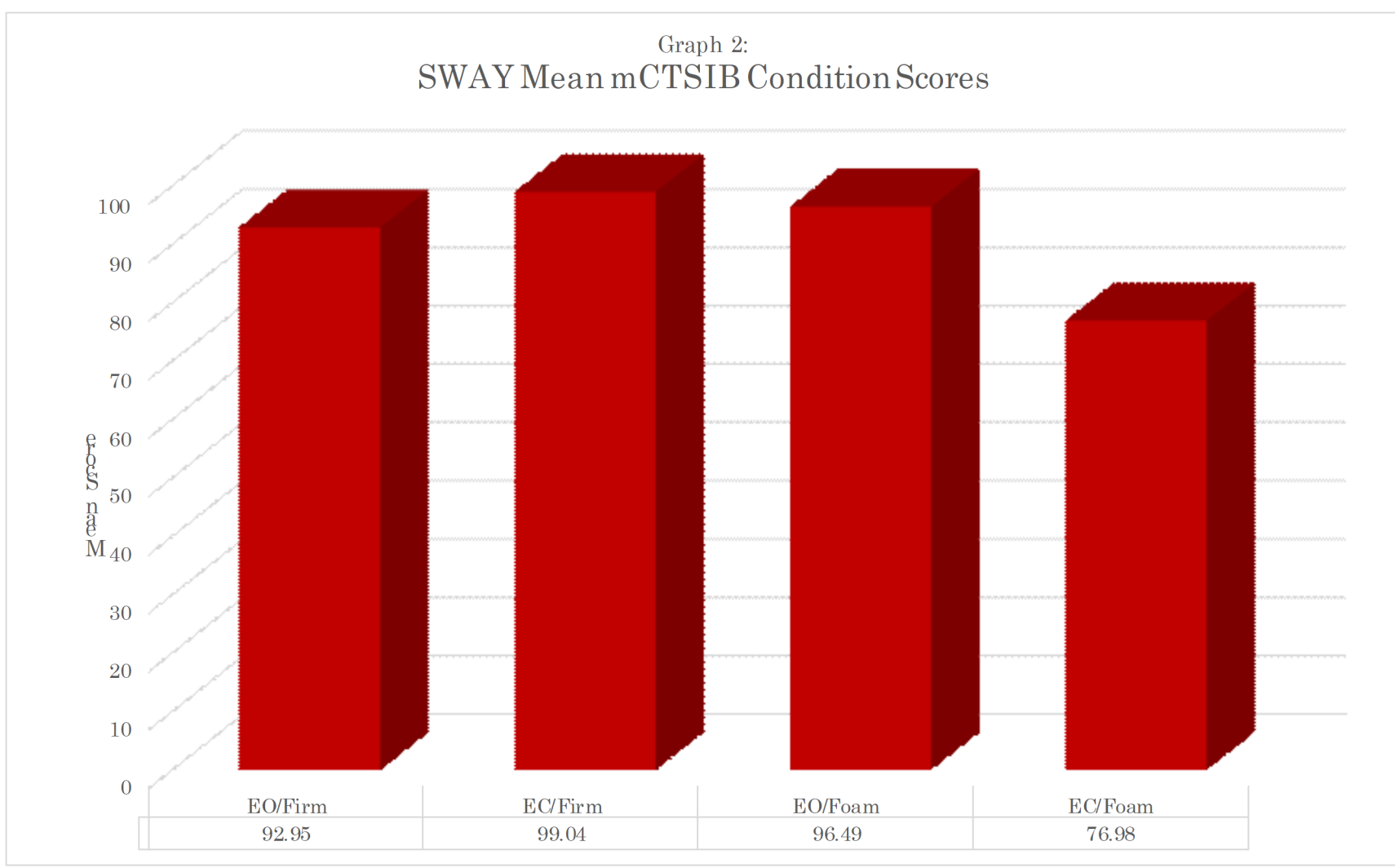
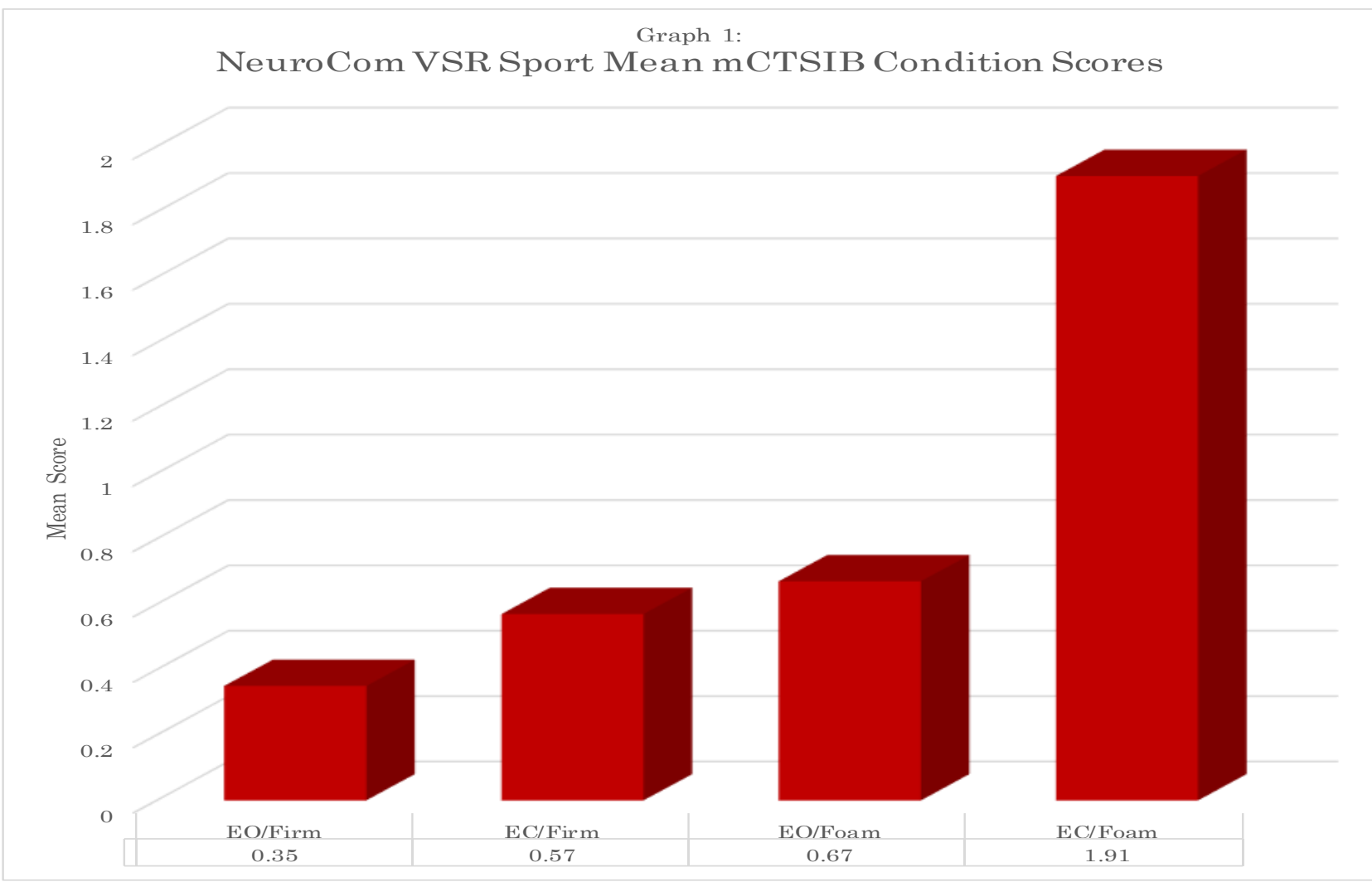
- Used and/or consumed alcohol within the past 24 hours
- Currently being treated for concussion or other head injury
- Has vertigo, a vestibular impairment or any feelings of dizziness or spinning
- Injury to the lower body within the last 3 months and/or present swelling
- Currently being treated for a lower body injury

Participant Demographic Information (Mean ± SD)					
Participants	No.	Age, y	Weight, lb	Height, in	BMI
Total	40	21.4 ± 1.66	159.05 ±	67.4 ± 3.97	24.55 ± 3.96
Male	17	22.11 ± 1.57	178.21 ±	70.35 ± 3.55	25.28 ± 3.68
Female	23	20.87 ± 1.48	144.89 ±	65.22 ± 2.50	24.02 ± 3.99

Results & Analysis

Descriptive Statistics of Composite Balance Measures				
Characteristic	Mean ± SD	Maximum	Minimum	Median
Overall (N= 40)				
VSR Sport	0.875 ± 0.18	1.4	0.5	0.9
SWAY	92.95 ± 4.24	98.1	81.6	94.15
Male (n= 17)				
VSR Sport	0.88 ± 0.17	1.3	0.6	0.9
SWAY	92.72 ± 4.92	97.8	81.6	94.6
Female (n= 23)				
VSR Sport	0.87 ± 0.19	1.4	0.5	0.9
SWAY	93.12 ± 3.65	98.1	84.3	93.9

Mean mCTSIB Condition Scores				
	EO/Firm	EC/Firm	EO/Foam	EC/Foam
VSR Sport	0.35 ± 0.08	0.57 ± 0.16	0.67 ± 0.15	1.91 ± 0.51
SWAY	92.95 ± 4.24	99.04 ± 1.02	96.49 ± 2.15	76.98 ± 15.07



Mean mCTSIB Condition Scores by Gender				
	EO/Firm	EC/Firm	EO/Foam	EC/Foam
Male (n=17)				
NeuroCom VSR Sport	0.35 ± 0.08	0.6 ± 0.16	0.71 ± 0.14	1.86 ± 0.34
SWAY	92.71 ± 4.92	98.41 ± 1.22	95.76 ± 2.47	78.05 ± 16.42
Female (n= 23)				
NeuroCom VSR Sport	0.35 ± 0.08	0.54 ± 0.15	0.63 ± 0.15	1.94 ± 0.60
SWAY	93.12 ± 3.65	99.51 ± 0.44	97.03 ± 1.69	76.19 ± 13.94

Methods & Materials

Design

- Correlational study

Materials

- NeuroCom VSR Sport system including foam, iPad and chest harness, SWAY Balance System application, Microsoft Excel, laptops, consent forms, scale and measuring tape.

Testing Measures/Procedure

- All testing was done on-site at SFU. A consent form was provided to subjects. Subjects were given instruction once and then performed the mCTSIB according to the specific protocol of each device, with participants alternating which test was performed first. Subjects completed the mCTSIB two times in total. The iPad and harness was worn during both trials. Data was recorded and analyzed for any correlation.
- During pilot testing, it was revealed that due to the protocols on the software, the timing of the tests would not match up correctly for data collection. (SWAY 30 sec, VSR Sport 3, 10 sec increments)
- Four trials were completed for each device as outlined below:

mCTSIB Conditions
1. Eyes open firm surface
2. Eyes closed firm surface
3. Eyes open foam surface
4. Eyes closed foam surface

Conclusion

- Moderate inverse correlation was found between scores during the following trials:
 - Eyes closed on firm surface (p = 0.0011)
 - Eyes closed on foam surface (p = 0.0006)
 - Composite score of all four trials (p = 0.0008)
- The SWAY Balance System may be an effective and viable tool for balance assessment
- Further research is needed using different SWAY Balance System protocols to determine if it is a reasonable alternative for use with concussed individuals