



COMPARING LIMIT OF STABILITY AND SENSORY ORGANIZATION TEST SCORES AS A PREDICTOR OF FALL RISK IN MEN AND WOMEN

Authors: Ampa Pantages

Faculty Sponsors: J.R. Wilson, Ph.D., C. Ray, Ph.D.

Center for Healthy Living and Longevity, The University of Texas at Arlington, Arlington, TX



Abstract

INTRODUCTION: Falls in older patients often occur when several tasks are performed simultaneously and have become the leading cause of injuries such as bone fractures. Factors such as reaction time, flexibility, and directional control can help determine the fall risk in older individuals.

PURPOSE: The purpose of this study was to compare the limit of stability and sensory organization test scores between men and women as a predictor of fall risk.

METHODS: Twenty-six individuals of the Center for Healthy Living and Longevity at the University of Texas at Arlington volunteered to participate in this study. The subjects performed the Sensory Organization Test (SOT) protocol and then the following week performed the Limit of Stability (LOS) protocol. Both tests used the NeuroCom.

RESULTS: Sixteen women mean age 75.8 years (± 5.9 years), mean height 162.8 cm (± 5.99 cm). For women there was a moderate negative correlation between reaction time (sec) and the SOT composite score ($r=-0.51$). There was weak positive correlations between SOT score and movement velocity ($r=0.13$), endpoint excursion ($r=0.29$), and max excursion ($r=0.37$). Ten men mean age 77.9 years (± 4.8 years), mean height 179.5 cm (± 6.9 cm). For men there was a weak negative correlation between reaction time and the SOT composite score ($r=-0.45$). There was weak positive correlations between the SOT score and movement velocity ($r=.034$), endpoint excursion ($r=.39$), and max excursion ($r=.43$).

CONCLUSION: These results indicate that limit of stability is a weak predictor of fall risk in older individuals. Only the negative relationship between reaction time and the SOT score displayed the greatest correlation and occurred more strongly in women than in men.

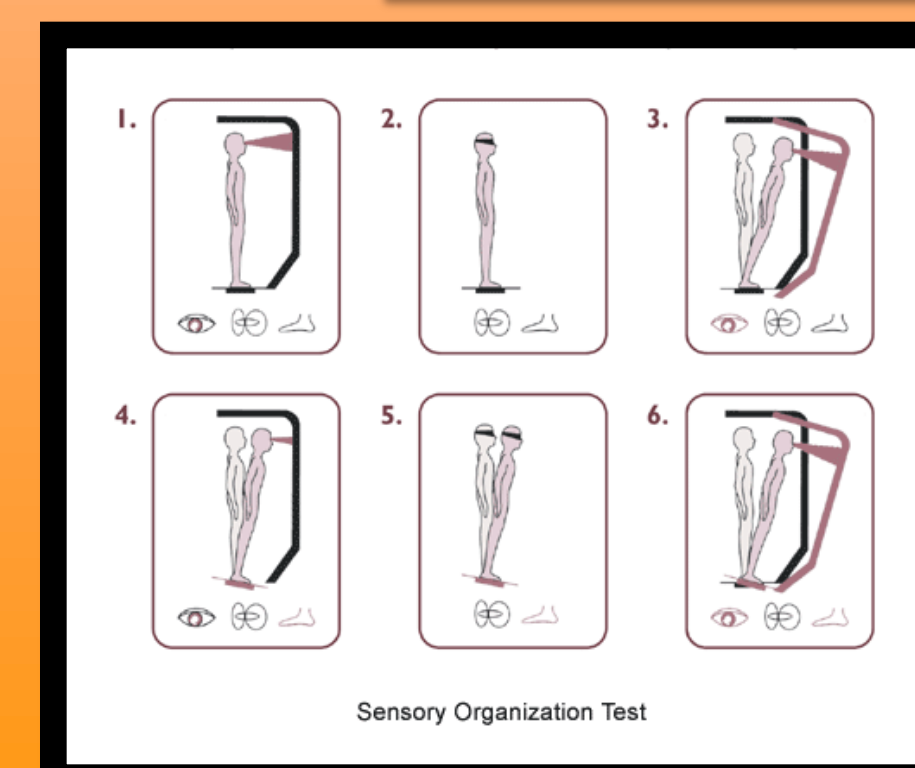
Purpose

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Methods

Twenty-six individuals of the Center for Healthy Living and Longevity at the University of Texas at Arlington volunteered to participate in this study. They were explained the procedure and signed an informed consent form. The subjects' age, height and weight were recorded. Before the protocol began they were instructed on what the procedure was and what to expect during the tests. The subjects also wore safety harnesses to prevent injury from unexpected falls and a member of the Center for Healthy Living and Longevity oversaw each subject during each tests. Both tests used the NeuroCom. The subjects performed the Sensory Organization Test (SOT) protocol which consisted of six sensory conditions.

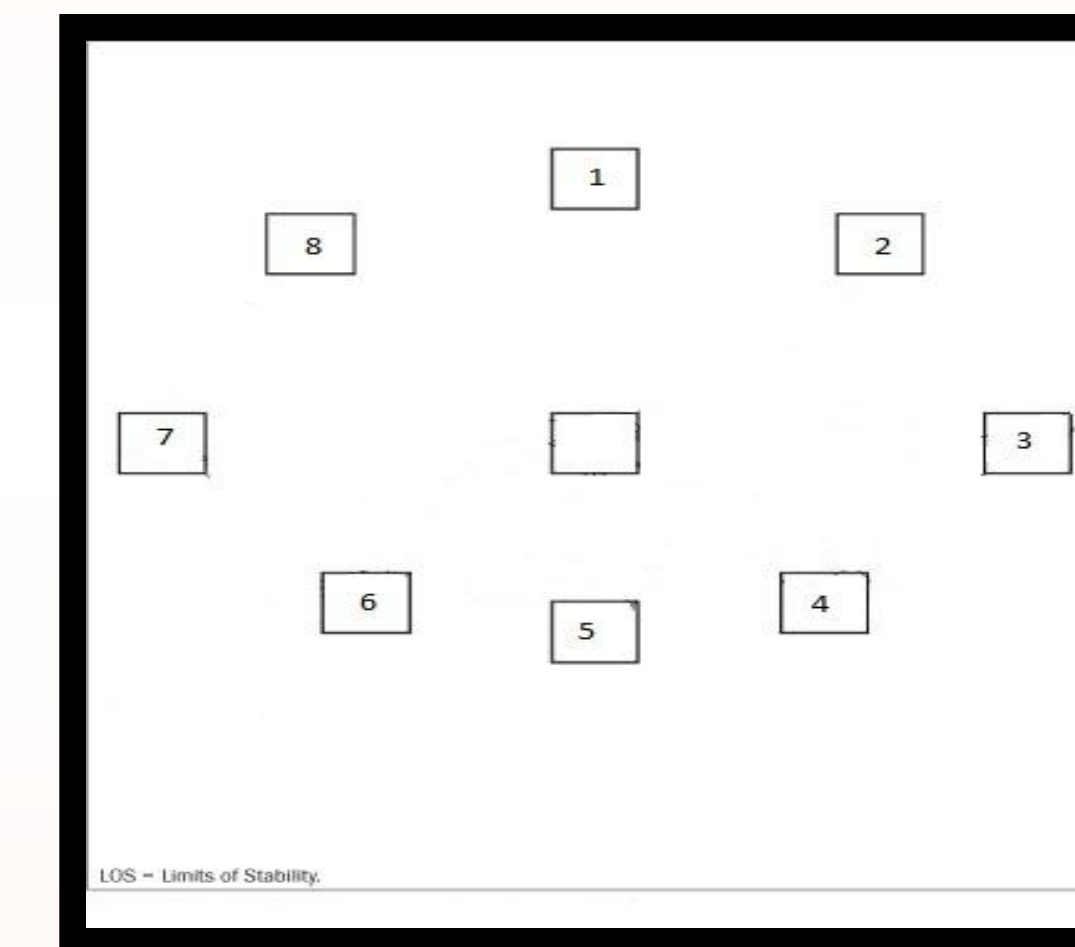
1. Eyes open, fixed support surface and surround (visual, vestibular, and somatosensory)
2. Eyes closed, fixed support surface and surround (absent visual input)
3. Eyes open, sway-referenced surround, and fixed support surface (visual input inaccurate)
4. Eyes open, sway-referenced support surface, and fixed surround (somatosensory inputs inaccurate)
5. Eyes closed, sway-referenced support surface, and fixed surround (absent visual input and somatosensory input inaccurate)
6. Eyes open, sway-referenced surround and support surface (inaccurate visual and somatosensory inputs)



Methods (cont'd)

The subjects were placed in the safety harness and stood on the NeuroCom force plate facing the monitor. There were three 20 second trials for each of the six conditions. In the first trial, each of the six conditions were performed consecutively with instructions to familiarize the subjects with the equipment. The order of the next trials were randomized. If the subject fell or stepped to maintain balance, a zero was scored. The following week subjects performed the Limit of Stability (LOS) protocol which consisted of eight directional trials. Wearing the safety harness, subjects stepped into the NeuroCom chamber and their feet were lined up properly to guidelines on the force plate. A screen in front of the subject displayed a chart with eight squares (pictured below) indicating the eight different directions they would be moving to, the center square represented the starting position.

A cursor indicated where the subject's center of gravity (COG) was located. When the trial began a red circle appeared in the corresponding square prompting the subject to begin moving the cursor towards that particular square. The subject was instructed to move the cursor towards the square as fast and as far as they could before they began to feel unstable. They had to keep the cursor in that position for 8 seconds before returning to the center square. A red circle appeared in each square to indicate the beginning of each trial until all the trials were complete.



Results

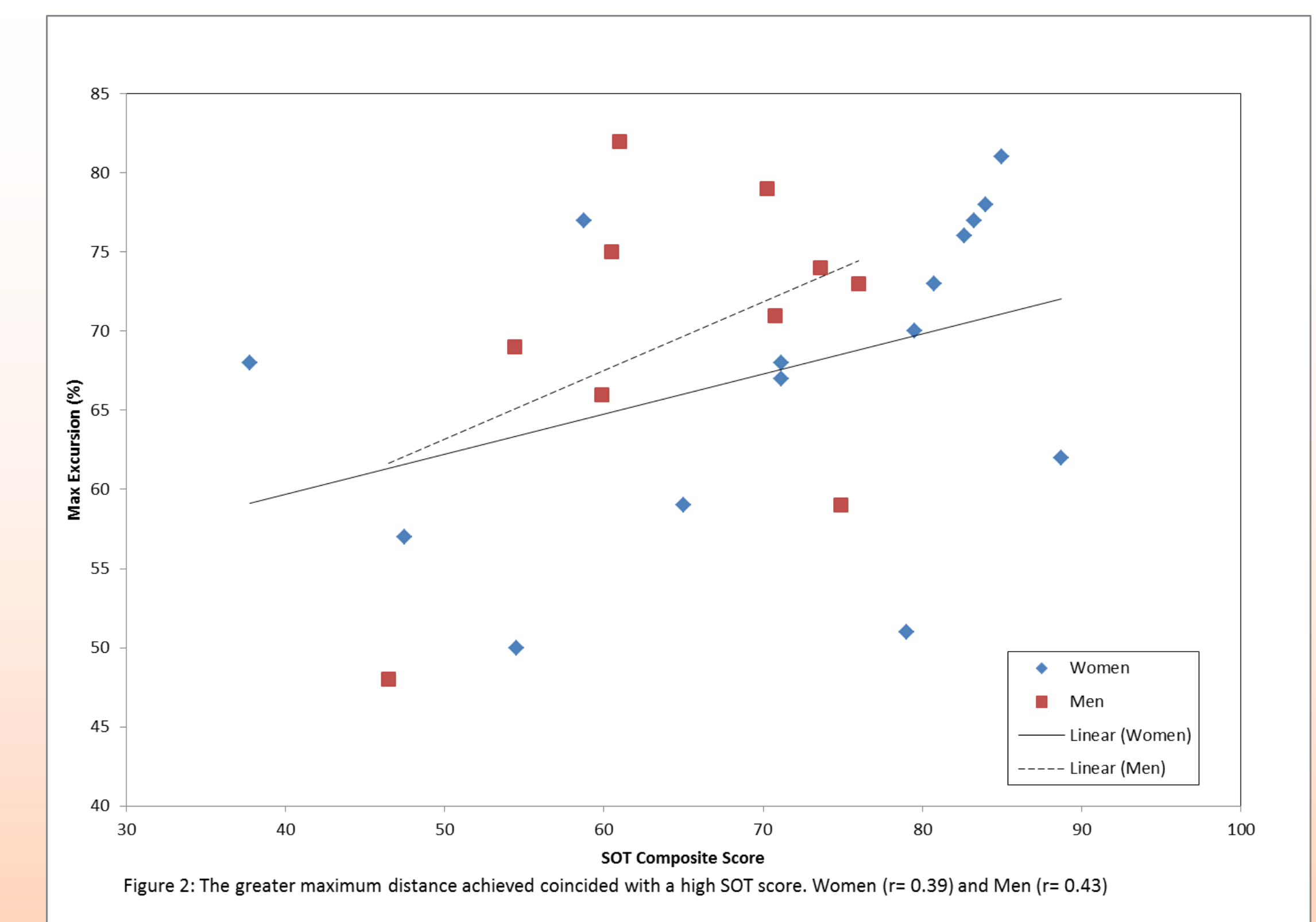
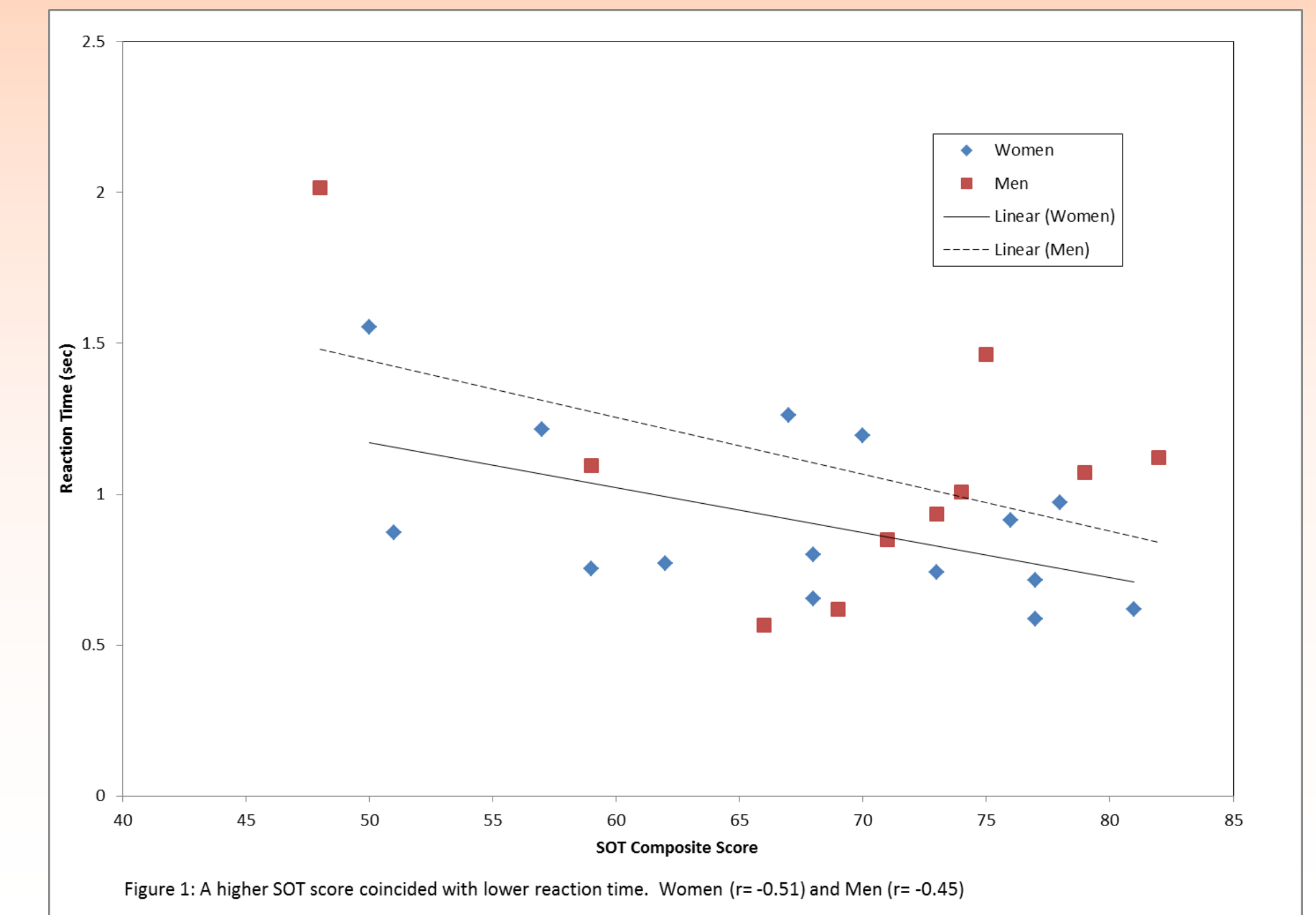
Subjects (n)	Gender	Age (years)	Height (cm)
16	Female	75.8 \pm 5.9	162.8 \pm 5.9
10	Male	77.9 \pm 4.8	179.5 \pm 6.9

Table 1: Subject demographics

	RT (sec)	MVL (deg/sec)	EPE (%)	MXE (%)	DCL (%)	Composite
Female Mean (SD)	0.91 \pm 0.26	3.3 \pm 1.3	53.2 \pm 12.1	71.1 \pm 14.4	63.6 \pm 13.3	68.25 \pm 9.6
Male Mean (SD)	1.1 \pm 0.40	2.86 \pm 0.93	46.9 \pm 8.1	64.8 \pm 9.3	63.3 \pm 7.8	69.6 \pm 9.5

Table 2: Variables measured by Limit of Stability test and the composite score from the Sensory Organization test

Results (cont'd)



Conclusions

Certain elements showed a weak to moderate relationship between SOT and LOS test scores. Reaction time displayed the greatest relationship with the SOT composite score. Subjects with a faster reaction time scored a higher on the SOT test. This indicates that subjects with faster reaction time have greater balance. The maximum excursion, or greatest distance reached in LOS, increased with the corresponding SOT score. The greater distance a subject could reach, the more time the subject has to react in order to correct instability, thus enhancing balance. There were no significant differences between men and women. Variations did occur that showed women scoring slightly higher than men. This may have been as a result of the average age, women being younger, and height difference, men being taller. More research needs to be performed to better understand the relationship between limits of stability and balance.