The effect of sensory input on the temporal structure of center of pressure in stroke survivors

Samantha Chong, BS, Takashi Sado, BS, Mukul Mukhurjee PhD.
Department of Biomechanics, University of Nebraska at Omaha, Omaha, NE USA
email: schong@unomaha.edu, web: https://www.unomaha.edu/college-of-education/cobre/

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INTRODUCTION

Stroke is the leading cause of disability that affects 17 million people worldwide. Patients post stroke suffer from maintaining balance because the brain may not be able to receive or process visual, vestibular and proprioceptive sensory information: all of which contribute towards maintaining stability. Information provided by vision is important for spatial orientation, as it develops an environmental perspective. Proprioception is detected through the stretching of tendons and surrounding tissue, and is able to help the brain determine spatial location. The vestibular system provides the sense of balance detecting rotations and linear accelerations through the vestibulo-ocular reflex. The vestibular system is important in maintaining spatial orientation and helps override sensory conflict. Postural control is a problem in stroke because it affects people carrying out activities of daily living (ADL).

It was hypothesized that when sensory feedback is absent or unreliable, balance control in stroke survivors will be worse than healthy age-matched controls. In this study, chronic stroke survivors and healthy age matched adults were recruited to go through the Sensory Organization Test with the objective of determining the effect of the contributions of each of the different sensory systems for maintaining balance during perturbed and unperturbed standing tasks.

METHODS

Data from 9 chronic stroke survivors and 9 healthy age-matched adults who underwent a sequence of standardized balance testing (the sensory organization test) was analyzed for this study. This series of tests allows us to look at the contribution of each sense towards maintaining balance on The SMART balance Master (NeuroCom International Clackamas, OR, USA). Specifically, based on the center of pressure (CoP) data in AP and ML direction, DFA was calculated to analyze long-range correlations in postural sway data. Other variables, such as root mean square (rMS) and sway range in both directions, as well as sway path was calculated. A 2 x 3 multi-factorial ANOVA was used to measure (groups: post stroke vs healthy x condition C1, C2, and C3) in SOT. And 2 x 4 multi-factorial ANOVA was used to measure (groups: post stroke vs healthy x condition C1, C4, C5, and C6) in SOT. Alpha level was set to 0.05 and further significance was tested using Turkey's HSD post-hoc test.

RESULTS AND DISCUSSION

There was no significant condition effect or interaction between the conditions and groups between the stroke group and healthy age matched group when the visual contribution (Conditions 1 to 3) was tested on the static surface for postural control.

There were significant differences in the rMS_AP (Figure 1), and range_AP (Figure 2), when the multisensory contributions were tested during the dynamic support surface conditions. However, there were no significant interactions present between the conditions and groups.

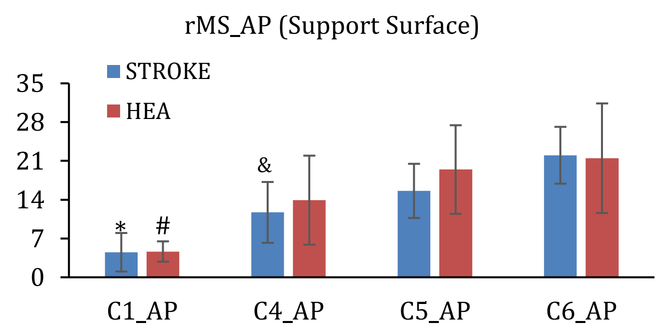

Figure 1 shows the average value of rMS in AP direction (mm) between stroke and healthy age matched group. * Indicates significant differences between C1 to C5 and C6 for stroke. # Indicates significant difference between C1 to C4, C5 and C6 for healthy. & Indicates that C4 is significantly different compared to C6

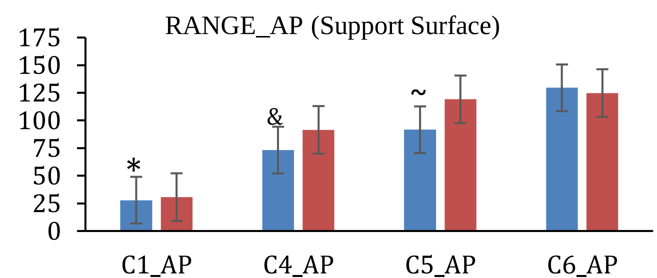

Figure 2 shows the average value of range in AP direction (mm) between stroke and healthy age matched group. * Indicates significant differences between C1 to C4, C5, and C6 for stroke. & Indicates that C4 is significantly different compared to C6. ~ Indicates that C5 is significantly different compared to C6.

References

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