

## **INFLUENCES OF HAND GRIP TASKS ON POSTURAL STABILIZATION DURING DIFFERENT BALANCE CONDITIONS.**

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**INTRODUCTION/CLINICAL RELEVANCE:** Postural stability as a measure of resistance to perturbation is a crucial component of fall prevention in physical therapy. The stabilizing influence of gripping an object has been demonstrated in the literature but the exact mechanism is unknown. The purpose of this study was to investigate whether this stabilization can be attributed to either additional somatosensory input from the hand holding an object or additional focus on performance of the secondary supra-postural task by comparing postural stability in standing and holding an actual object vs. imaginary object in hand.

**METHODS:** Twenty subjects (age mean  $22\pm 1.8$ ) were tested during three different balance conditions which were standing on a stationary surface, on a freely moving rockerboard, and on the rockerboard with an unexpected 44 Newton (N) force perturbation causing a forward tipping of the subject and rockerboard. Handgrip tasks included holding nothing, gripping a wooden stick at 5N, and imagining holding a stick at 5N. Postural stability was evaluated as average and maximum velocity of the Center of Mass (COM) compared across all experimental conditions with the use of mixed ANOVA at significance level  $<0.05$ .

**RESULTS:** Average COM velocity was equally reduced during the stationary surface and rockerboard conditions when subjects physically held and imagined holding the stick at 5N. However during perturbation subjects failed to show any postural stability improvements regardless of handgrip task.

**DISCUSSION:** The results indicate that both that during low demand balance tasks a similar strategy is used which improves equally with somatosensory input and supra-postural tasks. However during more difficult conditions subjects appear to employ a different strategy to maintain postural stability regardless of task.

**CONCLUSIONS:** Results indicate that subjects performing a suprapostural task have improved balance but when challenged via a perturbation condition this effect disappears indicating a possible change in cognitive strategy. This study helps establish a context for balance aid strategies which provide tactile input for vulnerable patient populations at risk for falls.