The Effect of Fatigue on Balance and Fall Risk using Balance Outcome Measures in Community Dwelling Older Adults: A Systematic Review

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INTRODUCTION

One fourth of all Americans aged 65+ fall each year. Falls are the leading cause of non-fatal injuries for older Americans. Falls threaten the safety and independence and generate enormous economic and personal costs. Common conditions that can lead to a fall include: weakness/fatigue, balance loss, vision loss, improper footwear, medications, and vitamin D deficiency. Falls result in more than 2.8 million injuries treated in emergency departments annually, including over 800,000 hospitalizations and more than 27,000 deaths.

PURPOSE

To investigate the impact of fatigue on balance ability and fall risk in older adults, recorded through the use of both clinical and laboratory/instrumented balance tests.

METHODS

The search was limited to human subjects and studies conducted between 2006 and 2016. Search engines used included: CINAHL, ProQuest Health and Medical Complete, Science Direct, Google Scholar databases. The primary search terms included “fatigue,” OR “exhaustion,” AND “balance,” AND “elderly,” OR “older adults,” OR “senior,” OR “geriatric,” AND “falls.” These search terms yielded 8,935 articles from the four databases. Using inclusion and exclusion criteria, a total of 8 non-randomized cohort studies were selected to review. Our selection criteria was community dwelling older adults >60 y/o, balance measures and level 2 evidence or higher. Five out of the 8 studies were comparative studies which scored a mean of 18/24 on the MINORS Scale. Three out of the 8 studies were non-comparative studies which scored a mean of 13.33/16 on the MINORS Scale.

RESULTS

Concerning clinical outcome measures, one study found a significant decrease in Berg Balance Scale scores in the older adults after fatigue; one study found a decrease in the Single Leg Stance Time Test, Lower Extremity Reach Test, and modified Functional Reach Test in the older adults after fatigue. Studies that used laboratory/instrumented tests of older adults to look at the effects of fatigue demonstrated a significant increase in sway, step length, mediolateral trunk acceleration, step length variability, and lead limb vertical loading rate. Scores were significantly decreased when using the Modified Clinical Test of Sensory Integration and Balance test. All of these differences were found to be statistically significant; p < .05 - .001.

CONCLUSIONS

Fatigue has a statistically and clinically significant effect on the performance of older adults on both clinical and laboratory/instrumented balance tests. These tests revealed both lower scores on balance tests and an increase in kinetic gait deviations associated with increased fall risk. This indicates that fall risk assessment may be more representative of real-life situations when performed with the subject in a fatigued state. Limitations of the systematic review include varied fatigue protocols and outcome measures.

Search result from all databases = 8,939
Duplicates removed = 2
Articles excluded by title and abstract = 8,906
Articles excluded by full text = 23
Total articles included = 8

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CLINICAL RELEVANCE

Fatigue impacts older adult’s performance on balance tests conducted to determine fall risk. Healthy older adults not determined to be a risk for fall via clinical and laboratory balance testing might, in actuality be at risk for fall when tested in a fatigued state. Walking tests, such as the 6min walk test, may be a useful functional fatigue protocol, as every outcome measurement done in these studies directly relates to gait and balance while walking. Future studies should be conducted focusing on the effect of fatigue during functional tasks to determine what tasks are the most common causes of fatigue that could result in an increase in fall risk.

References: