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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Background$^{1,2}$

➢ One fourth of all individuals aged 65 and older fall each year in the US

➢ Falls are the leading cause of fatal and non-fatal injuries for older adults in the US

➢ Falls threaten personal safety and independence while also generating enormous economic and personal costs

➢ Common factors that can lead to a fall:
  ○ 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 on average every year

➢ Falls can result in up to 27,000 deaths on average every year
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 balance tests.
Methods

- **Literature search**: CINAHL, ProQuest Health and Medical Complete, Science Direct, and Google Scholar

- **Search terms**: fatigue OR exhaustion AND balance AND elderly OR older adults OR senior OR geriatric AND falls

- **Search Limitations**: human subjects and studies conducted between 2006 and 2016.
Eligibility Criteria

- ≥ 60 y/o community dwelling older adult
- Individuals balance and muscle responses tested after fatigued
- All study types were accepted
Prisma
# MINORS Scores

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Results$^{6,8-10}$

Clinical Outcome Measures:

➢ Decrease in Berg Balance Scale scores in older adults after fatigue

➢ Decrease in the Single Leg Stance Time Test, Lower Extremity Reach Test, and modified Functional Reach Test in the older adults after fatigue

➢ Decrease in Physiological Profile Assessment in the older adults after fatigue
Results$^{3-5,7}$

Laboratory Tests:

- Increase in sway, step length, mediolateral trunk acceleration, step length variability, lead limb vertical loading rate
- Decreases in foot reaction time, minimum foot clearance, average margin of stability, amplitude and vertical force of the lower extremity in phase to touchdown
- Decreases in scores when using the Modified Clinical Test of Sensory Integration and Balance test
- All of these differences were found to be statistically significant between p$<.05$ - .001
Limitations

➢ Each study used different fatiguing protocols and outcome measurements.
➢ None of the studies found were randomized controlled trials.
Conclusion

➢ Fatigue has a statistically and clinically significant effect on the performance of older adults on both clinical and laboratory balance tests.

➢ These results included both lower scores on balance tests and an increase in kinematic gait deviations associated with increased fall risk.

➢ Fall risk assessment may be more beneficial when performed with the subject in a fatigued state.
Clinical Relevance

➢ Fatigue impacts older adults’ performance on balance tests conducted to determine fall risk.

➢ A fatiguing task done prior to performing a balance test would be a highly functional combination to use as a primary prevention screen for fatigued fall risk in older adults.
Clinical Relevance

➢ Healthy older adults determined to not be a risk for fall via clinical and laboratory balance testing might actually be at risk for fall when tested in a fatigued state.

➢ Walking tests such as the 6-minute walk test may be the best functional fatigue protocol to use in a clinical setting as every outcome measurement done in these studies directly relates to gait and balance while walking.
Suggested Future Research

➢ Future studies should try and focus on more clinical outcome measure and functional fatigue tasks. For example, use the 6 minute walk test to fatigue the patient and then use a clinical outcome measure such as the BBS to measure fall risk and balance. There is no standardized fatiguing protocol.
Thank you!

- Dr. Leininger, PT, PhD, OCS
- Bonnie Oldham, MS, MLS, AB
- Dr. Sanko, PT, EdD
- Dr. Tracy Collins, PT, PhD, MBA, GCS
Questions?
References


