Early muscle activation of the hip abductors in older adults with fall risk.

M.B. Lanza, PhD, Nathan Frakes, MS, and V.L. Gray, MPT, PhD
Department of Physical Therapy and Rehabilitation Science, University of Maryland Baltimore, School of Medicine, Baltimore, MD, USA

UNIVERSITY of MARYLAND SCHOOL OF MEDICINE
PHYSICAL THERAPY AND REHABILITATION SCIENCE

Introduction

- The ability to generate muscle power requires rapid activation of the muscles[1] .
- In healthy older adults, those that rapidly activate the hip abductor muscles initiate a step faster[2].
- Thus, the ability to rapidly activate the hip muscles early in the movement may have clinical relevance.
- Therefore, the aim of this study was to compare the early muscle activation phases of the hip abductor muscles during a hip abduction power test between older adults within fall risk and no-fall risk status.
- The second aim was to investigate the association between hip abductor rate of activation and clinical tests, Stair Climb Power Test (SCPT), and 30-second Chair Stand Test (30CST).

Methods

- Twenty-two older adults were divided into two groups: fall risk (n=8) and no fall risk (n=14) and visited the lab twice.
- First lab visit: hip abduction one-repetition maximum (1RM) and 30CST and the SCPT tests.
- Second lab visit: two submaximal tests were performed at 10% and 75% of 1RM as fast as possible. Surface EMG sensors were positioned over the gluteus medius (GM) and tensor fascia latae (TFL) muscles.
- EMG rate of activation from the 75% of 1RM was calculated from 0-100 and 100-200 ms.
- Two-way Repeated measures was used to compare EMG, and Spearman correlation to investigate the association between EMG and clinical tests.

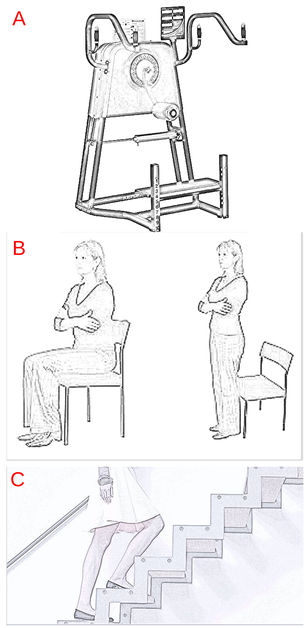

Figure 1: (A) Keiser machine, (B) 30-second Chair Stand Test (30CST), (C) Stair Climb Power Test (SPTC).

Results

Table 1. Demographics and clinical outcome measures

	Risk of Fall (N=8)	No Risk of Fall (N=14)
Age (years)	70.8 ± 4.2	71.5 ± 4.2
Gender (male/female)	2/6	3/11
Height (m)	1.63 ± 6.1	1.66 ± 8.9
Body Weight (Kg)	82.3 ± 10.7	81.8 ± 22.0
SCPT (W)	234.4 ± 65.8	314.1 ± 73.3
30CST (count)	10.2 ± 1.9	15.3 ± 3.2

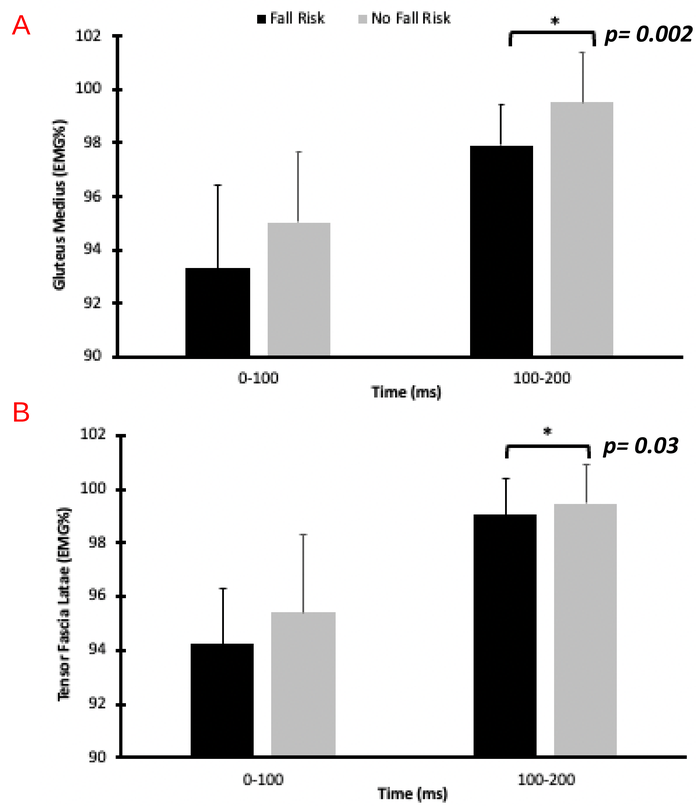

Figure 2. Figure 1. Gluteus medius (A) and tensor fascia latae (B) muscles activation at 0-100 and 100-200 ms during hip abduction power task normalized by muscle activation during a submaximal contraction (10% of 1RM). Symbols denote a significant difference (P< 0.05) between different time points within group. Data are presented as mean ± SD.

Results

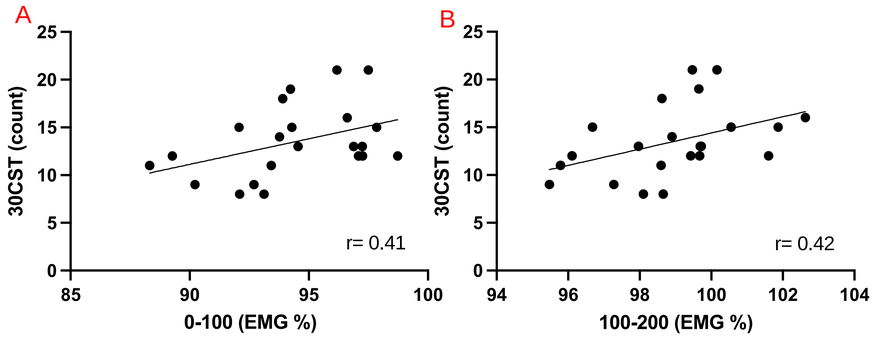

Figure 3. The relationship between GM rate of activation at both time points (0-100 /100-200 ms) and the 30CST.

Conclusions

- The ability to rapidly activate the hip abductors (GM and TFL) during a hip abduction power test increased at 100-200 ms, with differences in the groups found in the later time.
- However, rate of activation (0-100 ms) was similar between older adults classified with risk of fall or non-risk of fall.
- A higher rate of activation of the GM muscle (at both time points) was associated with the number of chair raises. Thus, the ability to quickly activate the gluteus muscle may influence the ability to stand from a chair.
- Future research should explore the role of the hip abductors activation in other well-used clinical assessments such as the Time Up and Go and/or gait assessments.

References

1. Reid KF, Fielding RA. Skeletal muscle power: a critical determinant of physical functioning in older adults. Exerc Sport Sci Rev. 2012.
2. Lanza MB, Rock K, Marchese V, Addison O, Gray VL. Hip Abductor and Adductor Rate of Torque Development and Muscle Activation, but Not Muscle Size, Are Associated With Functional Performance. Front Physiol. 2021.

Funding
NIH/National Institute on Aging (NIA), Hip Muscle Power, Lateral Balance Function and Falls in Aging R01AG060051-01.