

# Can handgrip strength be used as a predictor of balance in the elderly?

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## Summary

The aim of this study was to determine whether hand grip strength can be used as a predictor of balance in the elderly which is important in the context of an aging population and the need to develop simple indicators to assess the risk of falls and plan preventive measures. Forty-one elderly people participated in the study. The Zebris FDM stabilography platform was used to assess postural stability, and the Noraxon SmartLead handheld dynamometer was used to assess compression strength. Based on the results of Pearson correlation analysis, a moderate relationship was found between hand grip strength and stabilographic parameters such as COP path length and average COP velocity.

## Introduction

The hand grip test is a quick, simple and inexpensive test that is a general indicator of physical fitness and functional health. It is commonly performed by physiotherapists [1,2]. Stabilography, on the other hand, provides an assessment of balance, a key factor in preventing falls [3]. The aim of this study is to determine whether hand grip strength can be used as a predictor of balance in older people. This is important in the context of an ageing population and the need to develop innovative digital diagnostic tools and simple indicators to assess fall risk and plan preventive interventions.

## Methods

The study included 41 subjects with a mean age of 70.9±4.1 years. The study included a stabilography assessment using the Zebris FDM platform, according to the Romberg test. The subjects stood with their arms along their bodies and their feet positioned hip-width apart. The duration of the test was 60 seconds, of which the middle 30 seconds were selected for analysis. In addition, a test of maximum hand grip strength was conducted in a sitting position with the upper limb bent 90° at the elbow joint using a Noraxon SmartLead hand

dynamometer. Each person took three measurements with the dynamometer, using both the dominant and non-dominant limb.

## Results and Discussion

Pearson correlation analysis was conducted between hand squeeze strength (dominant limb, non-dominant limb, and average of both limbs) and stabilographic parameters such as path length and 95% ellipse area. The results of the analysis indicate a significant moderate correlation between squeeze force and COP path length in the entire group.

In addition, the analyses were divided into groups with higher and lower grip strength for the dominant and non-dominant limb and for path length values. In the higher and lower grip strength subgroups, the correlations were weaker and mostly not statistically significant. In contrast, when subgroups were formed according to path length, stronger and significant correlations were observed, especially for the dominant limb and the average of both limbs.

## Conclusions

There is a moderate correlation between hand grip strength and stabilographic parameters such as COP path length and average COP velocity, especially for the dominant limb.

## References

- [1] Alonso AC, et al. (2018) *Association between handgrip strength, balance, and knee flexion/extension strength in older adults*. *PLOS ONE* **13**(6).
- [2] Mandalidis D, et al. (2010) *Relationship between hand-grip isometric strength and isokinetic moment data of the shoulder stabilisers*. *J Bodyw Mov Ther.* **14**(1):19-26.
- [3] Howcroft J, et al. (2017) *Elderly fall risk prediction using static posturography*. *PLOS ONE* **12**(2)

**Table 1:** Person correlation coefficients between postural stability (COP path length and 95% ellipse area) and hand grip strength of the dominant limb, non-dominant limb, and the average of both limbs, for the whole group and the subgroups with longer and shorter COP paths (\*p<0.05).

	Hand grip - dominant limb			Hand grip –non-dominant limb			Hand grip - average of both limbs		
	The whole group	Higher value of path length	Lower value of path length	The whole group	Higher value of path length	Lower value of path length	The whole group	Higher value of path length	Lower value of path length
COP path length [mm]	0.313*	0.194	0.541*	0.381*	0.43	0.465*	0.357*	0.32	0.516*
95% confidence ellipse area[mm <sup>2</sup> ]	0.272	0.085	0.318	0.222	0.166	0.159	0.255	0.129	0.245