CENTER FOR RESEARCH IN HUMAN MOVEMENT VARIABILITY

DEVELOPING A FOOTSWITCH DEVICE TO ASSESS THE LIKELIHOOD OF FALLS IN AT-RISK POPULATIONS

Arash M. Gonabadi[1], Prokopios Antonellis[1], Travis Vanderheyden[1], Karina I. Bishop[2] & Philippe Malcolm[1]

[1] Department of Biomechanics, University of Nebraska at Omaha, Omaha, NE 68182, USA

[2] Department of Internal Medicine, University of Nebraska Medical Center, Omaha, NE USA

INTRODUCTION

- Falls are one of the main causes of injuries, reduced functioning and even mortality amongst older adults [1].
- Most of falls occur during walking and fall risk is directly associated with walking mechanics which could be analyzed by analyzing gait variability using nonlinear analyses [2].
- Healthy states reflect the adaptability of the underlying control system [3] while pathological gait can be either too regular or too random [4].

Purpose

- The main objective of this study is to develop a footswitch device including a programmed microprocessor electronic board and insoles with pressure sensors to measure gait variability and evaluate fall risk in at-risk populations (e.g. the elderly).

METHODS

Participants

- 20 healthy older adults and 10 older participants with an experience of fall will be recruited in this study

Clinical measurements

1) The timed up and go test.
2) The Berg Balance scale test.
3) The dynamic gait index test.

Experimental protocol

- we will ask participants to walk on a treadmill for 10 minutes at 0.8 [m/s]
- Foot switch prototype (gait-o-gram) will be placed under the participant's heels and toes to capture the temporal parameters of gait as they walk on the treadmill (Fig. 1).

✓ Stride interval time series from the footswitch data will be extracted
✓ Two nonlinear analysis methods (Coefficient of Variation and Detrended Fluctuation Analysis) will be applied to assess gait variability between healthy older adults and older adults who experienced a fall (Tab. 1).

	Gait-O-Gram	Gold standard (Bertec)	Average difference (%)
Stride time (s)	1.27 ± 0.17	1.27 ± 0.17	-0.1
Coefficient of Variation (dimensionless)	0.031 ± 0.014	0.028 ± 0.013	+9.8
DFA scaling coefficient (dimensionless)	0.88 ± 0.17	0.80 ± 0.02	+9.7

Table 1. Comparison of measurements with footswitch to gold standard (Bertec treadmill). Results are from 3 participants.

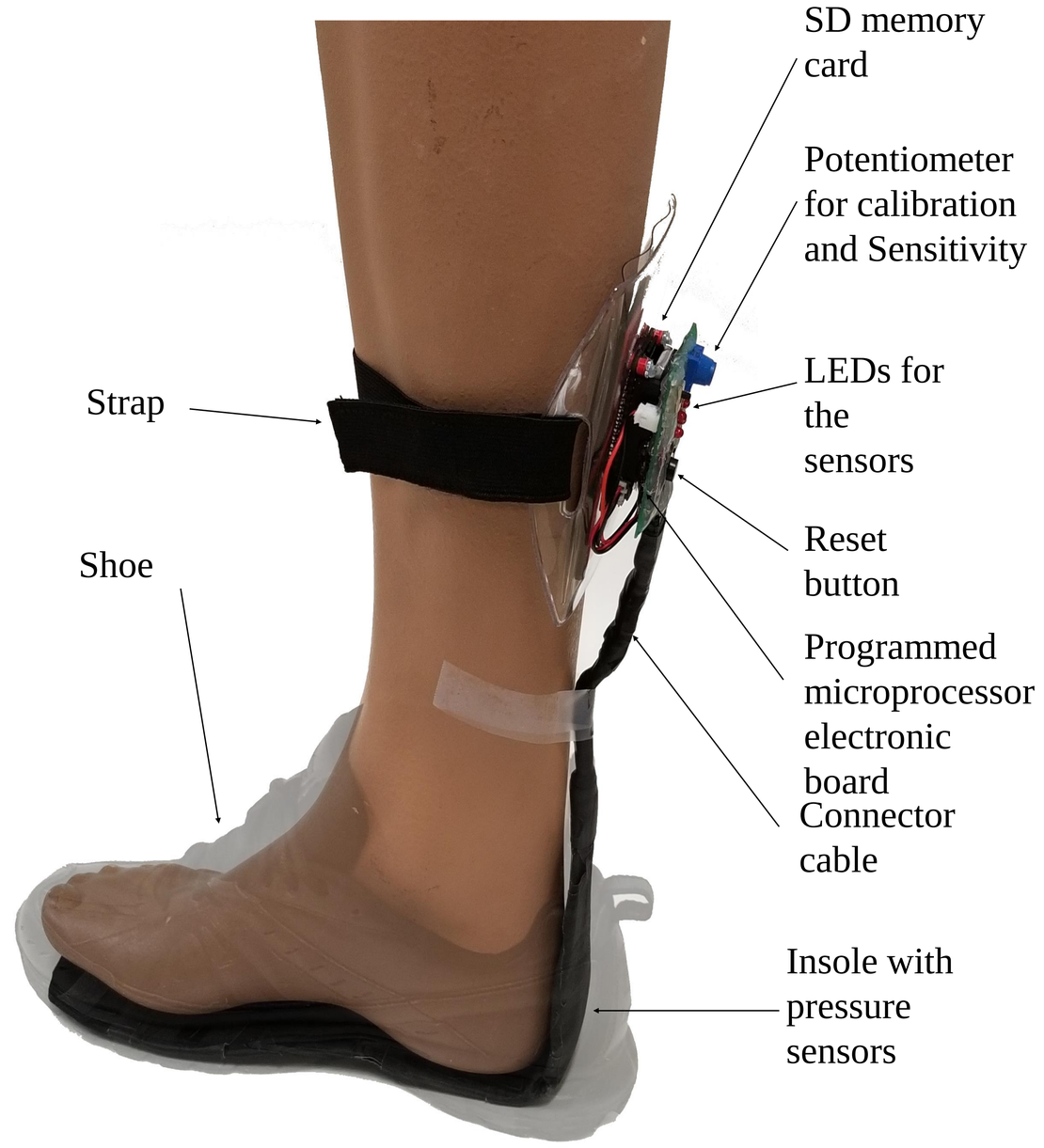

Figure 1. Footswitch device with the insole and sensors

ANTICIPATED RESULTS & DISCUSSION

- The association between the results obtained from the footswitch device and the clinical functional tests could provide an accurate and inexpensive gait assessments.
- This research could provide the basis for moving gait analysis out of otherwise immobile (and expensive) clinical laboratories to a portable system.

ACKNOWLEDGEMENTS

This study was supported by J. Brasch. Co. LLC. The authors would like to thank Alec Harp for help with data collections and Joe Runge from UNeMed for project planning.

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UNIVERSITY OF Nebraska Omaha