

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

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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

- The timed up and go test.
- The Berg Balance scale test.
- 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.

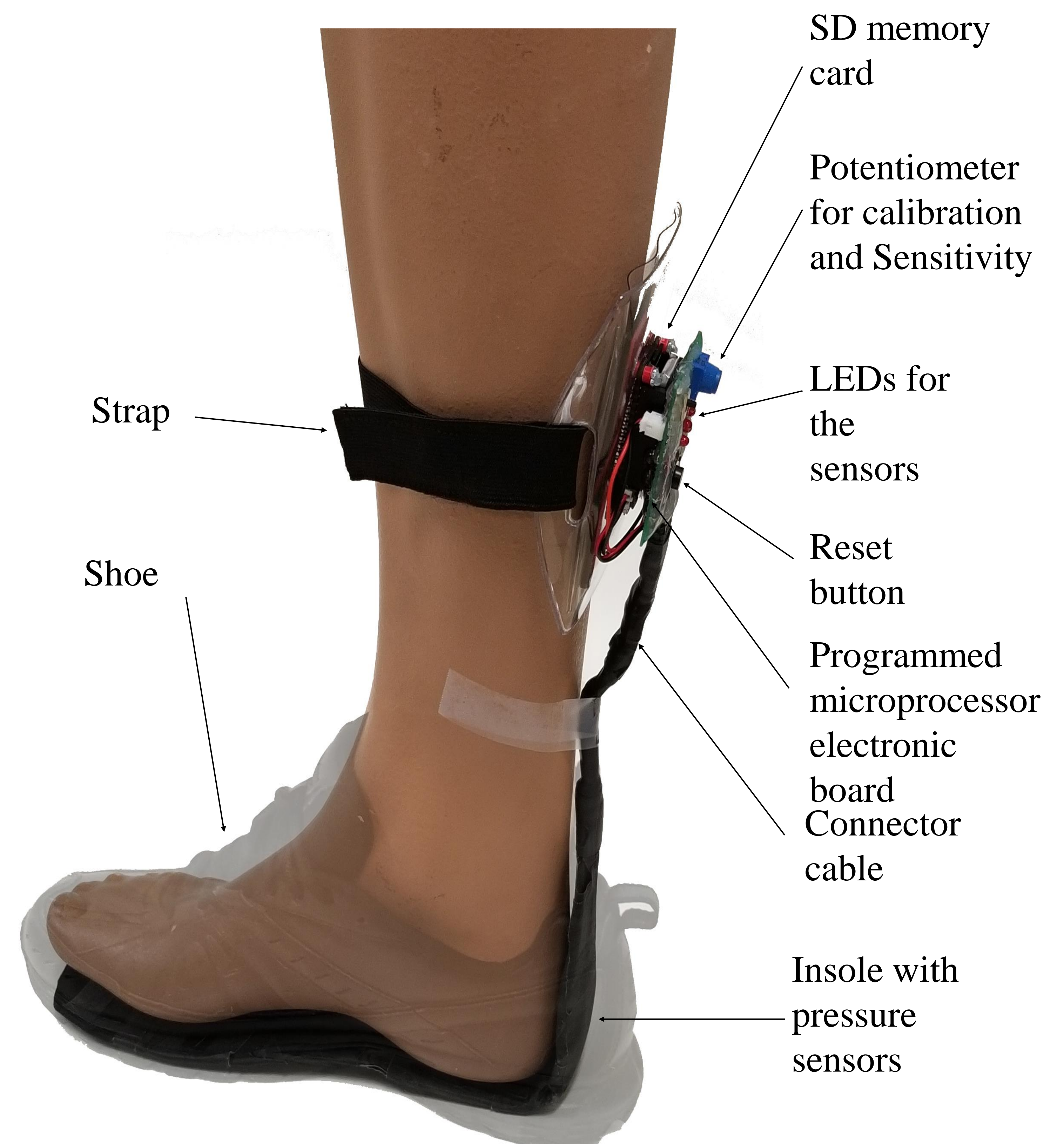


Figure 1. Footswitch device with the insole and sensors

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.

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