Added value of wearable sensors for fall risk assessment in an older adult group

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Objectives

Falls represent the leading cause of death-related injuries in older adults. Free-living activity recorded from wearables may offer a method to characterise people at risk. In this investigation we re-analyse a publicly available database to evaluate the added value of wearables in identifying fall risk.

Methods

Recruited healthy older adults were categorised as fallers if self-reported two or more falls (N=31) and as controls if only one or none (N=37) over a year period [1]. Participants had cognitive and in-clinic gait assessments and showed no evidence of gait or cognitive disorders. All participants were given a wearable sensor positioned near L5 and wore it for three days.

From the accelerometry data, gait bouts were identified using an in-house step-detection algorithm, divided in 20-second segments, and 74 gait features extracted per segment [2].

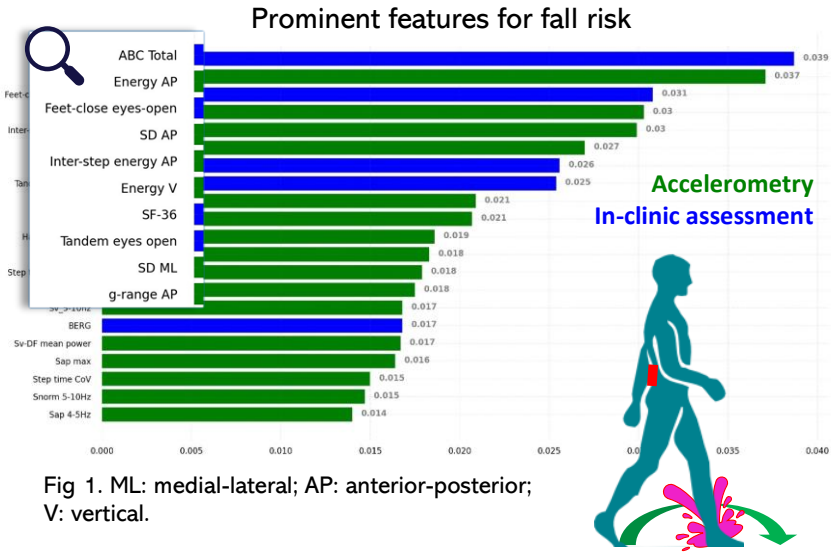

Fig 1. ML: medial-lateral; AP: anterior-posterior; V: vertical.

Results

The free-living gait features resulted in a 63% accuracy (50% sensitivity, 81% specificity). The in-clinic scores showed an accuracy of 72% (61% sensitivity, 81% specificity). When combining both feature sources, accuracy was 75% (61% sensitivity, 86% specificity). Prominent features are shown in Figure 1.

Conclusions

The ABC-total questionary resulted the most significant feature in the database, this was not surprising since the study is a retrospective study; participants grouped as fallers have suffered two or more falls and their walking confidence is already altered. However, both groups did not show a significant difference in their gait assessments.

Wearable gait features that resulted important for fall risk classification were related to anterior-posterior (AP) acceleration, specifically the AP signal energy.

Our future work will focus on whether wearable assessments can provide additional benefits in Parkinson's disease patients as opposed to the healthy participants studied here.

[1] Weiss A et al., Does evaluation of gait quality during daily life provide insight into fall risk? A novel approach using 3-day accelerometer recordings. 2013.
[2] Peraza LR et al. An adaptive step detection algorithm for waist-worn wearable devices: A feasibility study in older adults. **Poster 705**, ADPD 2021