BEYOND GAIT SPEED

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Introduction

Measuring gait with inertial measurement units (IMUs) during clinical assessment results in new, objective information about the way people walk after stroke [1,2]. However, it is unclear if the way people walk after stroke is associated with walking ability in daily life. This study evaluated the additive value of IMU-based gait features over a simple gait speed measurement in the estimation of the walking ability.

Methods

Every fortnight, participants walked for two minutes on a fourteen-meter path with three IMUs. The dimensionality of the corresponding gait features was reduced with a principal component analysis. During the two days after the two-minute walk test, the walking ability was assessed by measuring the number of steps, and average and maximal gait speed in daily life. A gait-speed only linear mixed model was used as baseline model per daily life gait characteristic with the participant as the random effect. The principal components (PC) were added to the models via a forward selection procedure. Finally, the model fit of the combined models was compared to the baseline models.

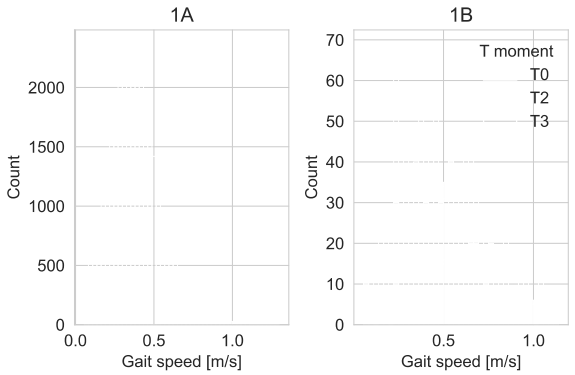

Figure 1: Distributions of gait speed in daily life of all measurements of all participants (1A), and of three measurements of one randomly selected participant (1B). The gait speed, measured with the two-minute walk test, of the participant in figure 2B was 0.75m/s at T0, 1.16m/s at T2, and 1.28m/s at T3.

Results

Eighty-one participants were measured during rehabilitation, resulting in 198 two minute walk test measurements and 135 corresponding daily life measurements (figure 1). The gait features were reduced to nine PCs with 85.1% explained variance. The linear mixed models demonstrated that gait speed measured with the 2 minute walk test was weakly associated with average and maximum gait speed and moderately associated with the number of steps per day (figure 2). The PCs did not considerably improve the outcomes in comparison to the gait speed only model.

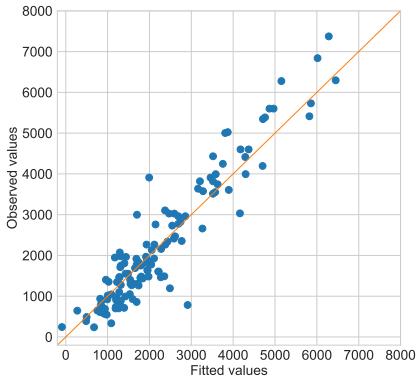

Figure 2: Scatterplot of the predicted versus the actual score of the number of steps in daily life.

Discussion

Measuring the way people walk after stroke with IMUs does not provide additive value in the estimation of walk ability in daily life. Future research should indicate if measuring gait with IMUs improves prediction of other relevant elements during rehabilitation.

References

1 Felius et al, Sensors, 22(3),2022.
2 Shin et al, Journal of Biomechanics, 105:109761, 03 2020.

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