Discussion

TF patients showed to have lower ROM than healthy controls, mainly at the hip and knee joints, in the sagittal plane, and reduced gait speed, which is somehow consistent with Sivakumar et al (2023) [6], but not with other research [1]. However, gait kinematics did not differ between 3M and 6M post-op in STF patients, showing that the main gains in walking ability occur during the first 3M post-op, and that this acquired gait pattern is maintained 6M post-op. This suggests that gait analysis at 3M post-op could provide sufficient information about gait impairments in STF patients.

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Modeling self-reported mobility in Parkinson's Disease through sensor-derived gait parameters

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Introduction

Parkinson's disease (PD) is the fastest-growing neurodegenerative disease [1]. As PD affects mobility, it significantly impacts the patient's quality of life (QoL) [2]. Although the association between QoL and mobility has been established, the relevance of sensor-derived gait features to model self-reported mobility is yet to be defined [3].

Research Question

This study explores the predictive value of combining gait features from different test paradigms with demographic and clinical variables to model the 39-item Parkinson's Disease Questionnaire (PDQ39) mobility sub-score.

Methods

People with PD (PwPD) were enrolled from the Luxembourg Parkinson's Study established within the National Centre of Excellence in Research on Parkinson's Disease [4, 5]. Participants performed a standard Time-Up and Go (TUG) and a dual-task motor test (TUG with tray) with gait features derived from a medical-grade IMU sensor attached to the patient's shoes.

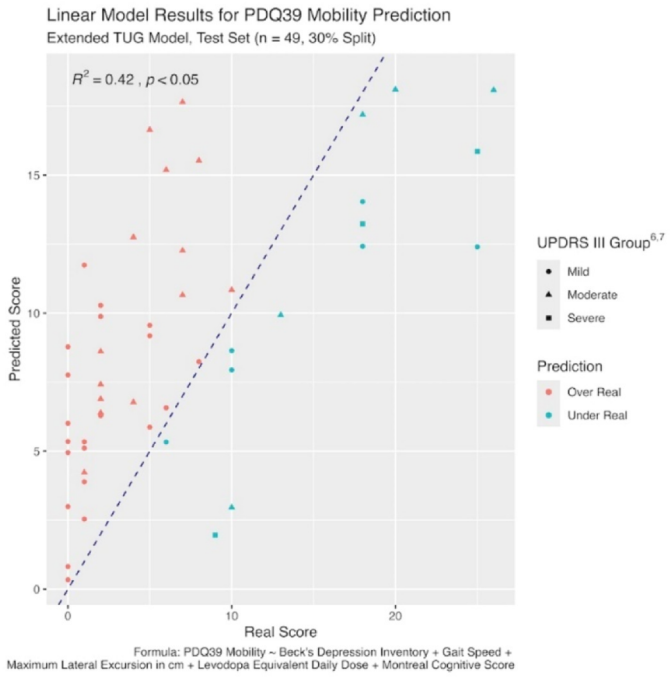
Analysis included a nonparametric *Wilcoxon signed-rank test* to assess significant differences across gait tests, a Kruskal–Wallis test for group-based differences, and bivariate correlation analysis through Spearman's rank to assess the significance of all variables and mobility. The association between significant correlations was assessed via multiple linear regression, with optimal features selected through repeated sub-setting of a global model.

Three models were implemented to predict PDQ39's mobility sub-score: a base model incorporating solely demographic and clinical variables, an extended model integrating TUG gait features, and a complex model with dual-task features.

Results

Data from 164 PwPD was analyzed (111 men, age: 66.4 ± 9.8 y, PDQ39 Mobility: 8.2 ± 8.1, MoCA: 24.67 ± 3.8, UPDRS III: 35.3 ± 13.8). Gait features significantly differed across TUG and dual-task tests ($p < 0.05$), except for Turn Angle and Heel Strike Degree. Bivariate correlations between mobility and clinical/demographic variables were constant across models, with medication, depression, and cognition being significant. Additionally, significant gait correlations with mobility were seen for gait speed and maximum lateral excursion for the extended model, and maximum lateral excursion for the complex model.

The best-performing linear model was the extended model predicting mobility, with a test set R^2 of 0.42 ($p < 0.05$) and a root mean square error (RMSE) of 5.93 points. The base ($R^2 = 0.25$, RMSE = 6.49) and complex ($R^2 = 0.24$, RMSE = 6.63) models performed similarly on the same test set.



Discussion

These findings highlight the relevance of gait parameters in modeling mobility-related QoL in PD and suggest their potential to outperform demographic and clinical metrics alone, thereby confirming their clinical utility. Furthermore, results suggest that complex gait tests may be unnecessary, as they do not outperform the predictive power of a standard gait test.

Further studies are needed to compare our results to alternative tests, like dual-task cognitive tasks, model non-linear combinations, and power for sub-group comparisons.

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Triceps surae muscle-tendon length changes and shear modulus ratios across the ankle motion in adolescents with cerebral palsy

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Introduction

Understanding skeletal muscle pathomorphology in cerebral palsy (CP) is important for identifying effective treatments [1,2]. Studies have reported reduced muscle-belly and fascicle lengths [3] and increased passive muscle stiffness evaluated by shear modulus [4]. However, the ratio of length changes of the muscle-tendon unit (MTU) properties across the range of motion (RoM) along with the proportion of muscle-belly and tendon passive stiffness remain unknown. Quantifying these ratios provides insights into the mechanisms of MTU remodelling.

Research Question

What are the passive muscle-tendon length changes and stiffness adaptations at the triceps surae in CP?

Methods

Twelve volunteers with CP (17.2 ± 4.2 years, GMFCS I/III 8/4) and 12 typically developing (TD, 16.8 ± 4.7 years) peers participated in this study. Medial (MG) and lateral (LG) gastrocnemius, soleus (SOL) and Achilles tendon (AT) were assessed using 3D-freehand-ultrasonography [3] and shear wave elastography (Aixplorer Supersonic Imagine and Vicon). Participants laid prone with fully extended knees while the ankle was in a custom orthotics. Data was acquired at maximum dorsi- and plantar-flexion and midway. From the 3D reconstructions [3], MG/LG/SOL muscle-belly, fascicle