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Personalised Rehabilitation via Novel AI PAtient StRatification StratEgies

Leveraging the PREPARE Project to Model Disability Trajectories in Parkinson's Disease: A ClinFIT-Based Multidimensional Longitudinal Analysis

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Background

Parkinson's disease (PD) is a progressive neurodegenerative condition characterized by heterogeneous motor and non-motor manifestations that jointly contribute to disability progression. Traditional monitoring strategies, focused on motor symptoms, only partially capture the complexity of functional decline.

Building on data collected within the PREPARE project, this study aimed to examine the evolution of disability in people with PD using the ClinFIT Generic-30, an ICF–based tool, and identify clinical and demographic predictors of disability progression, with particular attention to non-motor symptoms

Methods

A single-centre retrospective cohort study was conducted. Clinical and functional data were extracted from the PREPARE database for 262 consecutive people with PD evaluated in routine clinical practice. Assessments were performed at baseline (T0), approximately 3 years (T1), and 6 years (T2) post-baseline.

Functioning domains were analyzed longitudinally using the ClinFIT Generic-30 alongside standard clinical scales (UPDRS and NMSS). Regression analyses were used to identify independent predictors of disability progression, including age, sex, disease duration, Hoehn & Yahr stage, and comorbidity burden.

Results

At enrolment, patients were predominantly male (54%), with a mean age of 68.9 ± 8.7 years, and a mean disease duration of approximately 10 years since Parkinson's disease diagnosis. Overall, participants were largely independent in activities of daily living (mean UPDRS Part II score: 12.9) and did not exhibit disabling motor or non-motor symptoms (mean UPDRS Part III: 20.18; Part I: 12.4) (Fig. 1)
Female patients were slightly older and reported more severe non-motor symptoms than males, while showing comparable characteristics across all other assessed domains.

Fig. 1. Demographic and clinical profile of PD cohort at enrolment (T0)

Fig. 1	Total n = 262	Females n = 121 (46%)	Males n = 141 (54%)	Gender diff. *p value*
Age (years)	68,97 ± 8,76	70,92 ± 8,35	67,33 ± 8,80	< 0.001
Hoehn& Yahr Stage	2,80 ± 1,09	2,87 ± 1,10	2,75 ± 1,08	ns
Disease duration (years)	11,27 ± 7,66	11,96 ± 8,60	10,68 ± 6,75	ns
BMI	26,83 ± 4,49	26,87 ± 5,14	26,80 ± 3,88	ns
CIRS	1,50 ± 0,35	1,52 ± 0,31	1,48 ± 0,38	ns
UPDRS part I	12,39 ± 5,92	13,20 ± 6,03	11,71 ± 5,77	0,057
UPDRS part II	12,91 ± 7,18	13,16 ± 7,34	12,71 ± 7,07	ns
UPDRS part III	20,18 ± 10,99	21,19 ± 11,91	19,35 ± 10,13	ns
UPDRS part IV	2,60 ± 3,26	2,65 ± 3,17	2,57 ± 3,35	ns

Results

ClinFIT scores showed a significant and progressive worsening of functioning over time across most domains, particularly mobility, self-care, domestic activities, and participation (Fig. 2). Hoehn & Yahr stage was the strongest predictor of functional decline.

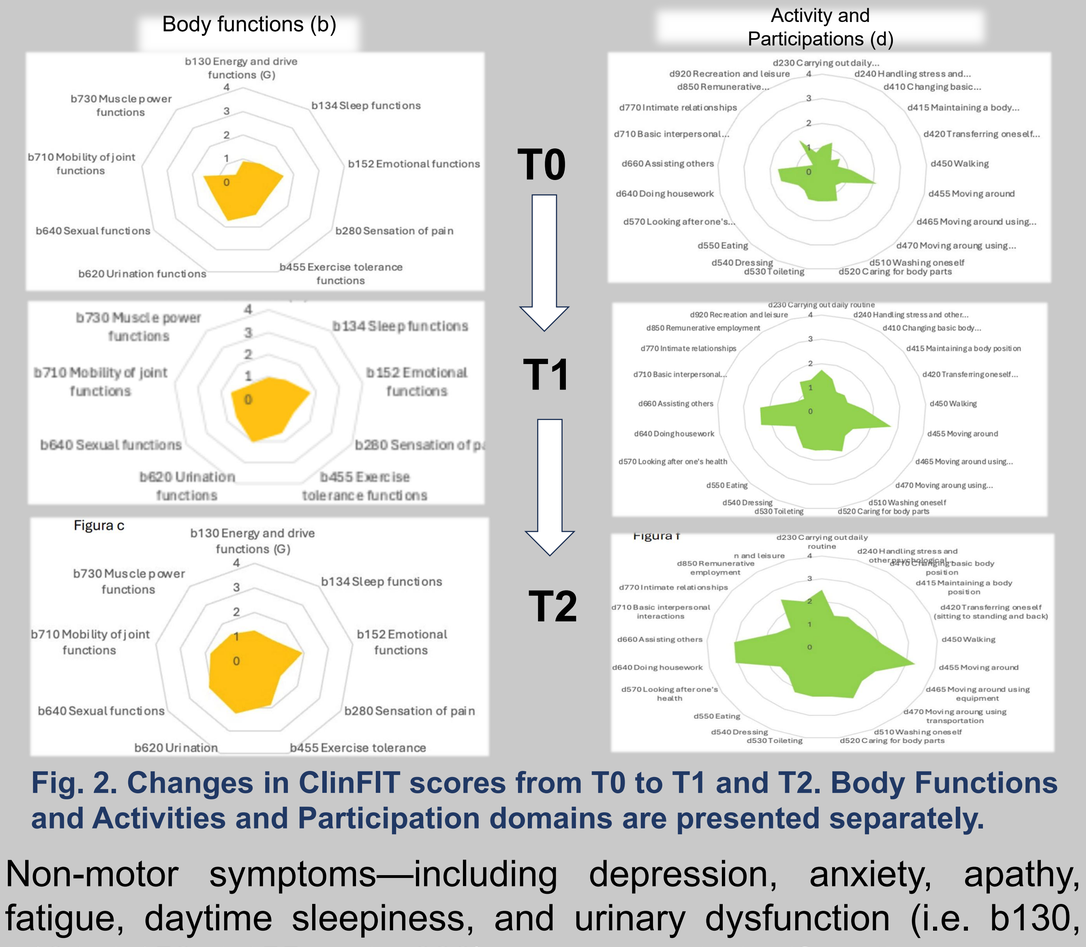

Fig. 2. Changes in ClinFIT scores from T0 to T1 and T2. Body Functions and Activities and Participation domains are presented separately.

Non-motor symptoms—including depression, anxiety, apathy, fatigue, daytime sleepiness, and urinary dysfunction (i.e. b130, b134, b152, b455 and b620)—progressed significantly over time and independently predicted worsening disability beyond motor severity. Marked inter-individual variability in functional trajectories was observed, indicating heterogeneous patterns of disability progression

Conclusion

Disability progression in PD is multidimensional and strongly influenced by non-motor symptoms and comorbidities. Integrating ClinFIT within large-scale datasets enables a more comprehensive, functioning-oriented monitoring of PD and supports big data approaches to model individualized disability trajectories. These findings highlight the need for multidimensional assessment frameworks to inform personalized rehabilitation strategies and prompt further research into early identification of high-risk functional phenotypes.

References

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