

Gait parameters als objective markers for fatigue?

On the association between gait parameters and the FACIT-F questionnaire

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Introduction

Fatigue is a prominent symptom of many chronic and neurodegenerative diseases and affects the physical and cognitive abilities (Davies, Dures & Ng, 2021). Normally, fatigue is assessed using retrospective, standardized questionnaires (Antikainen et al., 2022), but digital health technology (DHT) allows for objective and continuous monitoring of fatigue in daily life.

This study focuses on these hypotheses:

- There is a positive correlation between FACIT-F score and selected gait parameters
- The strength of the correlation decreases, when the temporal distance between the FACIT-F response and the gait measurement is increased

Discussion

- Participants with IMID showed more fatigue than healthy volunteers (Fig. 1)
- In the IMID cohorts, step count and time spent walking showed a positive correlation with FACIT-F score
- In the PD cohort, stride velocity showed a significant correlation with the FACIT-F score
- There is no significantly stronger correlation for a shorter temporal distance to the completion of the FACIT-F questionnaire
- The stable correlations observed over several days, particularly regarding walking volume (number of steps and walking time), underscore the suitability of digital gait parameters as objective, real-world, and real-time markers of fatigue.
- Overall, digital gait parameters reflect fatigue in a cohort-specific manner: through walking distance in cases of immune-mediated inflammatory diseases and through walking quality in Parkinson's disease.

Results

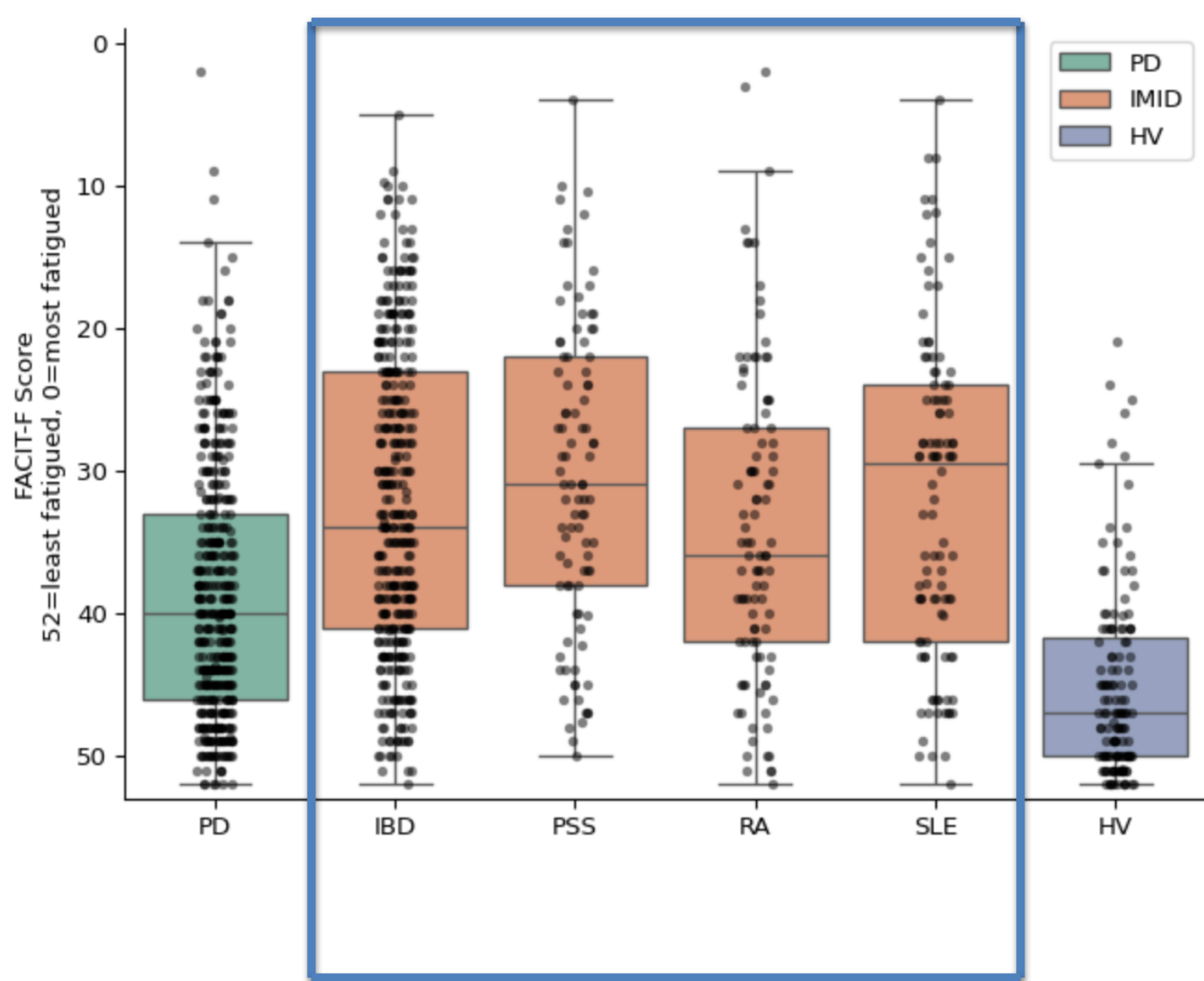


Fig. 1: FACIT-F score grouped by cohort

Table 1: Cohorts by age and gender

Cohort	n	Male	Female	Age (mean ± SD) ¹
PD	427	259	168	64 ± 9 years
IMID	660	475	185	49 ± 14 years
HV	136	42	94	64 ± 15 years

¹SD = standard deviation

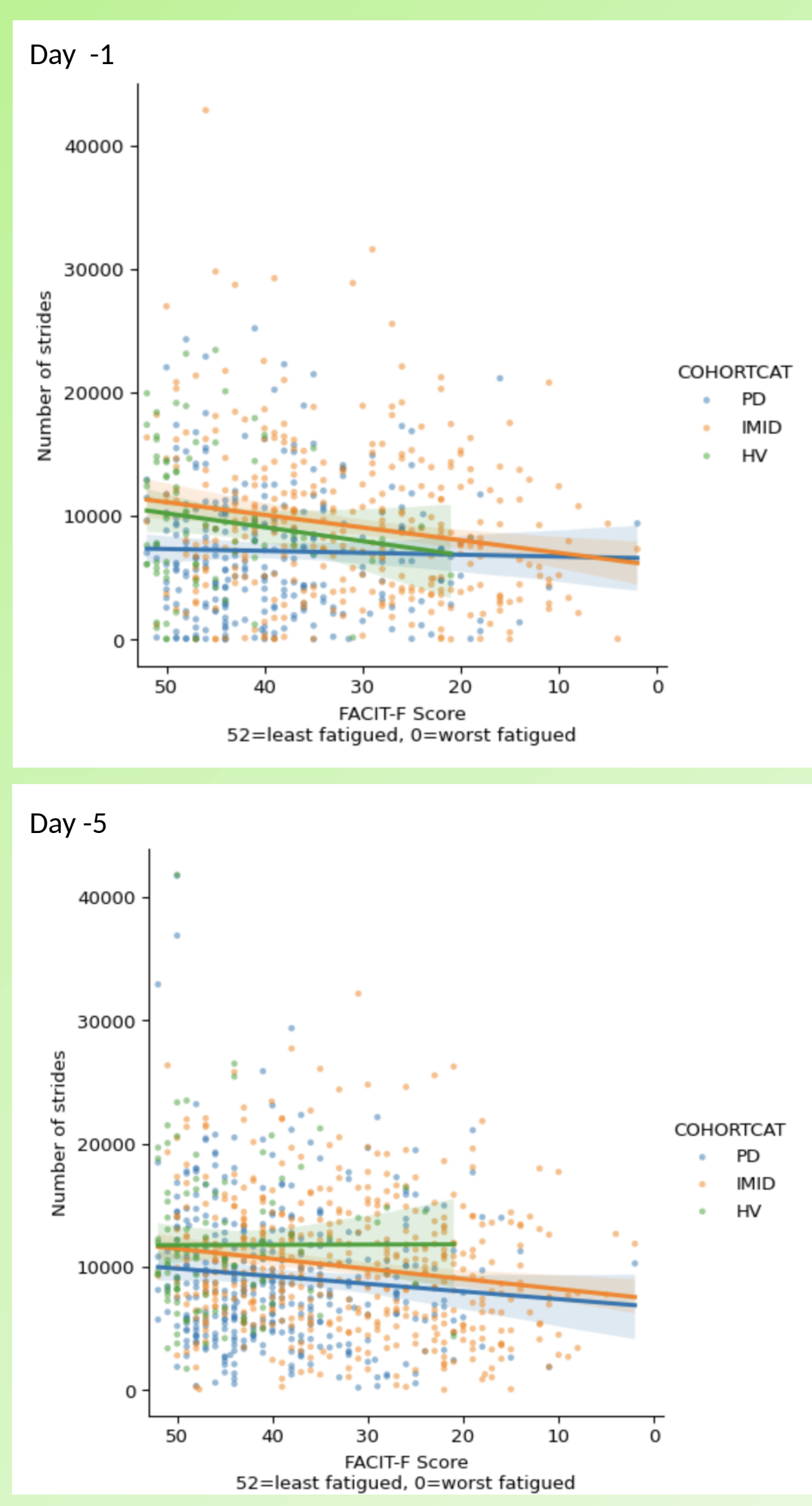


Fig. 2: Correlation between number of strides and FACIT-F score on days -1 and -5.

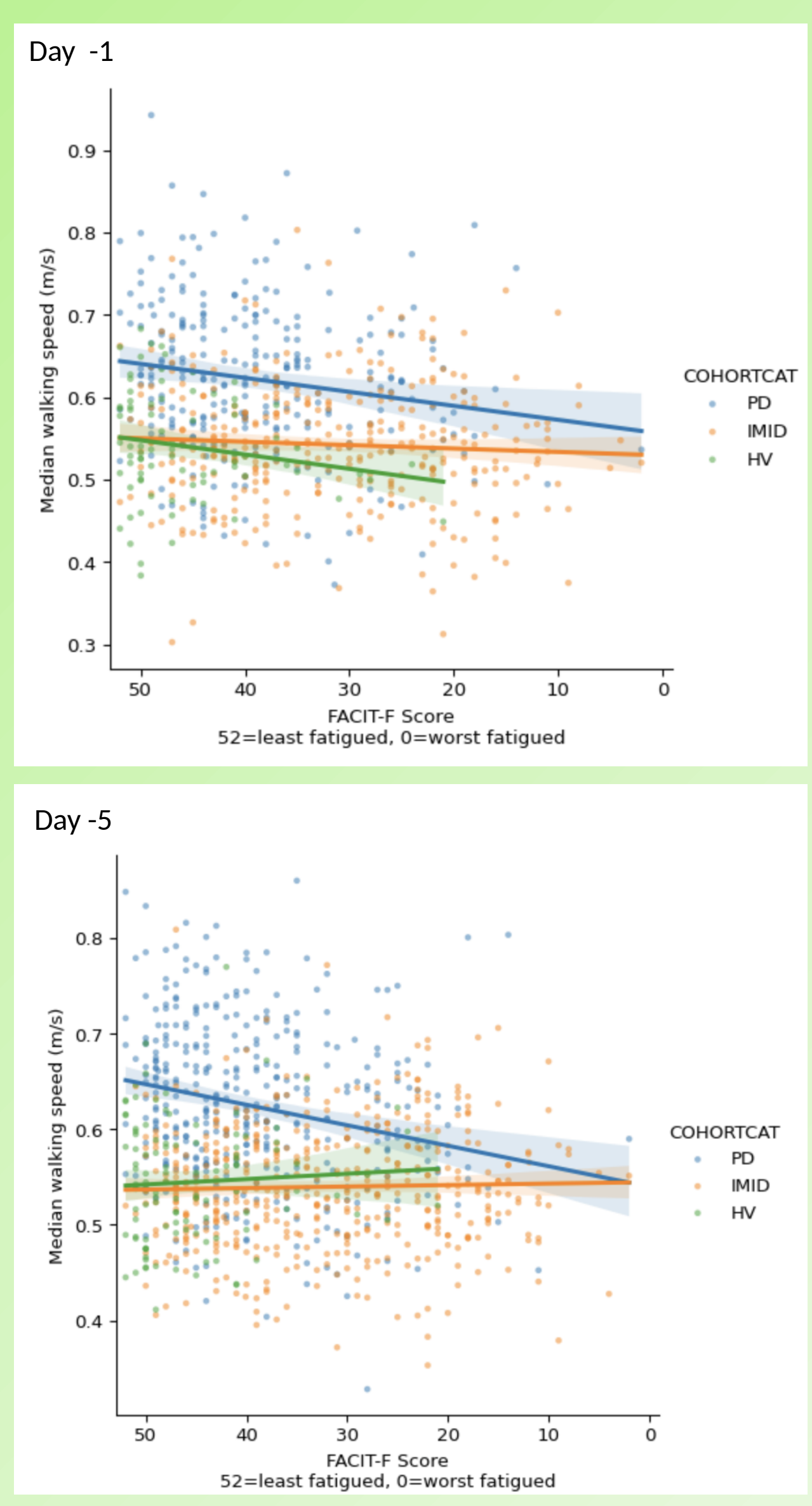


Fig. 3: Correlation between number of stride velocity and FACIT-F score on days -1 and -5.

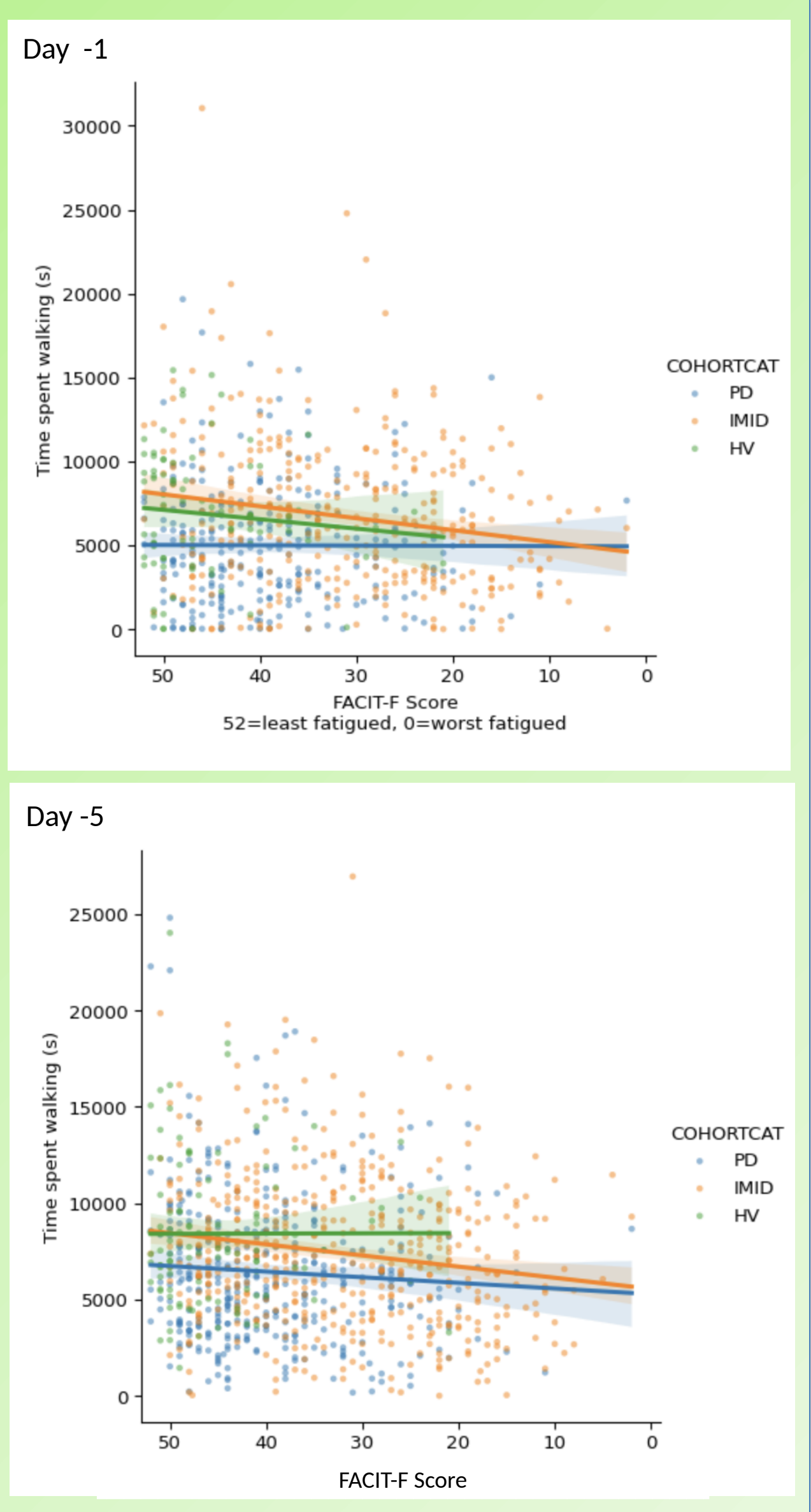


Fig. 4: Correlation between the time spent walking and FACIT-F score on days -1 and -5.

Methods

- **Data source:** IDEA-FAST Clinical Observation Study (COS)
- **Cohorts:**
 - 136 healthy volunteers (HV),
 - 427 people with Parkinson's disease (PD) &
 - 660 people with immune-mediated inflammatory disease (IMID)
- **Data collection:**
 - During 7 consecutive days: recording of gait parameters, e.g., number of strides, walking bout duration, stride velocity, using a lower back-worn inertial measurement unit (IMU; Axivity AX6)
 - On the last day: filling out the FACIT-F questionnaire on fatigue (0 points: maximum fatigue, 52 points: no fatigue)
 - **Analysis:** correlation of daily-mean gait parameters with the FACIT-F total score

FACIT-F (Version 4)

Please circle or mark one number per line to indicate your response as it applies to the past 7 days.

ADDITIONAL CONCERNS

	Not at all	A little bit	Some-what	Quite a bit	Very much
HE1 I feel fatigued	0	1	2	3	4
HE12 I feel weak all over	0	1	2	3	4
AA1 I feel listless ("washed out")	0	1	2	3	4
AA2 I feel tired	0	1	2	3	4
AA3 I have trouble <u>starting</u> things because I am tired	0	1	2	3	4
AA4 I have trouble <u>finishing</u> things because I am tired	0	1	2	3	4
AA5 I have energy	0	1	2	3	4
AA7 I am able to do my usual activities	0	1	2	3	4
AA8 I need to sleep during the day	0	1	2	3	4
AA12 I am too tired to eat	0	1	2	3	4
AA14 I need help doing my usual activities	0	1	2	3	4
AA15 I am frustrated by being too tired to do the things I want to do	0	1	2	3	4
AA16 I have to limit my social activity because I am tired	0	1	2	3	4

Fig. 5: FACIT-F questionnaire