

Dynamic activity – fatigue relationships in daily life in ME/CFS: insights from ecological momentary assessment

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Background

Chronic Fatigue Syndrome (ME/CFS) is characterized by persistent fatigue and post-exertional malaise (PEM). Fatigue levels in ME/CFS are highly variable and fluctuate unpredictably in daily life. However, studies investigating symptom fluctuations in real-time remain scarce.

Objective: To investigate inter-individual differences in the relationship between daily activities and fatigue in individuals with ME/CFS using ecological momentary assessment (EMA).

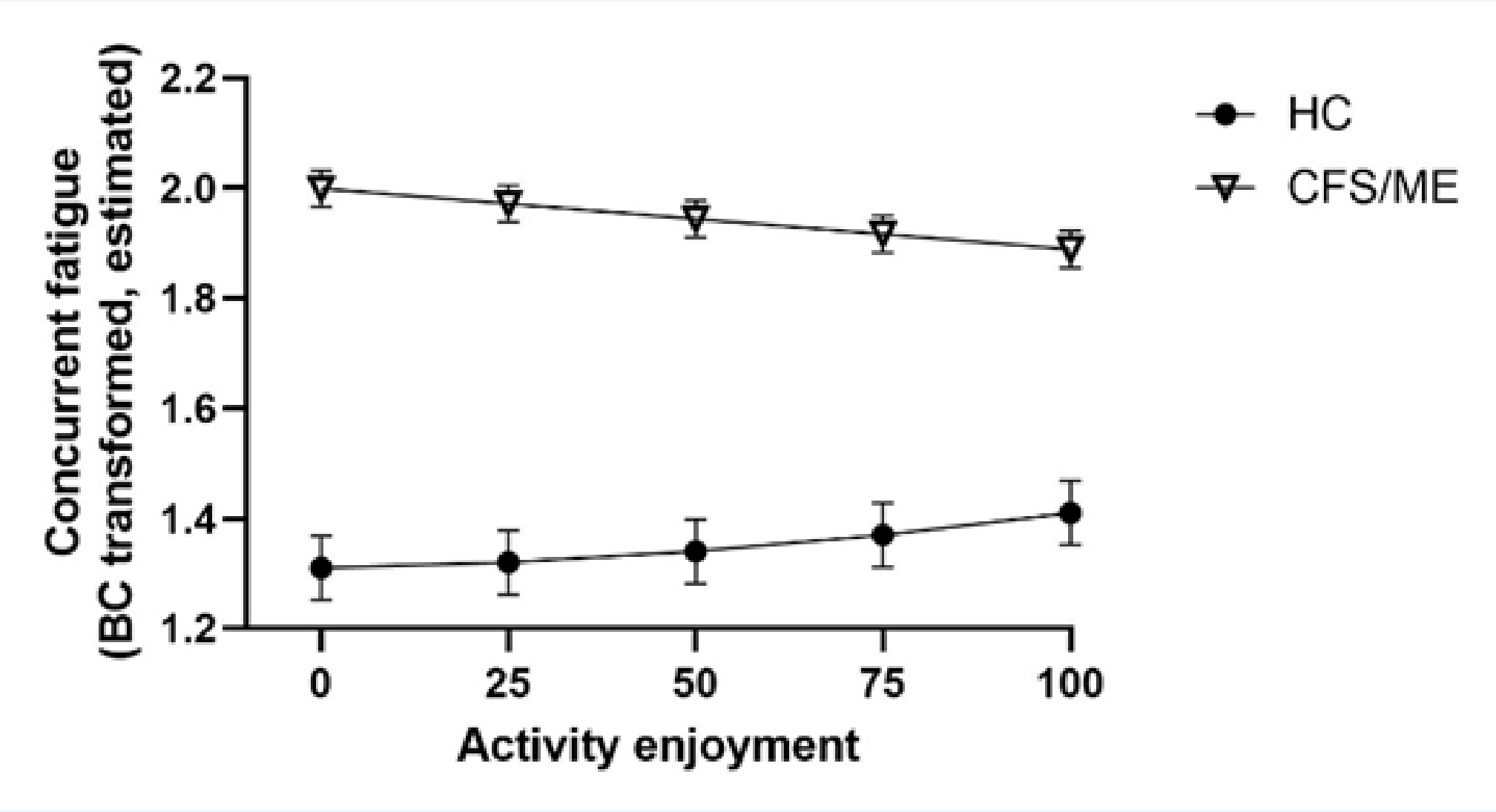
Methods

- **N=164:** 109 patients with CFS/ME, 55 healthy controls (HC), (139 female)
- **7-day experience sampling protocol:** 8 semi-random prompts per day
- **At each prompt participants reported:** momentary physical fatigue levels, whether they had just engaged in physical activity (yes/no), and how much they enjoyed their current activity
- **Analysis:** Random-intercept, random-slope linear mixed models were used (1) to compare concurrent and lagged (i.e. 2 prompts or 3-4h later) activity-fatigue relationships between groups, and (2) to derive individual slopes as indices of activity-triggered fatigue. In ME/CFS, we examined correlations between individual activity-fatigue slopes and a lab-based measure of PEM (4h recovery after cycling task).

Results

- Individuals with ME/CFS had higher levels of self-reported momentary fatigue than HC ($p < 0.001$), despite no case-control differences in the proportion of “active” prompts (HC: 47.0%; ME/CFS: 44.2%, $p = 0.43$).
- Overall, active prompts were associated with higher concurrent ($p < 0.001$) and lagged ($p = 0.006$) fatigue levels, but this was the case for both ME/CFS and HC (activity x group interactions: $p = 0.25, 0.35$ resp.). However, activity enjoyment was significantly negatively associated with concurrent fatigue severity in ME/CFS but positively associated in HC (enjoyment x group interaction: $p < 0.001$; Figure 1).
- Within the ME/CFS group, lab-based PEM was unrelated to EMA-based individual activity-fatigue slopes (concurrent: $p = 0.12$, lagged: $p = 0.95$).

Figure 1: Interaction effect



Conclusion

- Patients with ME/CFS reported elevated fatigue even in the absence of activity, while activity-triggered increases were comparable to HC.
- Enjoyment of activities uniquely buffered fatigue in ME/CFS, highlighting the importance of considering contextual factors.
- Individual slopes derived from EMA are a promising measure of PEM in daily life, although sensitivity was limited by assessing only whether participants were active immediately before the prompt, leading to zero-inflation and preventing investigation of how activity *intensity* relates to fatigue in ME/CFS.

Figure 2: Individual slopes

