

# Heart rate response to and recovery from 6-minute walking test in individuals with Post-Covid Syndrome with and without ME/CFS symptoms

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## INTRODUCTION

Post-COVID-19 syndrome (PCS) has emerged as a significant health concern worldwide, with some individuals experiencing symptoms of myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). Evaluating heart rate (HR) responses during and after standardized exercise tests, such as the 6-minute walk test (6MWT), may provide valuable insights into the cardiovascular response of these conditions.

## AIM

To investigate the HR response of individuals with and without ME/CFS symptoms during and immediately after the 6MWT. HR kinetics during recovery after the test were also compared between groups.

## METHODS



- Adults with PCS (symptoms  $\geq$  3 months) were assessed for presence of ME/CFS symptoms (DePaul Symptom Questionnaire – short form).
- The 6MWT was conducted with participants wearing a smart shirt (Hexoskin) to monitor HR response.
- Baseline and recovery HR values were collected one minute before and two minutes after the test, respectively, with participants seated at rest.
- For between-group comparisons during and after the 6MWT, absolute HR values were smoothed using a random walk algorithm and averaged at one minute.
- HR kinetics during recovery was analyzed by applying least-squares fitting to HR values, allowing us to extract the coefficient of determination ( $r^2$ ), slope, and time constant of decay ( $\tau$ , tau).
- The distance covered in the 6MWT was normalized according to age-and sex-specific predicted values.

## RESULTS

Descriptives (n=27)	Mean (SD)
Gender (male/female)	5/ 22
Age (years)	53 (10)
BMI	28.1 (5.1)
6MWT distance (meters)	400.9 (123.3)
6MWT (%predicted)	77.1 (28.7)
ME/CFS symptoms (yes/no)	14/13

- No significant differences were found in age, body mass index, and 6MWT distance between individuals with and without ME/CSF symptoms.
- A MANCOVA (adjusted for baseline HR and percentage of predicted 6MWT distance) showed significantly **lower HR values in individuals with ME/CFS symptoms at the 6<sup>th</sup> minute of the 6MWT compared with those without** ( $p = 0.03$ ).
- Although differences in mean HR recovery at minutes 1 and 2 were not statistically significant between groups, individuals with ME/CFS symptoms presented a time constant two-fold higher during recovery ( $\tau = 7.28s$ , slope =  $-0.233$ ,  $r^2 = 0.971$ ) than those without ME/CFS symptoms ( $\tau = 3.63s$ , slope =  $-0.380$ ,  $r^2 = 0.991$ ); slopes were also significantly different between groups after the 6MWT ( $p < 0.001$ ).

## CONCLUSION

- The results suggest an altered cardiovascular regulation with attenuated HR recovery in PCS individuals with compared to those without ME/CFS symptoms .
- These findings may guide clinicians in developing targeted therapies to improve autonomic function and enhance HR recovery.
- Rehabilitation programs should be designed considering ME/CFS symptoms and potential cardiovascular differences. This approach can inform safer and more effective exercise interventions tailored to individual limitations, thereby minimizing the risk of symptom exacerbation in this population.
- Further research is needed to explore the long-term impacts of these findings on physical functioning, quality of life, and recovery trajectories of individuals with PCS.

Figure 1a (analysis of the 1<sup>st</sup> minute of decay): 0 – 60 seconds  
Individuals with and without ME/CFS symptoms

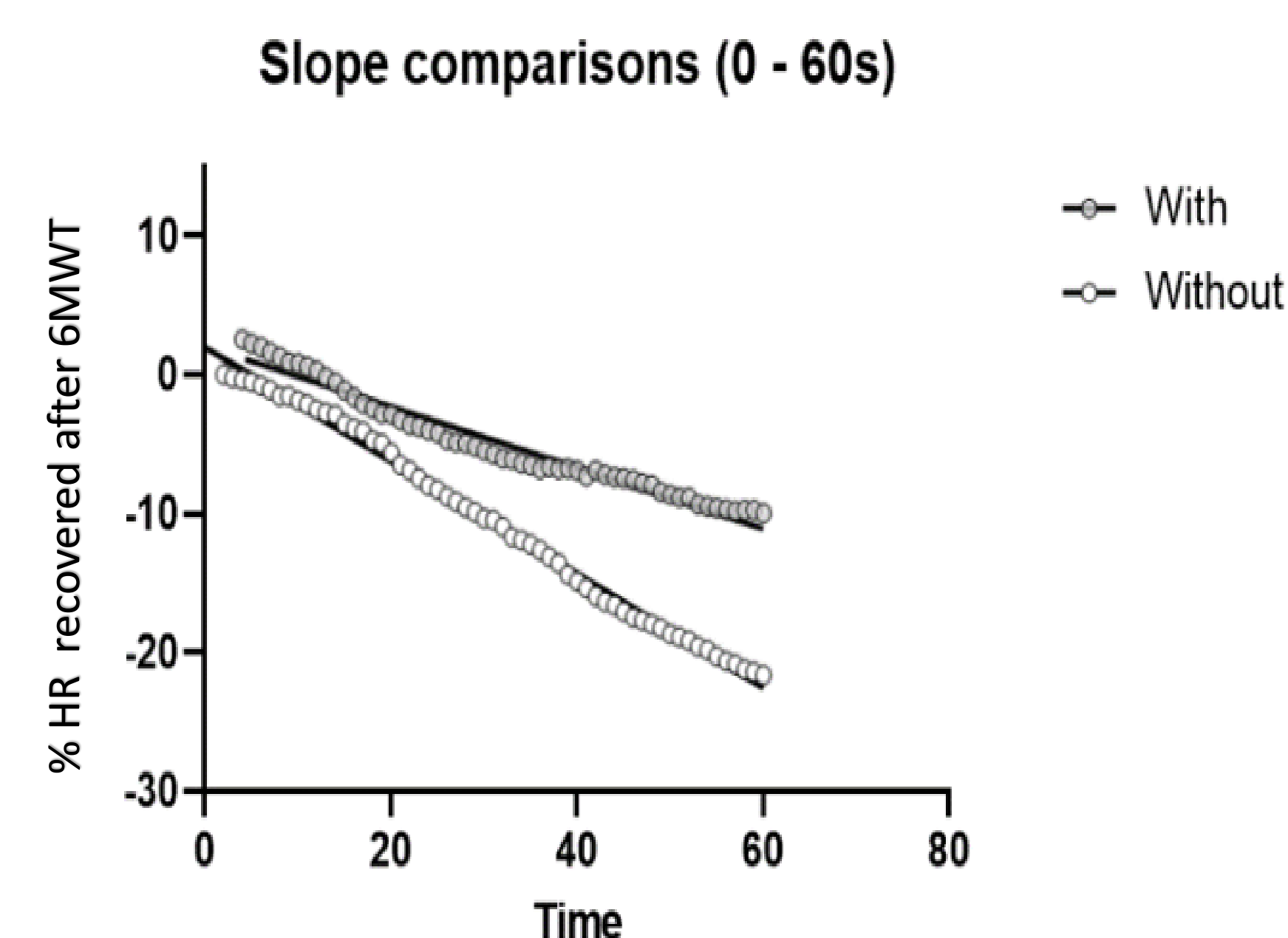


Figure 1b (analysis of the 2<sup>nd</sup> minute of decay): 60 to 120 seconds  
Individuals with and without ME/CFS symptoms

