Differentiation of Neuropsychological Post-COVID Symptoms using Heart Rate Variability

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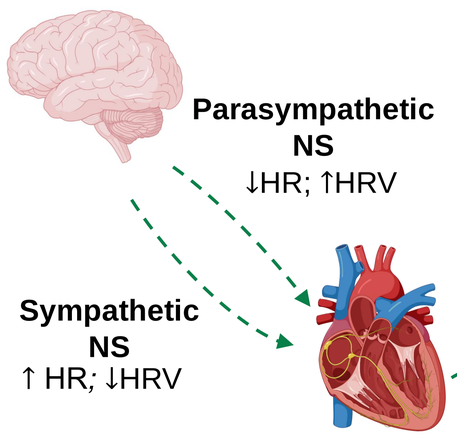
Introduction

Post-COVID syndrome (PCS): Continuation or development of new symptoms that persist for at least 2 months after a COVID infection [1]

Fatigue and **cognitive impairment** are the most frequent symptoms and can occur independently [2]

Problem:
Current diagnosis of fatigue relies mainly on subjective complaints
Differential diagnosis is challenging, due to interaction between fatigue und cognitive impairment



Cardiovascular autonomic dysfunction (CVAD):

- Highly prevalent in PCS [3]
- Impacts cognitive functioning and fatigue independent of orthostatic mechanisms (postural changes) [4,5]
- Assessed through ECG-derived heart rate variability (HRV)
- Higher HRV indicates parasympathetic dominance [6]

HRV as possible marker:

- Lower resting HRV found in PCS [7]
- Lower resting HRV relates to **cognitive impairment** [6]
- Increased reduction in HRV over the course of a task relates to **fatigue** [8]

Can **HRV** be a precise marker to distinctly **characterize fatigue** and **cognitive impairment**?

Methods

- Memory task in virtual reality (VR) as cognitive task (mimVMT) [9]
- Precise real-time monitoring of HRV over the course of the VR task

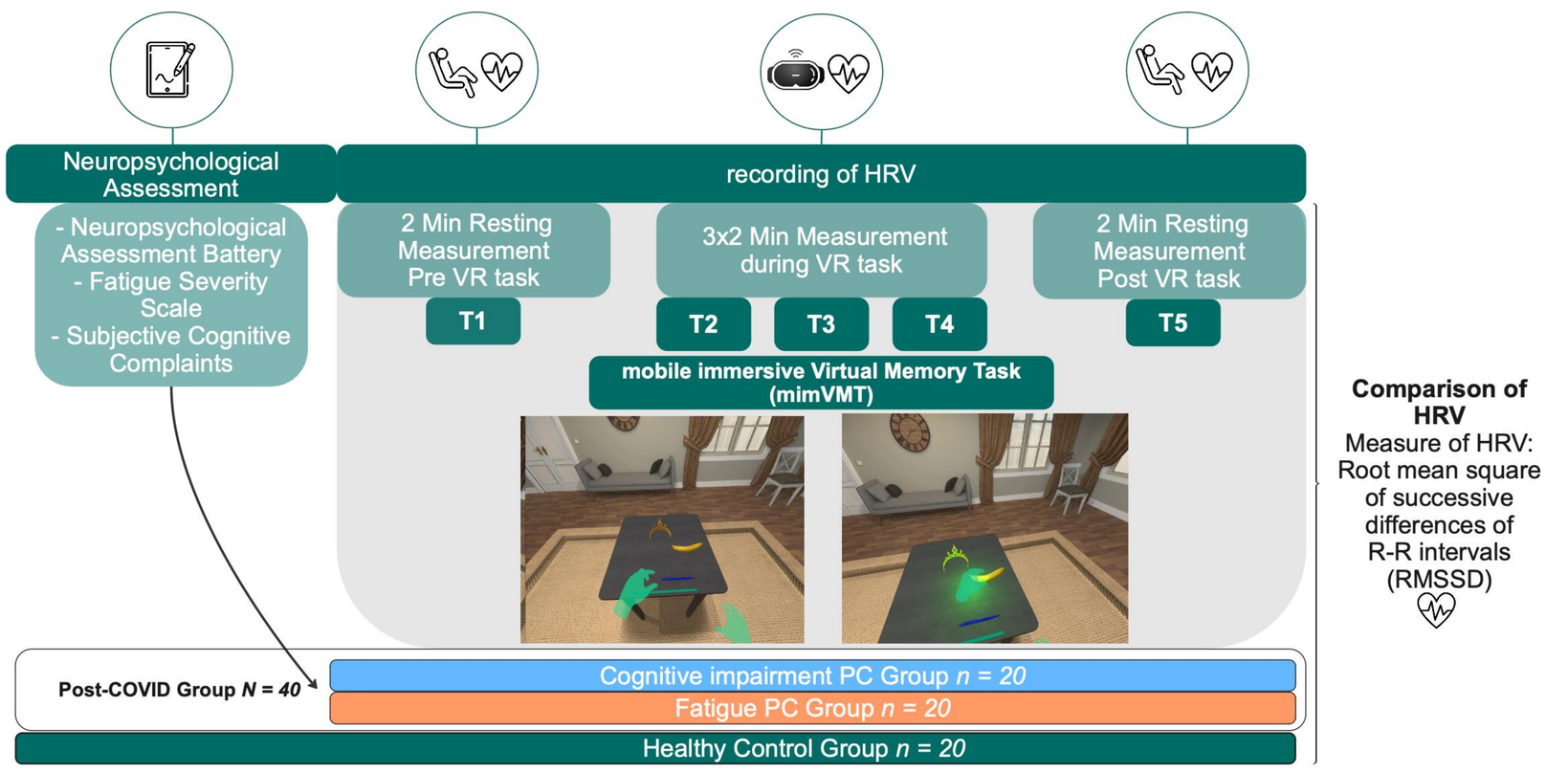
Setup:

Meta Quest Pro

Polar H10

Manager & Excite-O-Meter

Study design:



Expected results

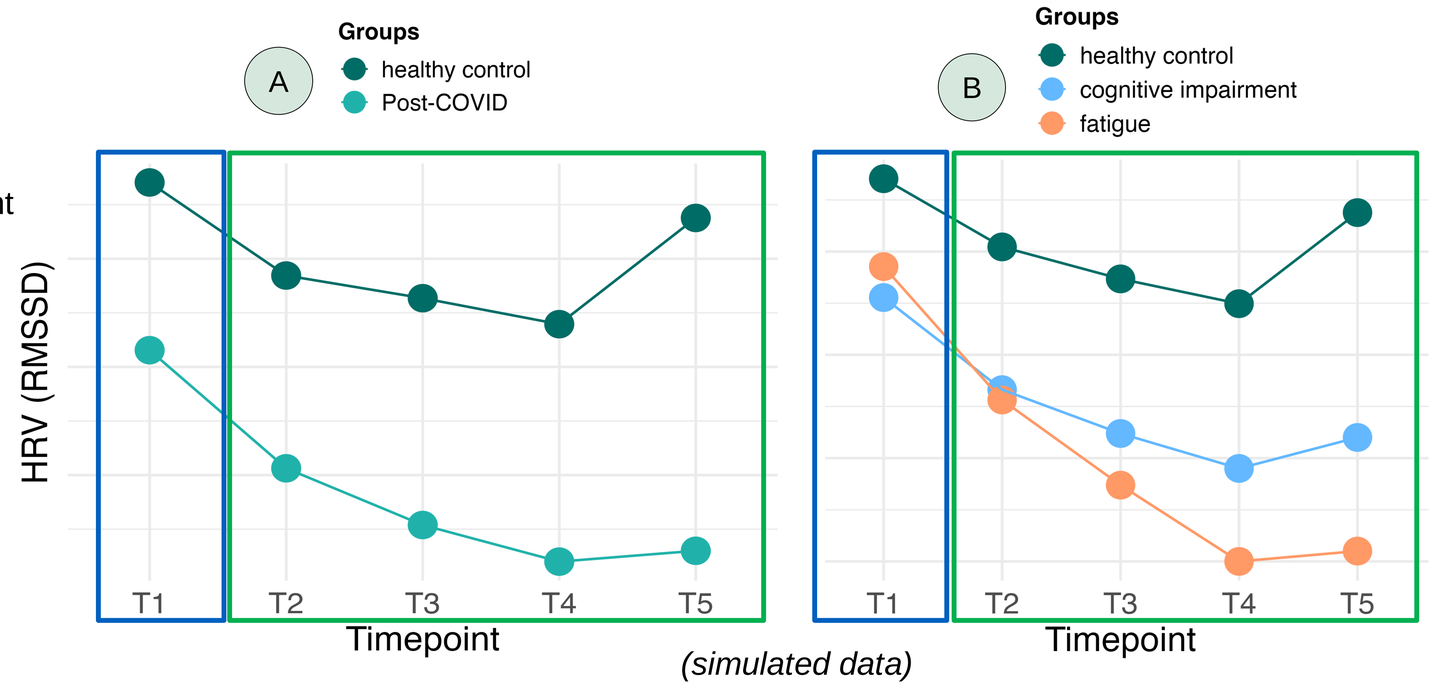
Comparison of

A two groups (Post-COVID vs healthy control)

B three groups (Post-COVID subgroups: fatigue vs cognitive impairment vs healthy control group)

1 HRV at rest (T1)
- A PC group: ↓ HRV
- B Cognitive impairment group: ↓↓ HRV

2 HRV over the course of the task (T2-T4) & in recovery (T5)
- A PC group: ↓ HRV, ↓ recovery
- B Fatigue group: ↓↓ HRV, ↓↓ recovery



Outlook and impact

1 Diagnosis:
- Objectifying fatigue in Post-COVID syndrome
- Differentiating fatigue from cognitive impairment
- Identifying involvement of cardiovascular autonomic nervous system in PCS

2 Therapy:
- Targeted treatment for fatigue
- Managing subclinical cardiovascular autonomic dysfunction

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