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Acute and Delayed Psychophysiological Responses to a Guided Forest Therapy Session

A Wearable HRV and Self-Report Study

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Master's thesis defense

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Why this study matters

Forest therapy

Structured, sensory contact with a forest environment.
Stress recovery and improved mood.

Evidence gap

Self-report outcomes more consistent.
Limited longitudinal HRV evidence.

Longitudinal field context

Two-week wearable monitoring.
Separated acute and delayed responses.

This thesis asks whether a real guided forest therapy session produces both immediate and delayed psychophysiological responses.

Study aim and analytical logic

Evaluate acute and delayed psychophysiological responses to a guided forest therapy session using wearable physiological monitoring and self-report questionnaires.

Acute psychology

pre vs post session
STAI-S + PANAS

Delayed physiology

confirmed-sleep RMSSD,
HR, sleep duration

Exploratory dynamics

5-min session physiology
movement-sensitive

Strongest claims were based on self-report and confirmed-sleep windows; daytime physiology was treated as exploratory.

Study design and time course

Naturalistic observational sub-study within PsySoma-UA-LT

Sample

25 participants
20 female / 5 male
age 38.3 ± 13.5 years

Setting

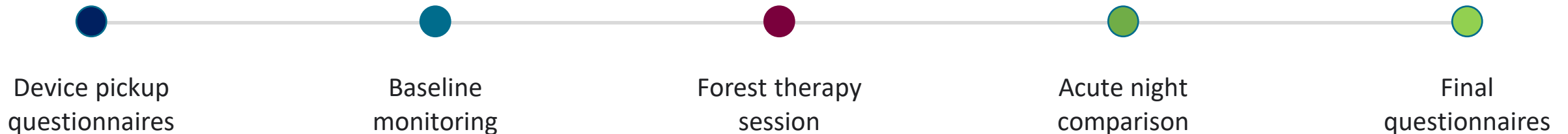
Dvarčionių šaltinis
forest area, Vilnius

Device

Garmin vivosmart 5
Fitrockr export

Study type

Observational sub-study
no randomization
or control group



Measures and analysis windows

One session, three complementary data windows

1. Confirmed-sleep physiology

- RMSSD
- nocturnal heart rate
- sleep-window duration

2. Self-report outcomes

- STAI + PANAS
- WHOQOL-BREF, Burns, CD-RISC-10
- HHP total score

3. Session physiology

- 5-min RMSSD
- heart rate
- Garmin stress score

Key point: confirmed-sleep physiology was the main wearable outcome; daytime session physiology was exploratory.

Forest Therapy Session



Dvarčionių šaltinis forest area, Vilnius · April 25–26, 2026

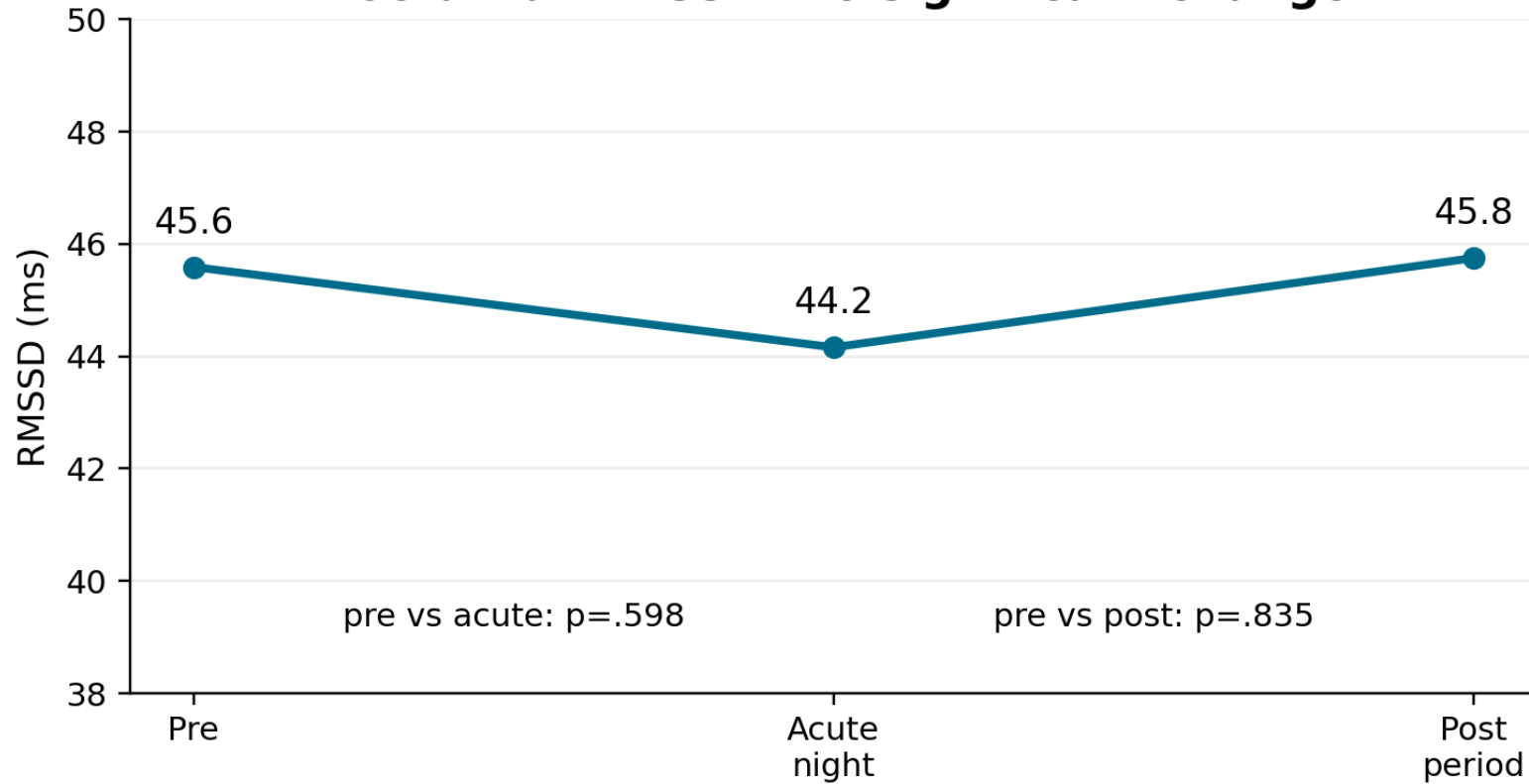
How it was conducted

- 1 Arrival and questionnaires
- 2 Guided slow walk in the forest
- 3 Guided sensory attention
- 4 Quiet individual reflection
- 5 Group sharing and tea circle
- 6 Post-session questionnaires

~3-hour guided session
Certified guide: Jurgita Šikšnienė

Primary physiological result

Nocturnal RMSSD: no significant change



Pre vs acute night

45.59 → 44.16 ms
 $p = .598$

Pre vs post-period

45.59 → 45.75 ms
 $p = .835$

Interpretation

No delayed autonomic change was detected in the most controlled HRV window.

Secondary nocturnal outcomes

Heart rate stable; acute sleep window longer

Nocturnal HR

Pre 62.49 bpm

Acute 63.60 bpm, $p=.726$

Post 62.35 bpm, $p=.789$

Sleep window

Pre 7.46 h

Acute 8.61 h, $p=.038$

Post 7.49 h, $p=.913$

Caution

Acute sleep-duration signal was not robust in the non-parametric sensitivity check.

The delayed physiological profile was mostly stable. The clearest changes appeared in subjective psychological outcomes.

Psychological recovery after the session

State anxiety ↓

STAI-S

36.36 → 27.17

$p < .001$

Positive affect ↑

PANAS PA

31.03 → 35.08

$p = .003$

Negative affect ↓

PANAS NA

15.68 → 12.32

$p = .009$

Participants reported substantially improved psychological state immediately after forest therapy.

Delayed questionnaire outcomes

Selective improvement, not global change

Improved from baseline to final

WHOQOL-BREF physical health
+9.09 points, $p < .001$

Burns depression symptoms
-9.29 points, $p = .001$

Resilience (CD-RISC-10)
+2.67 points, $p = .013$

No clear final change

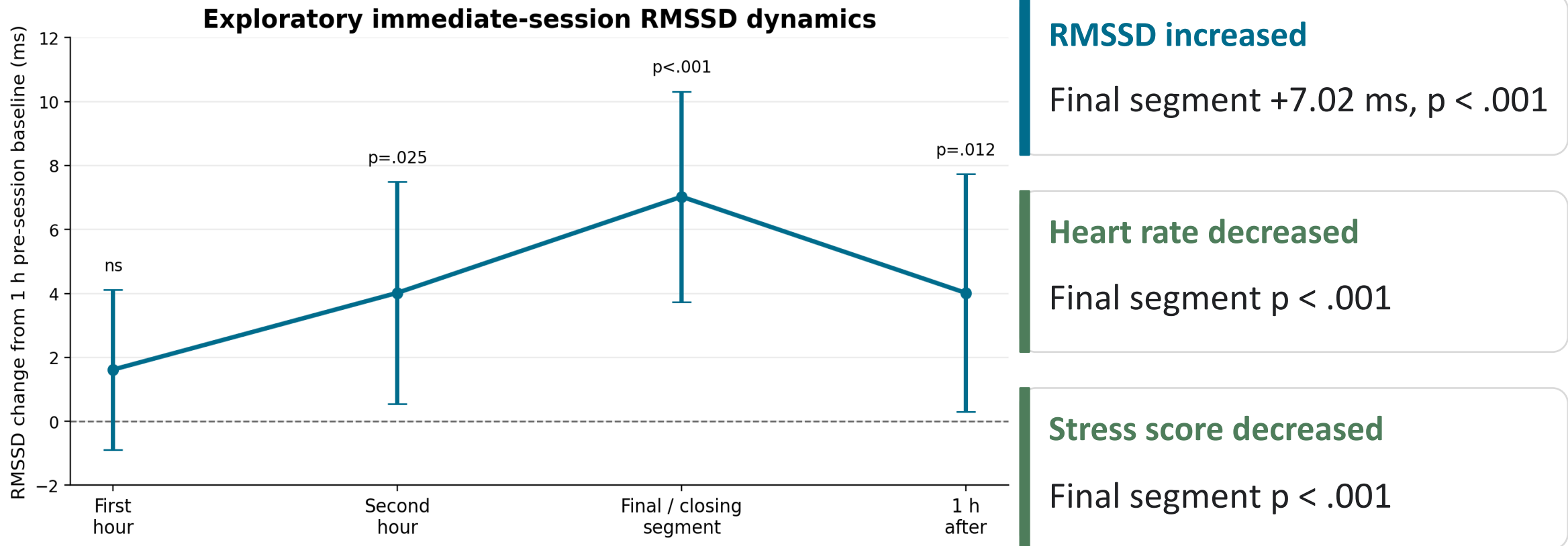
HHP total score
stable, $p = .656$

PANAS affect
no sustained final change

STAI-S final anxiety
lower direction, not significant

Physical health, depressive symptoms, and resilience improved, while global health and affect measures showed no clear sustained change.

Session physiology: relaxation pattern



Exploratory analysis: daytime wrist PPG can be affected by movement, posture, breathing and sensor contact.

Main interpretation

Supported

Clear immediate psychological improvement after the session.

Not supported

No significant delayed RMSSD/HR change.
No robust physiology–psychology coupling.

Tentative

Session physiology suggests acute relaxation.

Main limitation: single-group pre–post design without randomization or control group.

Main strength: real forest therapy setting, real participants, multimodal data.

Conclusions

Acute recovery, limited delayed HRV evidence

- 1** A guided forest therapy session was associated with strong acute psychological improvement.
- 2** No significant delayed change was detected in confirmed-sleep nocturnal RMSSD.
- 3** Delayed questionnaire outcomes showed selective improvement in physical quality of life, depressive symptoms and resilience.
- 4** Session physiology suggested acute relaxation.

Thank you