

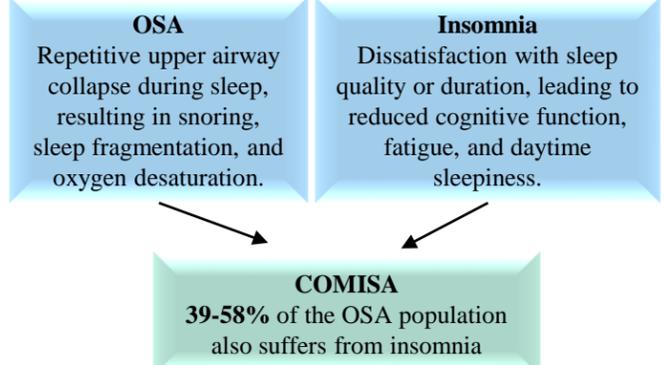
Heart Rate Variability Before and After an Exercise intervention in Individuals with Comorbid Insomnia and Obstructive Sleep Apnea



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Introduction



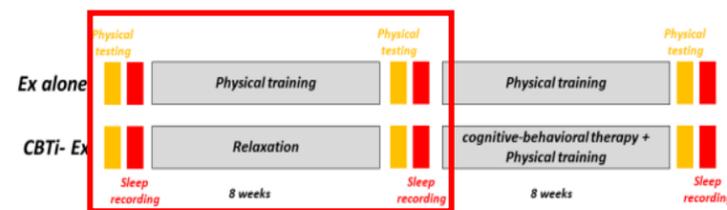
- The co-presence of insomnia symptoms decreases tolerance and adherence to continuous positive airway pressure (CPAP), the gold standard treatment for OSA.
 - Effective therapies treating OSA and insomnia simultaneously are lacking.
 - Our group is thus conducting a pilot randomized clinical trial (RCT) to study the effects of exercise training alone (Ex) or combined with cognitive behavioural therapy for insomnia (CBTi-Ex) on insomnia severity, sleep and cardiovascular health outcomes.
- HRV:**
- Accepted non-invasive approach to identify abnormalities to the autonomic nervous system
 - Reliable indicator for health and disease
 - OSA and insomnia have each been linked with cardiac autonomic dysfunction due to sympathetic overactivity.
 - However, HRV in COMISA has not been documented and the effects of exercise training on HRV are unknown.

Objectives

- To characterize five HRV outcomes at baseline and compare with the literature on healthy individuals
- To compare changes in HRV from pre- to post-intervention

Methods

Study Design: secondary analysis of RCT data



Exercise Intervention

- 3x/week, 60-min/session
- 1 session supervised at Perform Centre
- 2 unsupervised sessions at home/gym
- Aerobic training:** 5-min warm-up, 30-min aerobic exercise at ventilatory threshold, 5-min cool-down
- Resistance training:** 1 set, 12-15 reps, 6-8 exercises

Relaxation Intervention (active control)

- 3x/week
- Self-guided, home-based exercises:
 - Psychoeducation on the impact of stress on sleep
 - Diaphragmatic breathing
 - Progressive muscle relaxation
 - Guided imagery

ECG Recording:

- ECG recording was obtained from the 5-minute resting sequence the morning after the sleep assessment.
- HRV was analyzed using standardized guidelines¹.
- Participants were instructed to watch a video for 5 minutes while sitting quietly and breathing normally to obtain a baseline heart rate.
- ECG was manually inspected and cleaned using an HRV analysis software (Mindware Technologies, USA).
- HRV indices included time domain measures (SDNN, RMSSD) and frequency domain measures (LF/HF, LF, HF).

Statistical Analysis:

Descriptive statistics & two-way repeated-measures ANOVA: time (pre, post) by intervention (exercise, relaxation).

Table 1. Characteristics of the Study Sample at Baseline (n=14)

Variable	All (n=14)	Exercise (n=6)	Relaxation (n=8)	p Value
Age, years	54 ± 14	61 ± 13	49 ± 14	0.11
Female, n (%)	8 (57)	3 (50)	5 (63)	0.67
CPAP use, n (%)	9 (64)	5 (83)	4 (50)	0.21
Baseline BMI (kg/m ²)	32.2 ± 8.3	29.9 ± 6.7	31.1 ± 9.5	0.18
VO ₂ peak (ml/kg/min)	21.0 ± 7.7	20.1 ± 7.2	21.8 ± 8.7	0.71
VO ₂ peak (% predicted)	77.27 ± 6.84	73.75 ± 8.09	80.28 ± 4.01	0.12

BMI = Body mass index, CPAP = Continuous Positive Airway Pressure, VO₂ = Oxygen consumption

Table 2: Heart rate variability for all participants at baseline (n = 14)

Variable	All (n = 14)	Range (min-max)	Theoretical ranges*
LF/HF	2.18 ± 1.51	0.86 – 6.33	1.1 – 11.60
LF (ms ²)	602.21 ± 352.49	76.23 – 1226.55	193 – 1009
RSA	5.42 ± 0.93	3.74 – 6.67	0.08 – 6.95
SDNN (ms)	56.07 ± 15.46	26.20 – 85.44	32 – 93
RMSSD (ms)	32.69 ± 13.60	15.36 – 60.47	19 – 75

Data are presented as mean ± SD.

*Theoretical ranges measured with short term HRV for healthy adults

- Overall, when compared to normative values derived from healthy adults, the participants' mean HRV values fell within the normal theoretical ranges
- Individuals with COMISA in this study were characterized with HRV values within normal ranges from apparently healthy individuals, but further direct comparisons with other clinical populations are needed.
- Both exercise and relaxation training may improve certain HRV outcomes and preserve autonomic function in this population².
- Larger studies need to be undertaken.

Acknowledgments

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Results

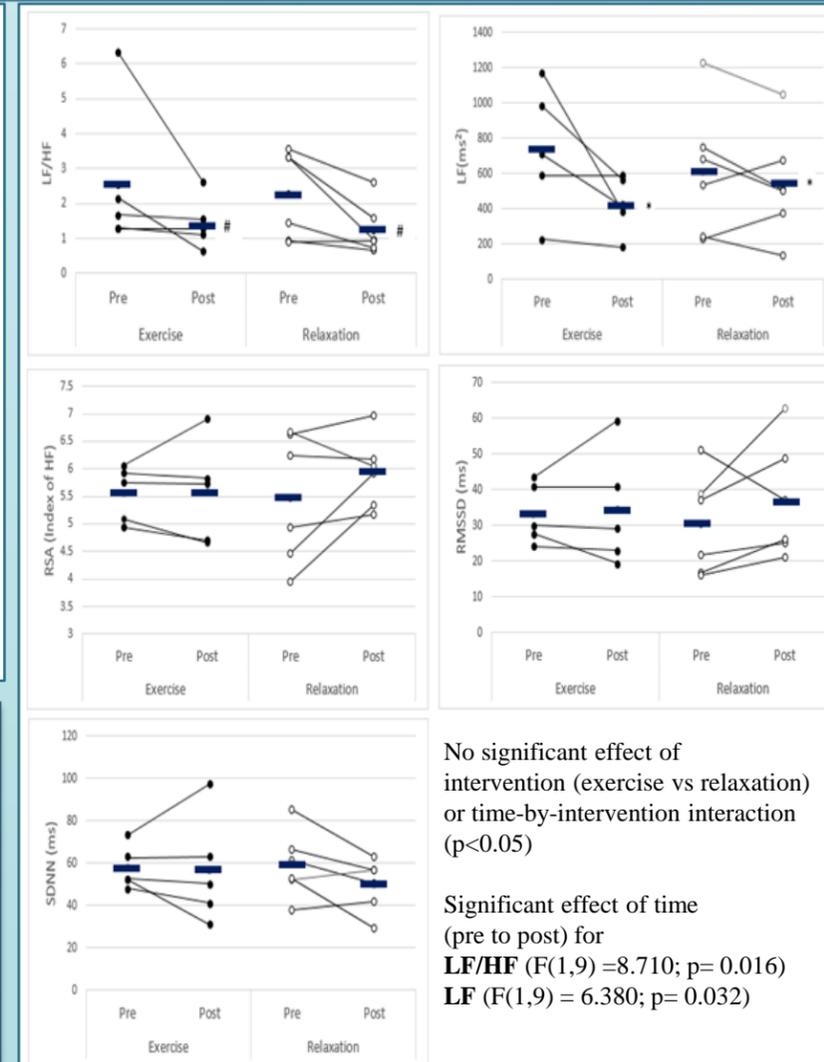


Figure 1: Individual HRV data pre- and post-intervention in the exercise (n=5) and relaxation group (n=6). The horizontal bar represents the group mean for each time point. *p<0.05 for effect of time. #p<0.05 for effect of time for log transformed values.

No significant effect of intervention (exercise vs relaxation) or time-by-intervention interaction (p<0.05)

Significant effect of time (pre to post) for **LF/HF** (F(1,9) = 8.710; p = 0.016) **LF** (F(1,9) = 6.380; p = 0.032)

Selected References

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