Somno ART®

POWERED BY PPRS
THE STRATEGIC PARTNERING ORGANIZATION

An innovative approach for the evaluation of Stress, Pain and Well-being: HRV measurement during sleep



Heart Rate Variability (HRV) is a strong indicator of the **autonomic nervous system**, reflecting the interplay between **sympathetic** (stress, alertness) and **parasympathetic** (rest, recovery) activity.

Current methods are limited by external factors and give only a partial view of autonomic function.

Somno-Art® is the new path
to assess HRV during sleep, in a stabilized, spontaneous, and physiological environment, free from external disturbances.

A New Approach to measure Sympathovagal Balance: Sleep as the Observation Window

Sleep represents an ideal state for observing the autonomic nervous system (ANS): external influences are minimal, biological rhythms are synchronized, and stage transitions reveal spontaneous changes in autonomic balance.

- The **N3 stage** (deep sleep) corresponds to **parasympathetic** dominance.
- **REM sleep** and **awakenings** correspond to **sympathetic** dominance.
- The **N3 → Wake transition**, marked by a cardiac arousal, reflects the **spontaneous reactivity** of the cardiovascular system.[1]

Turning sleep into **a natural cardiac test**, reveals sympathovagal balance modulation without external intervention.
This method enables monitoring of:

- The progression of pathologies affecting the ANS (neurological, metabolic, cardiovascular).
- The effects of treatments on ANS rehabilitation
- The individual's physiological state, recovery, or internal stress level

Our new methodology opens new opportunities in the analysis of ANS regulation.

Advanced HRV Analysis

We also perform a **comprehensive and customizable analysis of HRV indices** applied to any recording **regardless of the device used to record cardiac activity**, whether it be a Holter monitor, PSG or any other system.

Available indices:[2]

- Temporal and frequency-domain HRV parameters
- Nonlinear and symbolic indices

Available outputs:

- Global or continuous time course, value tables
- Specific periods (treatments, sleep stages...)
- Customized reports

ANI – The Analgesia Nociception Index[3]

Based on the high-frequency vagal component of the cardiac signal, the ANI complements HRV by directly measuring relative parasympathetic tone and was originally developed in anesthesia to assess the analgesia/nociception balance. ANI can be computed in instantaneous (ANI_i) or smoothed (ANI_m) form.

Score range: 0 to 100

- **100 = parasympathetic dominance** (comfort or analgesia state)
- **0 = sympathetic dominance** (stress, pain, nociception)

Currently, the ANI is used to evaluate non-communicating patients, individuals receiving palliative care, and patients with Alzheimer's disease.

Exemples of Applications:

Clinical and Scientific Applications

- Study of spontaneous nociception (chronic pain, fibromyalgia, neuropathy).
- Research on autonomic regulation in sleep, neurological, or inflammatory disorders.
- Evaluation of analgesic, neuroactive, or anti-inflammatory treatments.

Research and Clinical Use

- Neurological diseases (Parkinson's, epilepsy, narcolepsy).
- Cardiovascular conditions (post-infarction, hypertension).
- Metabolic and inflammatory disorders (diabetes, Crohn's disease, MS).

Health, Sports, and Well-being

- Assessment of recovery and physiological load.
- Monitoring of fitness level and stress regulation.
- Objective measurement of autonomic fatigue and bodily resilience.

References

1
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Heart rate variability: standards of measurement, physiological interpretation and clinical use. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Circulation. 1996 Mar 1;93(5):1043-65. PMID: 8598068.

3
Yoshida K, Obara S, Inoue S. Analgesia nociception index and high frequency variability index: promising indicators of relative parasympathetic tone. J Anesth. 2023 Feb;37(1):130-137. doi: 10.1007/s00540-022-03126-8. Epub 2022 Oct 22. PMID: 36272031; PMCID: PMC9589736.

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