

Heart Rate Variability (HRV)

Heart rate variability (HRV) is the physiological phenomenon of variation in the time interval between heartbeats. It is measured by the variation in the beat-to-beat interval. Other terms used include: “cycle length variability”, “RR variability” (where R is a point corresponding to the peak of the QRS complex of the ECG wave - and RR is the interval between successive Rs), and “heart period variability”.

The analysis of heart rate variability has been used as a resource for the measurement of autonomic nervous system activity in different situations. This analysis is based on identifying the strength of bands of low and high frequencies of the spectral function of the RR intervals in heart rate. Studies have shown that the related high frequency band parasympathetic tone controls the resting state, while exercise is associated with sympathetic activation, linked to lower frequency bands. The autonomic nervous system plays an important role in mediating the cardiovascular responses induced by stress.

Reduced HRV has been shown to be a predictor of mortality after myocardial infarction. A range of other outcomes/conditions may also be associated with modified (usually lower) HRV, including congestive heart failure, diabetic neuropathy, depression, post-cardiac transplant, susceptibility to SIDS and poor survival in premature babies.

The software “Nerve-Express” is one of the more popular and clinically used for performing heart rate variability analysis. (<http://nerveexpress.com/>)

To perform the HRV analysis, the “Nerve-Express” uses an effective and transparent visual representation, known as rhythmography method, which reflects the wave structure of HRV and acts as a “fingerprint” of the autonomic regulatory mechanisms. The wave RR intervals are recorded sequentially, forming a rhythmogram, or a picture of curved wave-specific variability of RR intervals.

The following **articles** describe the clinical relevance of heart rate variability analysis:

SáBrandão, Glauber, et al. "Analysis of heart rate variability in the measurement of the activity of the autonomic nervous system." *Manual Therapy, Posturology & Rehabilitation Journal= Revista Manual Therapy* 12 (2014).
<https://submission-mtprehabjournal.com/revista/article/viewFile/212/108>

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<https://www.ncbi.nlm.nih.gov/pubmed/8439119>

Malik, Marek, and A. John Camm. "Heart rate variability." *Clinical cardiology* 13.8 (1990): 570-576.
<http://onlinelibrary.wiley.com/doi/10.1002/clc.4960130811/full>

Stauss, Harald M. "Heart rate variability." *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology* 285.5 (2003): R927-R931.
<http://www.physiology.org/doi/abs/10.1152/ajpregu.00452.2003>

Wang, Yi-Tzu. "Monitoring Heart Rate Variability in Relation to Sleep Quality." Diss. 2017.
<https://repository.lib.fit.edu/handle/11141/1424>

Malik, Marek. "Heart rate variability." *Circulation* 93.5 (1996): 1043-1065.
http://dinamika-tech.ru/wp-content/uploads/hrv_standards_of_measurement.pdf

Moser, Maximilian, et al. "Heart rate variability as a prognostic tool in cardiology. A contribution to the problem from a theoretical point of view." *Circulation* 90.2 (1994): 1078-1082.
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Williams, Ebony T., et al. "Preliminary Evidence of a Positive Relationship Between Resting Heart Rate Variability and Trait Worry in a Sample of Women." *PSYCHOSOMATIC MEDICINE*. Vol. 79. No. 4. TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA, PA 19103 USA: LIPPINCOTT WILLIAMS & WILKINS, 2017.
https://www.researchgate.net/profile/DeWayne_Williams/publication/315706636_Preliminary_Evidence_of_a_Positive_Relationship_between_Resting_Heart_Rate_Variability_and_Trait_Worry_in_a_sample_of_Women/links/58dd6dd792851cd2d3e36cc7/Preliminary-Evidence-of-a-Positive-Relationship-between-Resting-Heart-Rate-Variability-and-Trait-Worry-in-a-sample-of-Women.pdf

Tulppo, Mikko, and Heikki V. Huikuri. "Origin and significance of heart rate variability." (2004): 2278-2280.
<http://www.onlinejacc.org/content/43/12/2278>

Bigger JT Jr; Fleiss JL; Steinman RC; Rolnitzky LM; Kleiger RE; Rottman JN. (1992). "Frequency domain measures of heart period variability and mortality after myocardial infarction." *Circulation*. **85** (1): 164–171. doi:10.1161/01.CIR.85.1.164. PMID 1728446. <http://circ.ahajournals.org/content/85/1/164.short>

Kleiger, R. E., Miller, J. P., Bigger, J. T., & Moss, A. J. (1987). "Decreased heart rate variability and its association with increased mortality after acute myocardial infarction." *The American journal of cardiology*, 59(4), 256-262. <http://www.sciencedirect.com/science/article/pii/0002914987907958>

The information in this monograph is intended for informational purposes only, and is meant to help users better understand health concerns. Information is based on review of scientific research data, historical practice patterns, and clinical experience. This information should not be interpreted as specific medical advice. Users should consult with a qualified healthcare provider for specific questions regarding therapies, diagnosis and/or health conditions, prior to making therapeutic decisions.

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