

Introduction to Photoplethysmography (PPG) and Heart Rate Variability (HRV)

A Comprehensive Overview

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What is PPG and HRV?

PPG: Optical technique for heart rate monitoring

HRV: Measures time between heartbeats (RR intervals)

Wearable technology driving innovation (WHOOP, Oura, Garmin, Apple)

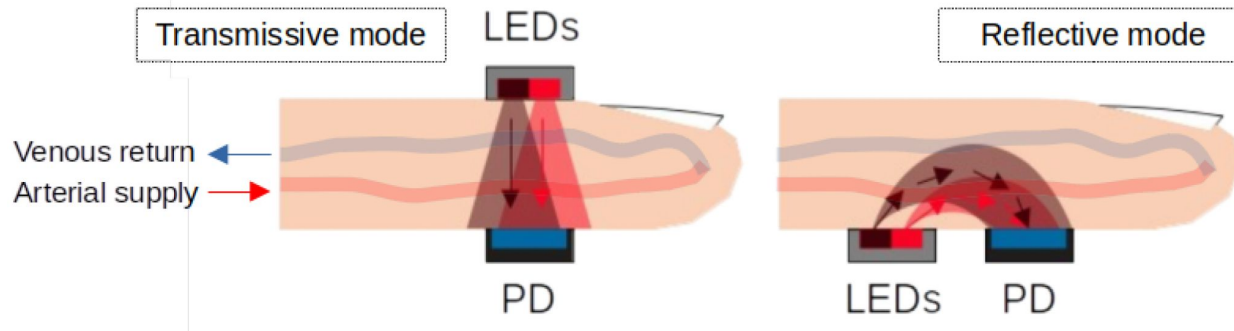


How PPG works?

Light emitted into skin, measures blood volume changes

Reflectance mode used in wearables (smartwatches, bands)

Transmissive mode used in devices like Pulse Oximeters



Significance of PPG

Non-invasive, cost-effective, real-time heart rate monitoring

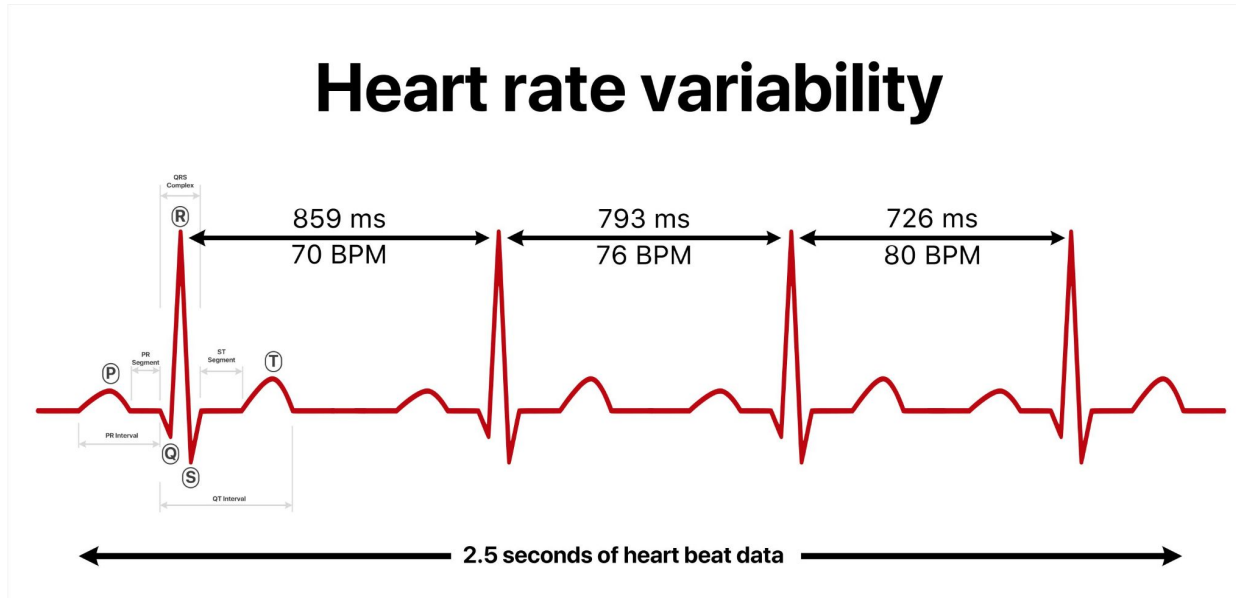
Used in wearables for continuous tracking



Introduction to HRV

HRV: Variation in time between heartbeats

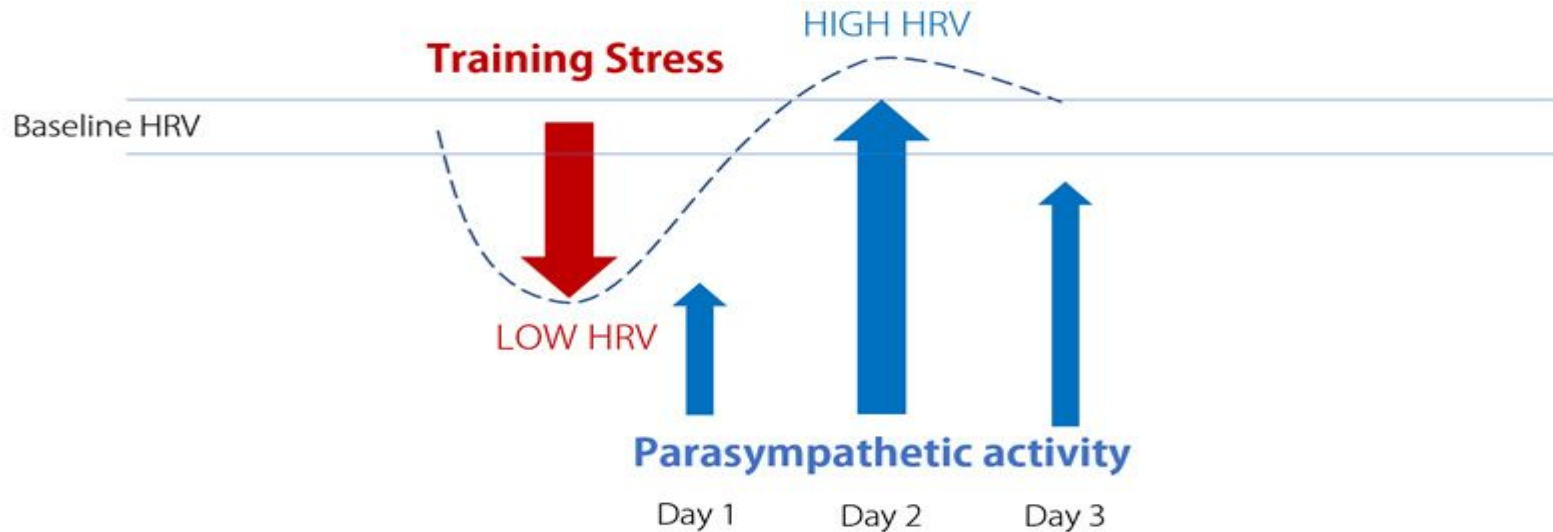
Sympathetic (fight-or-flight) vs. parasympathetic (rest-and-digest) systems



High vs. Low HRV

High HRV: Better recovery, strong parasympathetic function

Low HRV: Stress, fatigue, possible health issues



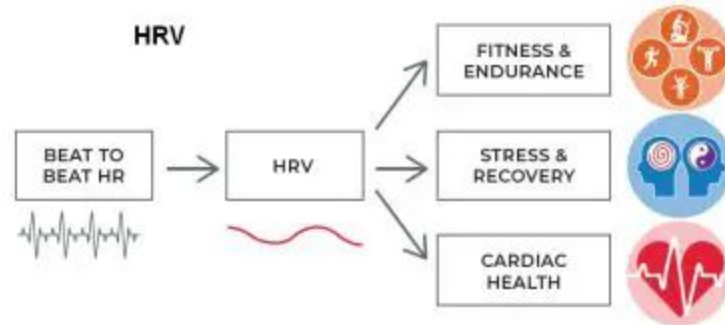
Application of PPG and HRV

Heart rate monitoring

stress analysis

sleep quality

recovery tracking



Research and Insights

PPG-derived HRV as alternative to ECG

Studies on exercise, rest, and sleep monitoring with PPG and HRV

- Whoop
- EliteHRV
- Oura

Conclusion

PPG and HRV provide valuable health insights

Continuous improvements in wearable technology

The future of preventive healthcare with PPG & HRV

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