

# HEXOSKIN

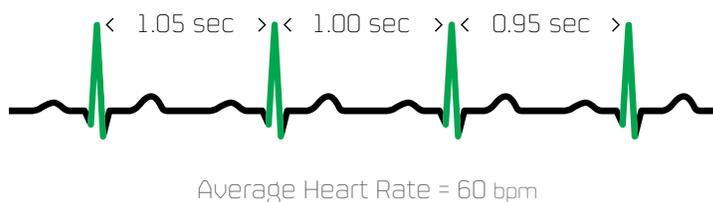
Wearable  
Body  
Metrics



## Measure your Heart Rate Variability with Hexoskin

### Why should I monitor my HRV?

HRV is the variation in the time interval between heartbeats. Hexoskin measures heart rate (HR) and its natural variances from beat to beat. HRV depends on external or internal stimuli such as emotions, heat, respiration, sleep, and physical exertion. Note: A HR of 60 bpm doesn't necessarily mean there is 1sec between each beat (see image).



### Why should I monitor HRV?

HRV measures the cardiac balance of the autonomic nervous system (ANS). It's a good sign if your heart rate varies; it means your ANS is active and adjusting to every situation. Hexoskin allows you to create your personal HRV scores linked to your daily living habits (exercising, diet, stress) and conditions. High-level athletes and coaches also use HRV to monitor training readiness and performance<sup>1</sup>. HRV monitoring with Hexoskin can be used to prevent overtraining or overreaching, thus optimizing training efficiency<sup>2,3</sup>.

### How do I get my HRV?

Each time you move, talk or have stressful thoughts, your HRV changes. Exercise is a type of stress and causes extreme variations in the heart rate. Studies have shown that HRV is difficult to interpret during exercise. Hexoskin provides simple HRV data during rest and sleep, a measure that has more meaning than HRV obtained during exercise. Many factors influence HRV (see page 2). It is very important to control your testing conditions for accurate results.

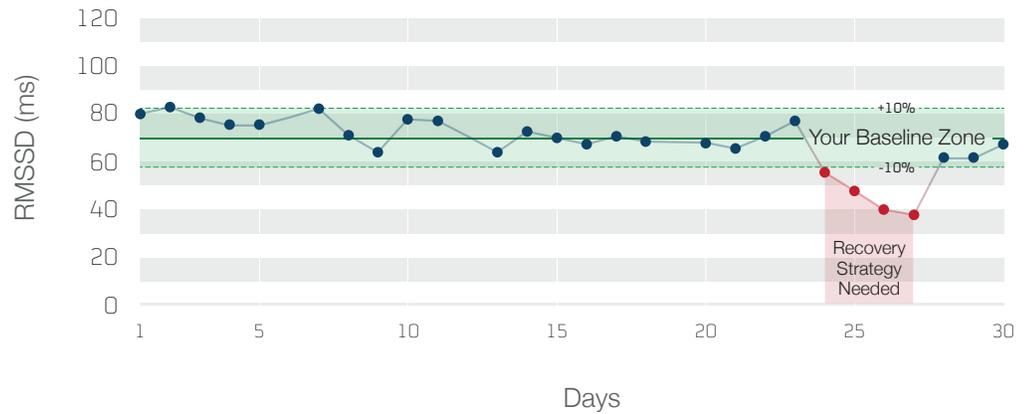
### Rest monitoring

To monitor HRV and prevent overtraining, RMSSD (for Root Mean Square of Successive Differences) is widely used<sup>3</sup>. RMSSD measures the time difference between adjacent heartbeats in milliseconds (ms). Unlike resting heart rate, a higher value is better<sup>3</sup>.

To build your HRV history, compare your results, and plan training or recovery strategies, we suggest that you perform a baseline protocol with your Hexoskin (3 mornings within the same week) at least once a month. To do so, you must go through Hexoskin's 5min Rest Test when you wake up in the morning, after a good night's sleep. Simply lie down and relax, but don't fall asleep! It is very important to always do this test the same way every time in order to obtain comparable and accurate results.

Note your RMSSD score for each test to find your personal average for a relaxed morning. Once your baseline value is set, your baseline zone will be around this value +/- 10 % (see figure on page 2). Do the test every week with your Hexoskin, or every training day morning, to build a significant history. A drop of >10%, associated with fatigue symptoms and decrease in sport performance during a few days or weeks, suggests that resting/recovery strategy might be needed. Your Hexoskin health and recovery history will help you work on strategies to optimize performance and avoid overtraining or health issues.

## Heart Rate Variability History (Measured during 5min Rest Test)



## Sleep monitoring

During sleep, since the recording is much longer, Hexoskin provides the Normalized High-Frequency ratio (Norm HF). Norm HF is a frequency ratio, mostly used in sleep research, that represents the balance of your autonomic nervous system<sup>4</sup>.

To build your sleep history and follow your progress through time, we suggest you use your Hexoskin to perform a baseline protocol (3 nights within the same week) once a month. Make sure these are typical nights, note your result for each night, and final average. For a full night's sleep, people get around 35% on average, but results vary amongst individuals<sup>1</sup>. Your average (baseline) +/- 2.9% is your baseline zone (see figure below).

The figure illustrates how to compare your Hexoskin results. A value (%) lower by at least 2.9% from your baseline zone indicates that your body is in a stressed state, which could be caused by overtraining, fatigue, or health issues (anxiety, cold, etc.)<sup>4</sup>. However, signs and symptoms must be taken into account. E.g. if you feel rested and you got a lower value than usual, that does not mean you're overtrained or sick. Norm HF is only an indicator of your health and sleep quality. Results always need to be put into context. If you are travelling, feeling sick, or experimenting significant changes in your life, you might want to use your Hexoskin to monitor your sleep as well to track changes and ensure sufficient recovery.

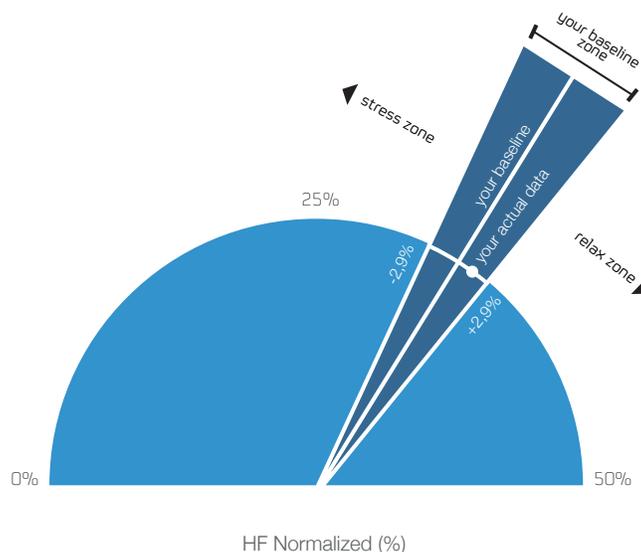
## What can affect HRV?

Increase (good)

- High fitness condition (especially aerobic fitness)
- Healthy food and hydration habits
- Enough recovery and sleep
- Relaxation (breathing exercises, yoga)

Decrease (bad)

- Overtraining or physical stress
- Mental stress, anxiety
- Insufficient recovery and/or sleep
- Poor eating and hydration habits
- Disease, injury, inflammation
- Smoking, alcohol, drugs



References  
 1. Heart rate variability Guidelines (1996). "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." *European Heart Journal*. 17(3): 354-381.  
 2. Morales, J. et al. (2014) "Use of Heart Rate Variability in Monitoring Stress and Recovery in Judo Athletes." *Journal of Strength and Conditioning Research / National Strength & Conditioning Association*. 28 (7): 1896-1906.  
 3. Buchheit, M. (2014). "Monitoring Training Status with HR Measures: Do All Roads Lead to Rome?" *Frontiers in Physiology*. 5 (73): 1-19.  
 4. Tian, Y. et al. (2013). Heart rate variability threshold values for early-warning non functional overreaching in elite female wrestlers. *Journal of Strength and Conditioning Research / National Strength & Conditioning*