SLEEP MONITORING WEARABLES

Great sleep is a competitive advantage, and today's wearables can help athletes quantify key aspects of their nightly recovery as part of a holistic approach to training and lifestyle monitoring. But not all sleep-tracking metrics are created equal, and knowing which ones truly matter can make the difference between informed adjustments and unnecessary distractions.

HOW IT'S MEASURED	MEASURE	OUTCOME METRICS
Pulse oximeter/ plethysmogram (PPG)	HEART RATE	Resting Heart Rate (RHR) Heart Rate Variability (HRV) Oxygen Saturation (SpO2)
Inertial Measurement Unit/Accelerometer	MOVEMENT	Sleep Duration Sleep/Wake Times
Thermocouple	TEMPERATURE	Skin Temperature

	HOW IT'S REPORTED	HOW IT'S ESTIMATED
Sleep Stages	Duration in each stage of sleep	Algorithms typically use HRV, HR patterns through the night, skin temperature, and movement patterns
Sleep Quality	Typically given as a score from a proprietary algorithm	Algorithms typically use HRV, HR patterns through the night, skin temperature, and movement patterns and assumptions about ideal times in various stages of sleep
Recovery Status	Typically given as a score from a proprietary algorithm	Algorithms typically use HRV patterns and may incorporate training/activity data from the day or previous days
Training Load/Fatigue	Typically given as a score from a proprietary algorithm	Algorithms typically use training/activity data from the day and/or previous days
Menstrual Cycle	Predictions of cycle phase times (periods, ovulation, etc.)	Algorithms use skin temperature, HR/HRV, and user-logged feedback

Accuracy and reliability: Good | Better than random | Weak or unknown

DEVICE	DESIGN	PROS	CONS
Oura Ring	Ring	• Comfortable and discreet design • High accuracy/reliability in heart rate metrics during sleep • Accurate cycle tracking for women	• Low accuracy/reliability in heart rate metrics during activity and daily living • Not good for training or activity monitoring
Whoop	Band	• High accuracy/reliability in heart rate metrics • Less noticeable than a watch on wrist • Can also be worn on forearm	• No screen for real-time activity monitoring • No cycle tracking for women
Garmin Watch	Wristwatch	• Multi-use device can also serve as comprehensive sport/training measurement tool • Good accuracy/reliability in heart rate metrics throughout day and during sleep	• HRV measures not quite as accurate as Oura/Whoop • Cycle tracking not as accurate as Oura • Bulkier design than Whoop due to sport tracking/GPS watch functionality • May be less comfortable for sleep for those who don't like wearing watches
Apple Watch	Wristwatch	• Multi-use device can also serve as sport/training measurement tool • Good accuracy/reliability in heart rate metrics throughout the day and during sleep	• HRV measures not quite as accurate as Oura/Whoop • Cycle tracking not as accurate as Oura • Bulkier design than Whoop band due to activity/monitoring and GPS watch functionality • May be less comfortable for sleep for those who don't like wearing watches • Requires iOS

Note: Pay attention to versions of the devices. More recent versions often include upgrades to sensor technology, improving quality of the measurements.

TIPS FOR USING WEARABLES IN TRAINING & COMPETITION

1

Track Trends, Not Daily Fluctuations

Monitor weekly/monthly trends in RHR, HRV, and sleep duration to guide training load. Avoid fixating on single-night data to prevent sleep anxiety ("orthosomnia").

2

Pay Attention to Valid Measures

RHR, HRV, and sleep duration trends can be valuable. Sleep stage durations, any "scores", etc. are all approximated via proprietary algorithms unique to each device and lack validity and generalizability within and across training periods.

3

Establish Healthy Baselines

RHR may need 2 weeks of healthy normal baseline data and HRV may need 3-4.

4

Collaborate With Performance Team

Discuss data with coaches or sports scientists to interpret metrics in the context of your individual training and life. Increases or decreases in RHR, HRV, or other metrics and the magnitude of those changes will mean different things for different athletes.

5

Combine with Subjective Feedback

Pair wearable data with sleep diaries or the USOPC's sleep questionnaire/screening tools to capture perceived sleep quality, which devices miss.

6

Plan A Competition Strategy

Use wearables during training and pre-competition to optimize recovery. Skip wearing during competition nights if data feels distracting.

CAUTION

- Composite metrics (sleep scores, recovery scores, training loads, etc.) can correlate with perception in many cases, but they can diverge from physiological reality in sometimes unexpected or unexplained manners.
- Equal "score" changes from different stresses do not imply they are equal stresses. The magnitude of change in scores from different stresses can be similar despite different physiological stress. E.g., the drop in a recovery score from a big day of training versus having several alcoholic beverages before bed may have similar score changes, but the physiological stresses are very different.
- Common acute disruptors include: training load fluctuations, personal stress, long travel, meal timing, alcohol use, and cannabis use. Each of these can affect metrics and scores in unique ways.
- Review app privacy settings to protect health data, especially with cloud-based platforms like Apple Health or Garmin Connect.
- Wearables are tools, not substitutes for professional sleep assessments. Consult a sleep specialist for ongoing issues.