QUICK GUIDES

# EVALUATING SLEEP QUALITY


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# Evalutating Sleep Quality

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# The Importance of Quality Sleep

Quality sleep is an important factor in maintaining health, as it is necessary for the body to restore and repair bodily systems.

Short and poor-quality sleep have been directly linked to a series of chronic health problems, including weight gain and obesity, insulin resistance, hypertension, depression, adverse cardiovascular consequences, weakened immune response, and more.

Research shows that excessive sleep can contribute to health concerns as well, with one study recommending that the optimal amount for adults is seven to eight hours nightly.


Helo wearables, equipped with a cutting-edge PPG function, provide useful sleep monitoring and analysis for everyday consumer use.

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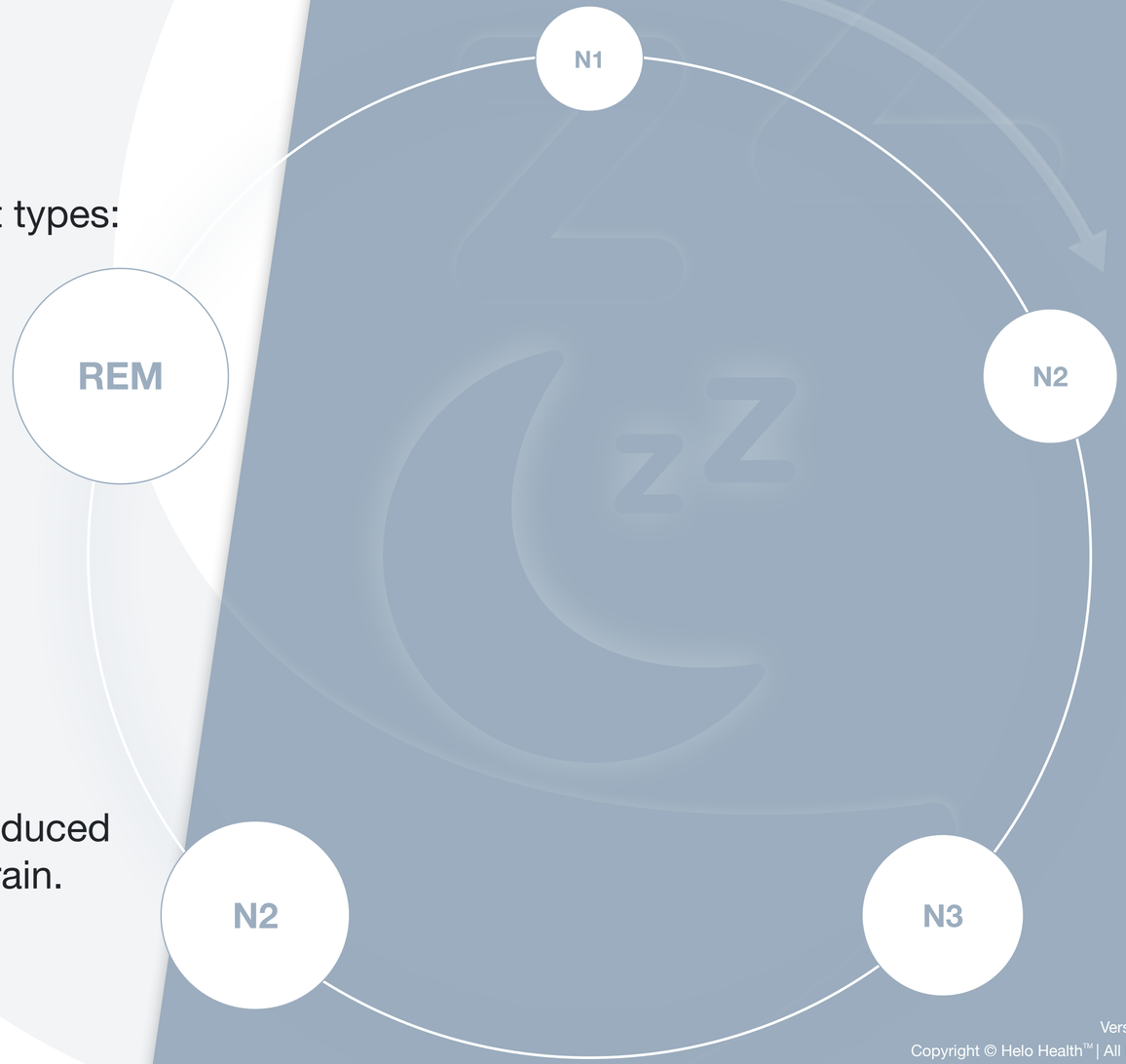
# Patterns of Sleep

Sleep is a naturally recurring state divided into two very distinct types:

**Non-rapid eye movement (NREM) sleep**

**Rapid eye movement (REM) sleep**

**NREM** or deep sleep, which occurs first, is characterized by reduced body temperature and heart rate, and less energy use by the brain.



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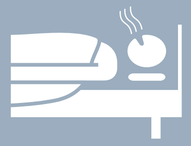
# Sleep Disturbance Impacts

**Loud snoring**

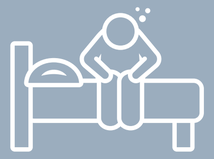
**Periods when breathing stops and restarts (reported by another person)**



**Gasping for air during sleep**

**Waking with a dry mouth**

**Morning headache**



**Difficulty staying asleep**

**Excessive daytime fatigue**

**Difficulty paying attention while awake**

**Irritability**

**Reduced Heart Rate Variability**

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# REM Sleep

Known as the dream state, it represents a smaller percentage of overall sleep. It involves fast brain waves, eye movements, and relaxed muscle tone.

REM is a critical, necessary sleep state that happens every night when you sleep properly, and it provides numerous benefits for your health.

REM stages can be monitored and reported with the right technology, and easily tracked and analyzed by Helo wearables and the Helo Smart App so you can know how much REM sleep you get, and work to improve.

All you have to do is wear your device while sleeping and you will automatically get insights on your sleep quality, including REM sleep and any sleep apnea incidents!

**This feature is active when 24h monitoring is enabled on your device, which requires a Wellness+ subscription.**

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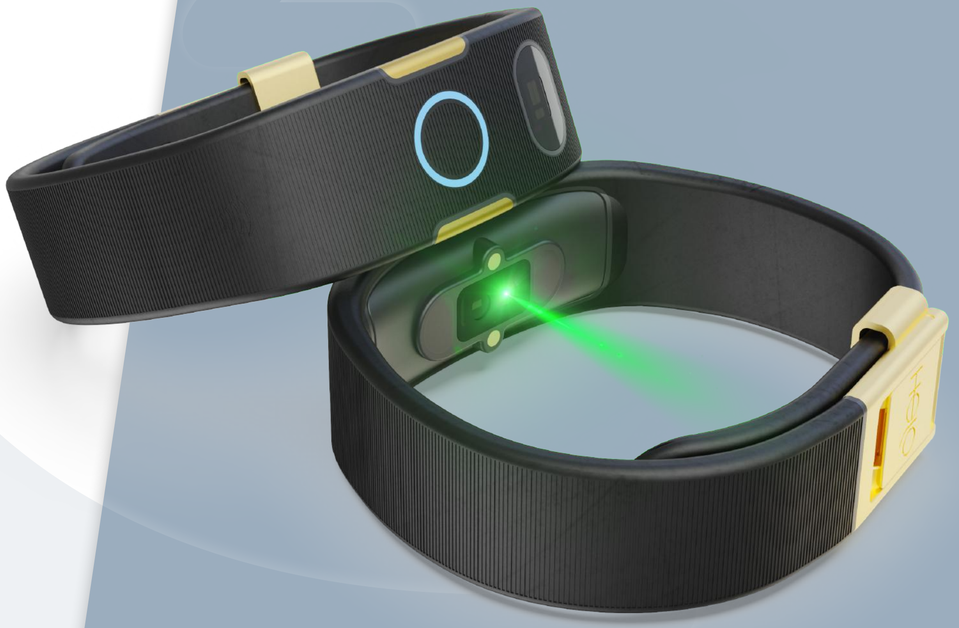
# Benefits of REM Sleep

- Learning
- Memory processing
- Stress management
- Forming new neural connections in the brain (cortical plasticity)
- Restoration of aminergic cell/receptor function
- Heightened creativity

# Evaluating Sleep Quality

- Given its impact on overall health, quality sleep should be a priority for everyone.
- There are different methods for measuring and evaluating sleep quality. Polysomnography (PSG) is considered the «gold standard» and this method measures and records numerous parameters as a polysomnogram.
- Another method is actigraphy. However, it can only be used to automatically approximate sleep-wake patterns and cannot reliably distinguish between the different stages of sleep.
- Electrocardiogram (ECG) can be used to evaluate sleep by analyzing cardiopulmonary coupling using two features of the signal, heart rate variability and respiratory modulation of QRS waveform on a beat-to beat basis. However, the ECG sensor still requires multiple electrodes to be attached to the body, which might limit prolonged use at home.
- Photoplethysmography (PPG) can also be used for monitoring sleep.
- Wearable devices are also usually equipped with accelerometers, which can improve sleep monitoring accuracy.



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# Using PPG to Evaluate Sleep

- Photoplethysmography (PPG) is an optical method for measuring blood volume changes in a bed of tissue, such as a finger or earlobe, by illuminating the skin and measuring light absorption.
- PPG has the ability to capture the modulation of the autonomic nervous system during sleep.
- Research shows that wrist-worn PPG is promising for long-term sleep monitoring.

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# Why Sleep Monitoring with Helo Wearables

- Helo wearables utilize high quality wrist PPG sensors and powerful analog front end chips, paired with digital signal processing technologies and motion sensors, which enable quality wrist-based PPG readings and accurate sleep monitoring.
- During the night, the wearable captures respiration rate, heart rate, heart rate variability (HRV), body temperature and more.

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# Detecting Sleep Disturbances with Helo

- When sleep disturbances occur, your heart reacts in ways that can be detected, including an increased heart rate and changes to heart rate variability (HRV).
- HRV is a measure of the difference of time between heartbeats and is an indication of how well the heart can change rhythm in response to different situations and stimuli.
- Helo devices optically monitor these changes in HRV to detect sleep disturbances
- The Helo Smart App reports a sleep disturbance score, based on incidents per hour:

  **Low**: Less than 15 incidents per hour
  **Moderate**: 15 to 30 incidents per hour
  **High**: More than 30 incidents per hour

This feature is active when the 24-hour heart monitoring is enabled on your device. Understanding your sleep disturbance count helps you take action to protect your health and elevate the quality of your sleep. A Wellness+ subscription is required for 24h monitoring.

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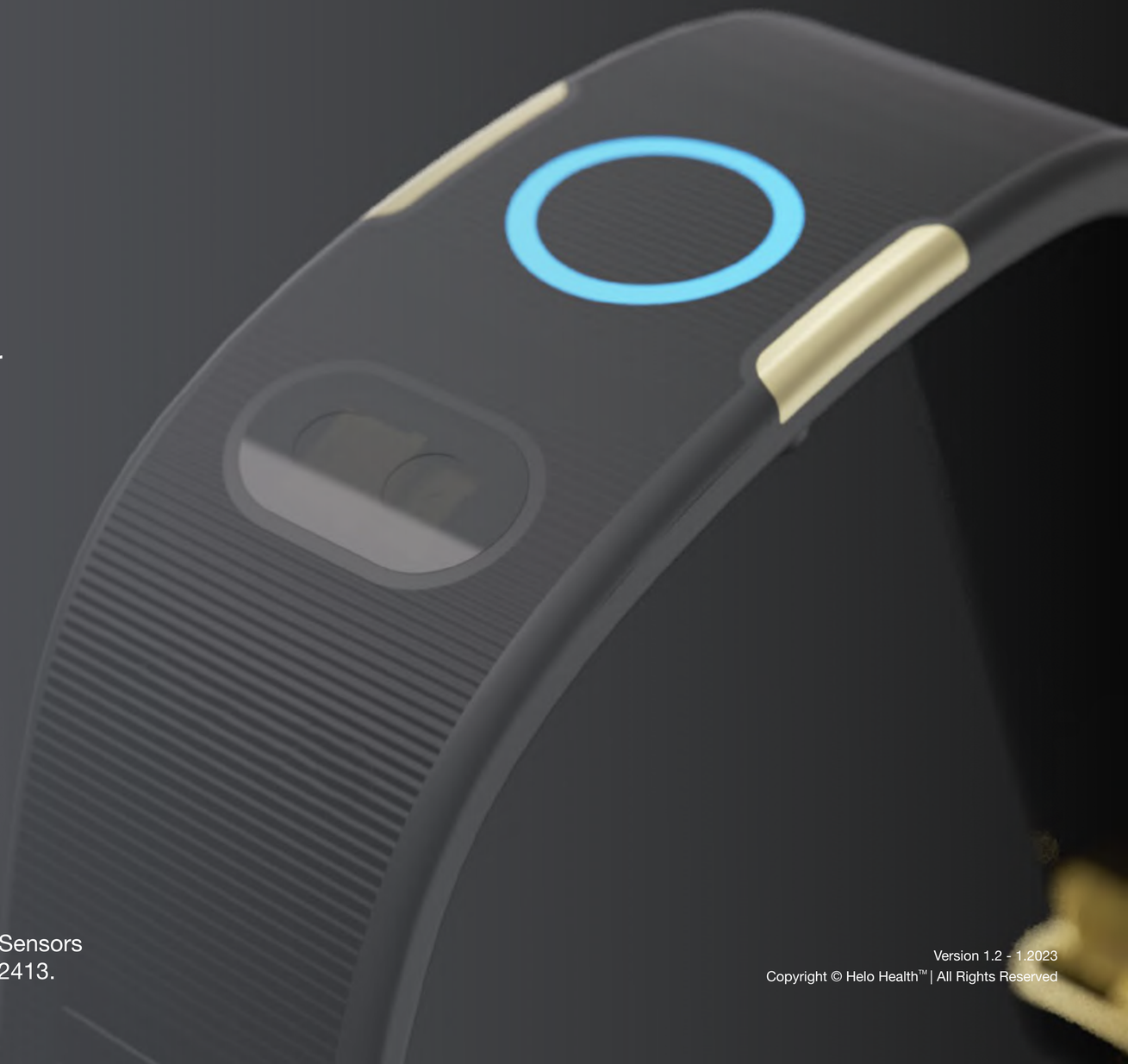
# Sleep Monitoring from Helo

- Researchers have found PPG to be a convenient and effective method for monitoring and reporting sleep quality.*
- Helo wearable devices are equipped with PPG functionality for measuring sleep and, on the back end, applying algorithmic analysis to detect areas of concern, including sleep disturbances. Helo supports device users' health by providing them with actionable insights that enable them to proactively improve their sleep habits.

**All you have to do is wear your device while sleeping and you will automatically get insights on your sleep quality, including REM sleep and any sleep disturbances!**



* Vulcan RS, André S, Bruyneel M. Photoplethysmography in Normal and Pathological Sleep. Sensors (Basel). 2021 Apr 22;21(9):2928. doi: 10.3390/s21092928. PMID: 33922042; PMCID: PMC8122413.

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## Note

Some features are not available in all markets.
Helo products and services are designed to support wellness and are not intended for diagnosing, curing, mitigating, treating, or preventing any diseases or other medical conditions and users should consult with a doctor or other qualified healthcare professional before making any medical decisions.

# Cheers to Life Sensing Technology™

Discover more with Helo!

www.helohealth.com

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