WHOOP UNITE™

Research FAQs

whoopunite.com

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1. What data does the WHOOP device collect? Outside of the scope of the study, what data does WHOOP collect? Is the data personally identifiable?
WHOOP collects HR and accelerometer data at 52 Hz 24/7. WHOOP uses respiratory rate, HRV/RR intervals, heart rate, and accelerometry to stage sleep (light, wake, REM, SWS). The WHOOP 4.0 device also collects skin temperature and spO2.

Data collected outside the scope of the study is limited to information that a user enters when creating a profile or when logging behaviors in the daily journal. Profile information includes: first name, last name, email address, height, weight, birth date, age, state (if applicable), country, and a photo (optional). Journal information includes: up to 80+ behaviors that they can choose to track that may impact their recovery score.

2. How do we, the research partner, access the data? Does WHOOP provide an API?
WHOOP provides raw data for analysis via CSV/Excel files. We do have API capabilities for data extraction at an additional cost.

3. We have experienced data syncing issues in the past with iOS. How does WHOOP sync data?
The WHOOP device will continually transmit data via Bluetooth to an individual's phone and in turn to the WHOOP servers as long as the WHOOP app is running in the background on the individual's phone. WHOOP can run on both iOS and Android devices with BLE 4.2 or higher.

4. Is WHOOP required to sign a BAA?
WHOOP is not a health care provider, a health plan or a health care clearinghouse and therefore is not a "covered entity" under the HIPAA rules. Further, if you are a "covered entity," we can structure our relationship such that you do not disclose protected health information to WHOOP, or the PI can obtain consent to disclosure, making a BAA unnecessary.

5. What are the minimum smartphone specifications for WHOOP?
Minimum device requirements are listed here:

6. Is the data sent from the app to the WHOOP EDC encrypted? Does the data sent from strap to phone via Bluetooth have vulnerabilities?
Data is encrypted in transit as well as at rest. Data is stored in AWS RDS and S3 services with 256 bit encryption. Security on the strap is enforced by means of encryption. Data sent from the strap to the phone is done over Bluetooth Low Energy using the security protocols introduced at specs 4.2 and above. The WHOOP Strap is a BLE 5.0 capable device.

7. What kind of data will each participant in the study have access to?

This depends on the design of the study. In some instances, participants may have access to all data that is shown within their individual WHOOP app. This includes recovery (HRV, RHR), strain (HR, calories, activity breakdown), sleep data (duration, efficiency, stages, respiratory rate), and any responses to daily journal questions. Users of the WHOOP 4.0 device may also have access to their blood oxygen level (SPO2) and skin temperature. In other instances, all user wellness data is blocked on the mobile app and the participant would only have access to device-related metrics such as remaining battery life.

8. We would like to have devices sent back to us if subjects stop participating in the study. In this case, is it possible to stop their free subscription and deregister the devices so that they could be reused for other subjects?

Yes, if a subject were to stop the study for any reason we can turn off their membership and transfer that status to the next user. The data is stored within each user's account, not on the strap, so the strap will not need to be wiped or reset.

9. Other than the Privacy Policy stated here on the WHOOP website, what other US privacy policies are individuals bound by?

Individuals are also bound to the Terms of Use, which can be found here. WHOOP is US Privacy Shield self-certified. WHOOP is also GDPR compliant for doing business within the European Union and the UK. WHOOP enters into Data Protection Agreements with third-party vendors (when necessary and appropriate) to protect the security of customer data.

10. Is there any encryption used during transfer and when it is stored on their servers?

Data is encrypted in transit as well as at rest. Data is stored in AWS RDS and S3 services with 256 bit encryption. Security on the strap is enforced by means of encryption. Data sent from the strap to the phone is done over Bluetooth Low Energy (BLE) using the security protocols introduced at specs 4.2 and above. The WHOOP Strap is a BLE 5.0 capable device.

11. In which nation will the data be stored?

Data is stored in the United States in Amazon Web Services (AWS) West.

12. Can you describe “system availability” and “accessibility guarantees”? WHOOP's architecture is entirely stored and backed up in a cloud environment running on AWS. We run a VPC inside AWS and as a result, system reliability and integrity is both secure and durable. Please refer to AWS FAQ sections for specifics: AWS RDS FAQs; AWS S3 FAQs

13. Can you describe the “Data Disaster Recovery” protocol?

Data transferred to WHOOP is backed up within the cloud environment for disaster recovery purposes.

14. Can you describe the System Security and Regulation?
WHOOP runs a VPC within AWS that requires MFA credentials and uses IAM protocols to secure data and produce logs recording access and changes.

15. What is the "level" of legislative compliance?
In general we work to follow legislated compliance for the regions around the world in which we do business.

WHOOP Metric Information

HR
The general process for HR estimation on WHOOP is the following:

1. Collect PPG data from the WHOOP Strap.
2. Using the Accelerometer and information from the PPG signal with a black-box algorithm, we filter out "noise" from the signal.
3. Estimate, each second, a heart rate value. The actual estimate can come from one or more "estimators" each with a "likelihood". Examples of these estimators are a peak finder if the PPG signal is sufficiently clean or spectral methods that extract frequency content over windows of PPG data of various lengths if it is not. The HR reported each minute *is not* 1/RR interval (e.g. you may not have an RR interval in each 1-second epoch).
4. Apply a smoother/tracking filter (basically an alpha-beta filter) over the HR time series to ensure one erroneous data point doesn't derail us).

RR Logic
Each row in the raw data file will end with RR-intervals. Each row may have 0 or up to 5 RR intervals dependent on 2 factors:

1. If we were unable to do RR estimation because the PPG signal is still too noisy, we will not report any RR intervals
2. If there was no heartbeat in that one-second interval, there will be no RR intervals. Likewise, if there were 2 or more heartbeats, there will be > 1 RR intervals reported.

RR intervals and HRV are used in the WHOOP system, at the current time, for the Recovery Score and HRV which are generated during periods of low/no motion particularly sleep. It is not expected to have RR intervals during activities or sport.

- The HRV in WHOOP is measured during the 5 minute period in which we take the Recovery score during sleep. It changes user to user but is usually the last 5-minute episode of the last Slow Wave Sleep period.

Sleep

Sleep is recorded in 30-sec epochs and a machine learning algorithm is used to calculate the probability of sleep stage class, with each Epoch subsequently assigned to the class with the highest calculated probability of being the true class. HR, RR Intervals, Accelerometry, and Respiratory rate are all used to stage sleep (Awake, REM, Light, Deep/SWS) .

Device Validation

Effect of wearables on sleep in healthy individuals: a randomized crossover trial and validation study, University of Arizona Health Sciences Center for Sleep and Circadian Sciences

- The bias and precision errors for measuring nighttime sleep duration (sleep quantity) and sleep fragmentation (sleep quality) by the wearable when compared to the PSG was very low. Similarly, the accuracy of wearable-based measurements of heart rate, respiratory rate, and heart rate variability was excellent when compared to the gold-standard PSG. The inter-class correlation coefficient (ICC) for scoring the various sleep stages between the two experienced blinded scorers was excellent (ICC 0.91 + 0.05). In contrast, the ICC between the wearable and the consensus scores of the blinded expert scorers was good (0.67 + 0.15 [SD]; n=32). However, the ICC was excellent for dream sleep (0.85 + 0.15) and good for slow-wave sleep (0.74 + 0.28). The ICC for light non-dream sleep was fair (0.63 + 0.15).

A validation of six wearable devices for estimating sleep, heart rate, and heart rate variability in healthy adults, The Appleton Institute for Behavioural Science, Central Queensland University

- For both HR and HRV, WHOOP 3.0 was within 0.3 bpm for RHR, and HRV was within 4.5 ms, with an interclass correlation of 0.99. “WHOOP 3.0, had an almost perfect agreement for measures of both heart rate and heart rate variability.”

Published Research Using WHOOP as Data Collection

- Feasibility of Using a Wearable Biosensor Device in Patients at Risk for Alzheimer’s Disease Dementia, The Journal of Prevention of Alzheimer's Disease
- The Measurement of Orthopaedic Surgeon Burnout Using a Validated Wearable Device, Arthroscopy Sports Medicine and Rehabilitation

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