



## Consent Form “Sleep, Attention & Scent”

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### Purpose

Sleep is a crucial factor in cognitive functioning, and a lack of sleep has been linked to decreased attention, mood and productivity in the workplace. Nevertheless, sleep deprivation and its negative impact on cognitive abilities as well as health are commonly identified among broad populations.

Software engineering specifically, is a complex and demanding field that requires a high level of focus and attention to detail. Previous research has shown a decrease in code quality when writing code after just one night of sleep deprivation. This motivates further investigating the influence of sleep patterns on software development tasks long-term.

Our study focuses first on exploring the relationship between different sleep measures on software developers' productivity and their ability to focus. More specifically, we aim to track software developers' sleep using a smartwatch as well as perceived focus and productivity and computer interaction data throughout six weeks. Additionally, we incorporate an intervention, a sleep mask with a lavender-scented dot, during sleep time. Our goal is to examine whether it has an effect on sleep and further, on developer focus and attention at work long-term.

### Study Procedure and Collected Data

Overall, the study spans over six weeks and consists of the following steps and phases:

Setup session (online) [no longer than 30 minutes]: At the beginning of the study, we inform you about the procedure and the data we record. You may freely decide whether you want to participate or not. After signing the consent form, you will be asked to fill in a pre-study questionnaire with questions on demographics, attention as well as sleep behavior. Afterwards, the research team will introduce you to the study, help set up the watch (Fitbit Versa 4), and ask you to install the tool PersonalAnalytics on your computer. This session should take no longer than 30 minutes including the questionnaire.

Study phase [6 weeks]: During the six weeks of the study, the following data will be collected.

- Sleep tracking and morning questionnaire (online) [2 minutes]: Throughout the baseline phase, your sleep data will be automatically tracked using a watch. In addition, you will be asked to fill out a short questionnaire (max. 2 minutes) about your perceived sleep quality in the morning, after waking up.
- Hourly self-reports (prompt on watch) [1 minute]: Throughout a workday, the watch will display a few short questions (Likert scale) every hour, including questions on your perceived attention, distractibility, and productivity. You can set your work times in the settings of the watch application and can skip or ignore questions anytime.



- End-of-day questionnaire and attention task (online) [8 minutes (weekdays), 10 minutes (Friday)]: Every workday evening, you will be asked to fill out a short online end-of-day survey, focusing on productivity and wellbeing. In addition, you are asked to complete three minutes of a Go/NoGo task in an online application. You will receive a link to this task together with the link to the end-of-the-day survey via E-Mail.
- The tool (PersonalAnalytics) installed on your computer will collect information on your interaction with the computer in the background in a privacy-preserving manner (for more details, see chapters on “Data Collection” and “Data Storage”).

Intervention: As part of this study, you will be asked to wear a comfortable and high-quality mask for sleeping for four weeks. During two weeks of the experiment, a lavender scent pod will be added to the sleep mask.

Post-study session [less than 30 minutes]: At the end of the study, we will conduct a final interview or a follow-up survey. The interview will be audio recorded and transcribed using the built-in transcription service and deleted within two weeks of the interview if you consent at the beginning of the interview. Otherwise, we will take notes during the interview. In this session, we will also show you how you can review and obfuscate the data collected by our tool and ask you to send it to us using a secure drop-folder. Overall, this should take no longer than 30 minutes.

### **Benefits**

As a token of our appreciation, you will get to keep the provided watch and sleep mask after the study and you will have the chance to learn more about your sleep quality and perception of focus during work. In addition, we want to encourage regular participation by giving you 1 token for each day that you fill out the morning, evening, and 4 hourly questionnaires. At the end of the study, you will receive a gift certificate corresponding to your number of tokens and if you fill out more than 3 per week over the 6 week period, you will be entered in a raffle for an additional gift certificate. By participating in this study, you are contributing to an ongoing effort to improve the future of the workplace.

### **Risks**

The main risk is the loss of time required to participate in the study. You may experience frustration if the self-report notifications come at inappropriate times, potentially disrupting important work or interrupting a meeting. To mitigate the disturbance factor of the notifications, we will collect your notification preferences prior to running the study. You can also adjust the notification start time and end time through the app settings at any time and have the option to skip all notifications.

Furthermore, there is a risk that the sleep mask might cause discomfort. If this is the case, you will be encouraged to continue participating in this study without the use of the sleep mask.

You are free to withdraw from participation at any point during the study, without the need to provide a reason.

### **Data Collection**

The collected data will be used exclusively for research purposes. In particular, we will collect survey and interview data. In addition, we will collect self-reports, sleep, physical activity, and heart rate variability data through the smart watch. No other data, such as location information, will be collected with the smart watch. In addition, our tool will collect data on your interaction with the computer and your web browser and will save this locally on your computer (it will not be uploaded to external data storages). In particular, the tool collects data on the amount of time spent on social media, email and instant messaging applications and generative AI web interfaces, as well as the number of window switches, and the overall aggregate of interaction with the computer, in aggregate for a given day. Neither the contents of any communication (emails or instant messages) will be collected, nor will we collect whom those messages are sent-



to/received-from. At the end of the study, (if you consent) we will ask you to provide us with a privacy-preserving and reduced version of the local data which obfuscates URLs and does not comprise web page titles nor any other information that can be used to identify the web page you visited. You will have the opportunity to review and obfuscate all data before sharing it with us, if you consent.

### **Data Storage and Confidentiality**

All data will be treated confidentially and only reside on machines of the university researchers. Your data will be used and seen only by researchers directly involved with this project. Interviews may be audio recorded (if you consent) and will be transcribed by a university-approved professional transcription service (if you consent). After the transcription is created, the audio recording will be deleted. In case there is any identifying information in the transcripts or any other collected data, the researchers will manually remove them before starting the data analysis. In any case, raw data may not be stored for longer than one year. All identifying information will be kept strictly separate at all times from any other collected data and will be stored in a different location at the University of Zurich. Only the involved researchers will have access to this information. Furthermore, it will not be associated with the data after it has been analyzed. After the study is finished, your identifying information will be permanently deleted. The anonymized, non-identifiable data produced from the study will be stored for five years, after which it will be permanently and irrevocably deleted.

### **Uses of the Study Data**

For our research, we will only use pseudonyms with your data, and no identifying information will ever be shared outside of the research group and the confines of this study without your explicit permission. The results of this study will be published in a research paper and may potentially appear in both internal and external academic research presentations and publications, such as academic journals and conference proceedings. Data presented in presentations or publications will never allow identifying individual persons.

### **Contact for Information about the Study**

If you have any questions or desire further information with respect to the study, you may contact Isabelle Cuber ([cuber@ifi.uzh.ch](mailto:cuber@ifi.uzh.ch)) or Prof. Dr. Thomas Fritz ([fritz@ifi.uzh.ch](mailto:fritz@ifi.uzh.ch)).

### **Consent for Study Participation**

Your participation in this study is entirely voluntary. You are free to withdraw your participation at any point during the study, without giving any reason and without any negative consequence. Any information you contribute up to your withdrawal will be retained and used in this study, unless you request otherwise.

With your check mark you confirm the following statements:

- I allow the tracking of my smartwatch data (sleep data, physical activity data and heart rate variability).
- I allow the privacy-preserving recording of my browser and computer interaction data.
- I understand the goals and procedures of the study and the applicable conditions.
- I had the opportunity to ask questions. I understood the answers and accept them.
- I am at least 18 years old.
- I had enough time to make the decision to participate and I agree to the participation.

In no way does this waive your legal rights or release the investigators or involved institutions from their legal or professional responsibilities.