Preregistration: Smartphone Sensing Panel Study

Fact Sheet	
Title of the research project	A longitudinal panel study combining smartphone sensing and survey methods (shortcut: smartphone sensing panel study)
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Structure of the pre-registration	1) **Basic Protocol** The basic protocol includes background information about the research project, the concept of the study, general study procedures, and assessed variables. It is preregistered prior to data collection.
	2) Preregistration Protocol Template The preregistration protocol template can be used to preregister specific research questions and related procedures and analysis methods. The preregistration of research questions is carried out by the respective researchers.
Data Collection	15.05.2020 - 14.11.2020

Basic Protocol: Smartphone Sensing Panel Study

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14.05.2020

Abstract

The study *Smartphone Sensing Panel Study* aims to create a benchmark dataset for the scientific community, including three data collection modalities: (1) smartphone sensing (2) experience sampling, and (3) monthly online surveys. The study is a panel study lasting for three to six months and resulting in high-dimensional and longitudinal behavioral and situational sensing data, self-report data in situ, and traditional questionnaire data about a broad range of psychological traits and phenomena. A quota sample of N = 800 participants is recruited and asked to install the research app *PhoneStudy* for three to six months. During the period of study participation, sensing data is continuously logged. Sensing data collection is complemented by monthly online surveys and experience sampling periods.

Description of the Study

Sample

This study aims to create a benchmark dataset for the research community including different data types (sensing, experience sampling, and survey data) in a longitudinal design. The starting sample size of $N = 800$ therefore results from the weighing of study duration, dropout rates, and study costs. The monthly drop-out rate is expected to decrease with time and to vary between 7 and 18.5%. Accordingly, a final sample size of about 430 participants is expected after six months. To control the costs for compensation of participants, the starting sample is split into two groups: 600 participants (group 1) are asked to take part in the study for six months and 200 participants (group 2) are asked to take part for three months. If the drop-out rate is higher than expected after three months, participants of group 2 will be asked if they are willing to extend their study participation for further three months. Participants of both groups are unaware of the other group. There are no differences between the groups in the onboarding procedures, except for the indicated length of the study and the subsequent compensation information. During the screening process, participants are randomly assigned to one of the two groups.

Requirements for the sample are an age between 18 and 65 years, fluent German language skills and the possession of an Android smartphone (Android 5 or higher) for private purposes (not business/job-related) as sole user. This study aims to collect a quota sample of Android users aged 18 to 65 years. Therefore, participants are selected for study participation according to the quotas presented in Table 1.

Table 1
Quotation of the sample

Variable	Categories	Proportion in German population (age group 18 - 65)	Size of subgroups in the sample
Gender [a]	male	49.4%	400
	female	50.6%	400
Age [b]	18-29	14% (22%)	180
	30-39	13% (20%)	160
	40-49	13% (20%)	160
	50-65	24% (38%)	300
highest education level [c]	no school leaving certificate / primary school/ equivalent	35%	280
	secondary school/ equivalent	31%	250
	high school/ equivalent	34%	270
Income [d]	less than 1.500€	33%	260
	1.500€ - 2.500€	40%	320
	more than 2.500€	27%	220
Confession [e]	No confession	37%	300
	Christianity	54.2%	430
	Other (Islam, Judaism, Buddhism, Hinduism etc.)	8.9%	70
Relationship status [f]	married/ registered partnership	39%	310
	in a relationship	27%	220
	single	34%	270

Note. They are single quotas, i.e. no cross quotas. The quotas were derived from the composition of the German population. References are given for each quota variable.
a Destatis (2020a)
b Statista Research Department (2020)
c Destatis(2020b)
d Institut der deutschen Wirtschaft (2019)
e Fowid (2018)
f Statista Research Department (2019)

Study procedures

1) Recruitment & Onboarding

Participants are recruited by a panel provider. Persons registered in the panel provider's database are invited via email to take part in a study focusing on smartphone-based research. First, interested persons are asked to check their eligibility for study participation and to fill out the quota items presented in Table 1. In the second step, the selected participants are invited to an onboarding questionnaire, which informs in detail about data protection according to GDPR and asks participants for their consent. After giving informed consent, participants are instructed how to download the PhoneStudy app and how to grant permissions step by step on their smartphones. During the installation and setup of the app, participants are assigned randomly generated eight-digit codes as user names (e.g., *25kl8ah1*). These pseudonyms are used to store user data during the study and to match data of the different data sources (sensing, experience sampling, and monthly surveys).
This recruitment and onboarding phase start two weeks before the start of the data collection phase. No data is recorded until the start of the study and participants are informed that the app is in a "snooze mode" until they are notified on the day of study start.

2) Study participation

For all participants the study starts simultaneously on 15.05.2020. This observational study lasts in total three/six months and includes three data collection modalities:

(1) **Smartphone Sensing**: the PhoneStudy app collects sensor and usage data in the background continuously for three/six months;
(2) **Experience Sampling**: participants are asked to complete short 5-minutes questionnaires several times per day during study week 11 and 12 (27.07.2020 - 09.08.2020, group 1 and 2) and study week 19 and 20 (21.09.2020 - 04.10.2020, group 1 only)
(3) **Monthly Online Surveys**: participants are asked to complete a 20- to 30-minutes online questionnaire in the middle of each month

After three/six months, participants receive a push notification informing them about the end of the study and instructions for uninstalling the app.

3) Compensation and Exclusion Criteria

The study includes different activities that are compensated separately. For example, participants receive fixed payments for each monthly online survey, for each experience sampling phase, and for each month of continuous data sensing. The longer participants take part in the study, the higher the compensation for the individual activities. Participants also receive a bonus for the online surveys after three and six months. In sum, group 1 gets up to 131.50€ and group 2 44.50€ for completing all study activities during the respective study duration.

Participants are excluded from the study, if they revoke permissions for smartphone sensing for more than two (group 2)/three (group 1) times on seven consecutive study days and do not complete two out of three monthly online surveys during month 1 to 3 and month 4 to 6 (group 1 only). Besides, during the study we will do quality checks for the monthly online surveys to check response quality (extreme or constant crossing/extreme duration). If we suspect that participants do not fill in the questionnaires carefully, they will still receive payment for the respective study activity. However, we inform participants and reserve the right to exclude them from the study after repeated occurrence.

4) GDPR Implications: Data Deletion and Withdrawing Consent

During the data collection phase, participants can withdraw their consent to participation and/or request the deletion of all collected data at any time. For this purpose, we have implemented a deletion button within the app. This means that participants can inform us via the app that they would like to claim these rights. This has the advantage that participants do not have to reveal their identity to us, but we can simply delete all data stored under the respective pseudonym. Upon this request, the participants will be informed of the irreversibility of the decision and their resulting dropping out of the study.

Description of Data Collection Modalities

The study schedule in Figure 1 provides an overview of procedures and collected data types.

Smartphone Sensing Panel Study: Schedule

Month (Topic)	Constructs (Inventories)	Items
Smartphone Sensing	Continuous logging of smartphone sensing data	
Survey 1: demographics, habits, & attitudes	Demographics	2
	Panel Item Pool	1
	Chronotype (short version)	3
	Satisfaction with Life	4
	Relationship Satisfaction	5
	Media Consumption	6
	Technology acceptance	7
	Environmentalism	8
	Political Attitudes	9
Survey 2: Personality	Panel Item Pool	1
	Big Five Personality	10
Survey 3: Wellbeing in Daily Lives	Panel Item Pool	1
	Wellbeing	11
	Trait Affect	12
	Emotion regulation	13
	Rumination	14
	Chronotype	3
	Big Five Personality	15
Experience Sampling 1	Mood	16
	Situational Characteristics	17
	Sleep (only first ES of the day)	18
	Audio Logging Task (only last ES of the day)	19
Survey 4: Emotional Experience	Panel Item Pool	1
	Sleep Quality	20
	Retrospective States	21
	Depression	22
	Relationship Satisfaction (short version)	5
	Motives	23
	Dark Triad Personality	24
	Big Five Personality	15
Survey 5: Intelligence	Panel Item Pool	1
	Intelligence	26
Experience Sampling 2	Mood	16
	Situational Characteristics	17
	Sleep (only first ES of the day)	18
	Audio Logging Task (only last ES of the day)	19
Survey 6: Mental Health	Panel Item Pool	1
	Life events	27
	Satisfaction with Life	4
	Relationship Satisfaction (short version)	5
	Self-Monitoring	28
	Attachment Styles	29
	Autism	30
	Psychosis	31

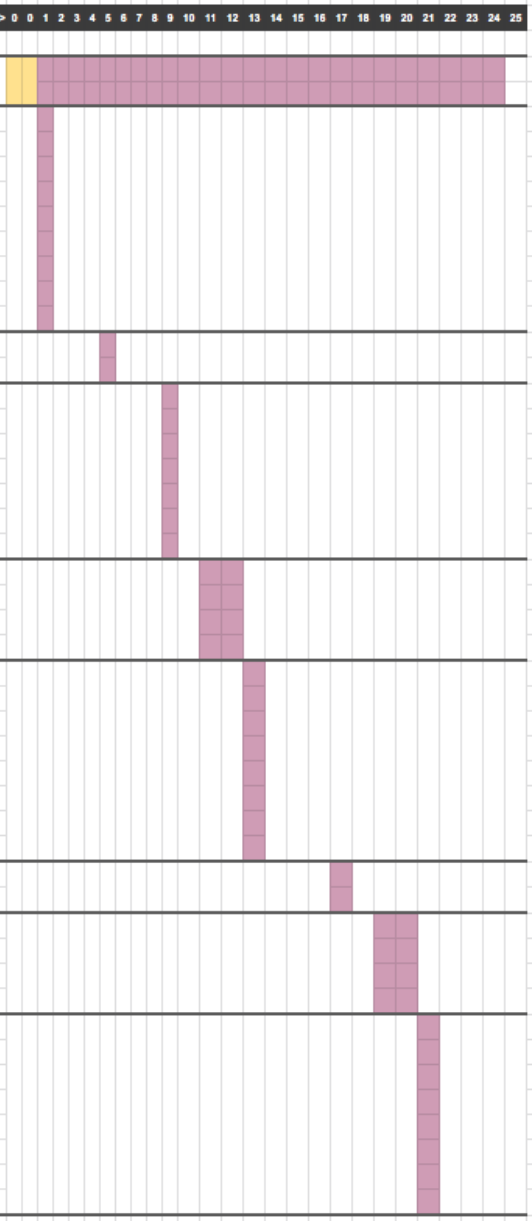

Figure 1. Study Schedule. All constructs are referenced by numbers (see column *items*). Corresponding inventories and items are presented in the section Variables.

1) Smartphone Sensing

Smartphone sensing means that data is logged continuously in the background while participants use their smartphones as usual. For this purpose, participants are asked to install the *PhoneStudy* application (app) being developed at LMU Munich and which is available for Android OS version 5 or higher. The app automatically records a broad range of data types in the background of the participants' smartphone. Except taking part in the study, the app has no functionality for the user. The interface is therefore kept simple and provides information about the study progress, GDPR regulations, contact details in case of support needs, a link to the compensation system of the panel provider, and a button to withdraw consent from study participation. If a WiFi connection is available and the smartphone is not used, data is synchronized every hour to the backend server using SSL-encryption.

Data logging comprises active usage/interaction with the smartphone and sensing of environmental/state data of the smartphone. All variables and related specifications are listed below (see Variables). Concerning users' interaction with the smartphone, data are logged whenever respective events (e.g., app usage, call) occur. Every event is logged time stamped and depending on the type of events specified by further information, e.g., call, time: 10:49:34, type: outgoing, duration of ringing: 3 *[sec]*, country code: 49 *[for Germany]*, called contact: 4583366sjjjkskks45 *[hashed contact]*.
Concerning environmental/state data of the smartphone, the logging frequency depends on the respective data type. For example, mobility/activity data (e.g., GPS) is logged once every 10 to 60 minutes depending on the respective smartphone model and android version. To save battery, physical sensor data is only logged between 6 p.m. and 12 p.m. every 10 minutes for 5 seconds and a sampling frequency of 1 Hz.
Besides, the *PhoneStudy* app includes keyboard logging adapted from the ResearchIME app by Buscheck, Bisinger, & Alt (2018). Typed texts are not stored in its raw version but relevant variables are directly extracted on the device. This online extraction comprises the categorization of words according to the SentiWS (Remus, Quasthoff, & Heyer, 2010) and the German version of the Linguistic Inquiry and Word Count (LIWC, Wolf, Horn, Mehl, & Haug, 2008), counting the frequency of words that occur in the German dictionary (Duden) and summing them up over the entire study period (Institut für Deutsche Sprache - Programmbereich Korpuslinguistik, 2013), and counting the frequency of emojis and emoticons.

2) Experience Sampling

As can be seen in Figure 1, the study comprises two two-week experience sampling phases (month 3: 27.07.2020 to 09.08.2020; month 5: 21.09.2020 to 04.10.2020) during which participants receive two to four short questionnaires per day.
The schedule for the presentation of the experience sampling questionnaires is pseudo-randomized. The scheduling of questionnaires is based on the following logic: Each day is divided into four equally sized sections, which on weekdays run from 7 a.m. to 10 p.m. and on weekends from 9 a.m. to 11 p.m.
Two to four questionnaires are distributed randomly to the four segments per day. Within the segments, the time is chosen randomly, but the interval between two consecutive questionnaires must be at least 60 minutes. As soon as the respondent actively uses her/his

smartphone for the first time after the calculated time, the participant is informed about the questionnaire via notification and asked to complete it. This procedure was chosen in order to increase the participants' commitment and not to provoke smartphone use and thus not to distort the naturally occurring smartphone sensing data (van Berkel et al., 2019). The questionnaire is available for 15 minutes and participants are given another 15 minutes to complete it once they have started answering it. If participants decide not to answer the questionnaire (wiping away or ignoring the notification), it is rescheduled to the next free segment. Since there are four segments on each of the 14 study days, but in sum only 29 questionnaires are scheduled to 56 available segments, there are also free segments in between. Participants receive a warning message once a day if they do not fill in any questionnaires at all on the respective day and as soon as it becomes clear that they will not be able to reach the total number of questionnaires to be answered.

3) Monthly Online Surveys

In the middle of each month, participants are asked to complete a 30-minute online survey. The PhoneStudy app notifies the participants to take part in the online survey via the browser. The links for the questionnaires will be available for seven days so that the participants can choose a suitable time for answering. The questionnaires for the monthly online surveys have been selected based on the research interests of the involved researches.
Each monthly survey starts with a fixed set of items, followed by varying psychological inventories. The latter have been grouped by topics and assigned to the six-monthly data collection waves:

- Month 1: demographics, habits, & attitudes
- Month 2: personality
- Month 3: well-being in daily lives
- Month 4: Emotional Experience
- Month 5: Intelligence
- Month 6: Mental Health

Variables

1) Smartphone Sensing

Table 2 presents an overview of available smartphone sensed data types. All data are processed using exact timestamps. Personal identifiers such as names, phone numbers, contact details, etc., which occur within contact or calendar entries, calls, text messages, notifications etc. are encrypted and therefore processed as anonymous character codes. For doing so, we use a so-called *hashing algorithm*, i.e., a mathematical function for which there is no reversibility.

Table 2

Overview of smartphone sensed data types

Event category	Specification of events
technical data	● anonymised user ID ● IP address, device ID ● CPU processor ● Android version ● mobile phone type, manufacturer and model name

connectivity	● WLAN/WiFi (on/off, connection status, hashed network name)
	● flight mode (on/off)
	● Bluetooth
	  ○ status (on/off/, connected/disconnected)
	  ○ connected device (hashed name of the device)
	  ○ devices with active Bluetooth in the environment (ID, device type, signal strength, hashed MAC address)

smartphone status	● screen state (on/off, locked/unlocked) ● device state (booting/shutdown/reboot) ● battery state (state of charge, power cable connected - yes/no) ● power saving mode (on/off) ● data saving mode (on/off)
calls	● type (incoming/outgoing/missed/rejected/blocked/ringing) ● duration of the call and ringing ● contact details (country code, contact hash)
text messages	● type (incoming/outgoing/draft/sent) ● length of text message (number of signs) ● contact details (country code, contact hash)
contact list	● status inquiry at the beginning and logging of changes ● for each entry: number of entries, contact hash, photo available yes/no
apps	● initial query at the beginning of the study: installed apps (name of the app, installations/uninstallations/ updates) ● app usage (name of the app, open/closed)
notifications	● hashed title and subtitle ● app that sent the notification ● category of the notification (e.g., alarm, reminder, error) ● notifications of the PhoneStudy App in plain text

calendar	● initial query at the beginning of the study
	● logging of new entries:
	  ○ start and end time
	  ○ hashed title, description and location
	  ○ id of the calendar entry

photos/videos	● photo/video trigger ● time stamp ● resolution of the photo/video in pixels ● camera type (front camera/back camera/external camera)
music consumption	● artist, title, album, duration ● headphone status (plugged/unplugged)

mobility/activity (every 10 to 60 minutes)	● location (longitude, latitude) ● height above sea level ● speed and direction of movement ● state of activity (at rest, walking, running, cycling, in a vehicle, on a train, on a motorcycle)
physical sensor data (every 10 minutes for 5 seconds at a frequency of 1 Hz (between 6pm and 12pm))	● coordinates of the acceleration values of the smartphone ● coordinates of the gravitational values (position) of the smartphone ● screen is obscured by a very close object yes/no ● ambient brightness ● ambient noise
logging while any keyboard usage	● categorisation of words according to the German version of the LIWC and the SentiWS ○ word category ○ used app while keyboard logging ○ text length ○ type of input (e.g., typing a new text, draft) ● emojis and emoticons ○ type of emoji/emoticon ○ used app while keyboard logging ○ type of input (e.g., typing a new text, draft) ● frequency of words ○ going through a German dictionary and counting the frequency of use of the words stored in the dictionary over the entire study period

2) Experience Sampling

During two experience sampling phases, we assess a variety of different variables. In each experience sampling questionnaire, we assess items of the following inventories in the following order:

- mood according to the circumplex model (valence and arousal; Russell, 1980), self-made items, see *2020-05-14_AdditionalItems.pdf*
- stress, self-made items, see *2020-05-14_AdditionalItems.pdf*
- situational characteristics according to the German version of the S8-I-Situational Eight DIAMONDS Ultra Brief Measures (Rauthmann, & Sherman, 2018)

In addition, the first questionnaire per day contains items on the sleep onset of the previous night, waking up on the respective day and sleep quality. For this purpose, items of the standardized consensus sleep diary are used (item 1-3 and 6-8 of the CSD and item 10 of the CSD-M; Carney et al., 2012). Besides, one item assesses whether the respective day is a free or a working day.

The last experience sampling questionnaire of the day includes an audio logging task at the end. Here, participants are instructed to read out a series of given sentences while making an audio recording of their voice. We use the open source software *Open Smile* by Audeering (https://audeering.com/technology/opensmile/#features) to extract two feature sets (*ComParE2016* and *eGeMAPS*) of voice parameters directly on the participant's device. We do not store the raw audio logging files. The sentences presented to the participants are based on

a set of validated German neutral and emotionally affective sentences (Defren et al., 2018) and differ in their emotional content: positive, negative, and neutral. These three emotional categories are presented consecutively in each audio logging task. The order of the categories is randomized per experience sampling questionnaire. For each emotional content category three sentences are randomly drawn from respective sets of sentences in the database created by Defren and colleagues. The audio recording is started by the participants via a button on the screen. Participants can stop the recording manually after a minimum of four seconds. Alternatively, the recording is stopped automatically after twelve seconds.

In addition, we record a mobility and activity data as specified in Table 2 during each experience sampling questionnaire.

3) Monthly Online Surveys

Figure 2 shows that we assess a variety of psychological traits and constructs during the monthly online surveys:

1 Panel Item Pool
Collection of items from different questionnaires, see document *2020-05-14_AdditionalItems.pdf*

2 Demographics
Self-made items **(Demo)**, see document *2020-05-14_AdditionalItems.pdf*

3 Chronotype
Munich Chronotype Questionnaire (MCTQ)
Roenneberg, T., Wirz-Justice, A., & Merrow, M. (2003). Life between Clocks: Daily Temporal Patterns of Human Chronotypes. *Journal of Biological Rhythms, 18(1),* 80–90. doi:10.1177/0748730402239679

4 Satisfaction with Life
Satisfaction With Life Scale (SWLS)
Janke, S., & Glöckner-Rist, A. (2014). Deutsche Version der Satisfaction with Life Scale (SWLS). *In Zusammenstellung sozialwissenschaftlicher Items und Skalen.* Mannheim, GER: ZIS.

5 Relationship Satisfaction
Couples Satisfaction Index (CSI)
German version of Funk, J. L., & Rogge, R. D. (2007). Testing the ruler with item response theory: increasing precision of measurement for relationship satisfaction with the Couples Satisfaction Index. *Journal of Family Psychology, 21(4),* 572:
Greischel, H., & Johnson, M. (in prep). Measurement invariance of a german translation of the couples satisfaction index.

6 Media Consumption
Self-made items **(Medien)**, see document *2020-05-14_AdditionalItems.pdf*

7 Technology acceptance

Technology affinity (TA_EG)

Karrer, K., Glaser, C., Clemens, C., & Bruder, C. (2009). Technikaffinität erfassen–der Fragebogen TA-EG. *Der Mensch im Mittelpunkt technischer Systeme, 8,* 196-201.

8 Environmentalism

New Ecological Paradigm Scale (NEP)

Schleyer-Lindenmann, A., Ittner, H., Dauvier, B., & Piolat, M. (2018). Die NEP-Skala–hinter den (deutschen) Kulissen des Umweltbewusstseins. *Diagnostica.* doi:10.1026/0012-1924/a000202

9 Political Attitudes

1) Self-made items, see document *2020-05-14_AdditionalItems.pdf*
2) **Short Scale Authoritarianism (KSA_3)**
   Beierlein, C., Asbrock, F., Kauff, M., & Schmidt, P. (2014). *Die Kurzskala Autoritarismus (KSA-3): Ein ökonomisches Messinstrument zur Erfassung dreier Subdimensionen autoritärer Einstellungen.*

10 Big Five Personality

Big Five Personality Inventory (BFSI)

Arendasy, M., Sommer, M., & Feldhammer, M. (2011). *Manual Big-Five Structure Inventory BFSI.* Mödling, Austria: Schuhfried

11 Wellbeing

Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)

Lang, G., & Bachinger, A. (2016). Validation of the German Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) in a community-based sample of adults in Austria: a bi-factor modelling approach. *Journal of Public Health, 25(2),* 135–146. doi:10.1007/s10389-016-0778-8

12 Affect

Positive and Negative Affect Schedule (PANAS)

Breyer, B., & Bluemke, M. (2016). Deutsche Version der Positive and Negative Affect Schedule PANAS (GESIS Panel). *Zusammenstellung sozialwissenschaftlicher Items und Skalen (ZIS).* https://doi.org/10.6102/zis242

13 Emotion regulation

Coping (COPE)

Knoll, N., Rieckmann, N., & Schwarzer, R. (2005). Coping as a mediator between personality and stress outcomes: a longitudinal study with cataract surgery patients. *European Journal of Personality, 19(3),* 229–247. doi:10.1002/per.546

14 Rumination

Perseverative Thinking Questionnaire (PTQ)

Ehring, T., Zetsche, U., Weidacker, K., Wahl, K., Schönfeld, S., & Ehlers, A. (2011). The Perseverative Thinking Questionnaire (PTQ): Validation of a content-independent measure of repetitive negative thinking. *Journal of Behavior Therapy and Experimental Psychiatry, 42(2),* 225–232. doi:10.1016/j.jbtep.2010.12.003

15 Big Five Personality

Big Five Inventory, extra-short form (BFI_2XS)

Rammstedt, B., Danner, D., Soto, C. J., & John, O. P. (2018). Validation of the short and extra-short forms of the Big Five Inventory-2 (BFI-2) and their German adaptations. *European Journal of Psychological Assessment.*

20 Sleep Quality

Pittsburgh Sleep Quality Index (PSQI)

Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research 1989, 28:* 193-213. doi:10.1016/0165-1781(89)90047-4

21 Retrospective States

Self-made items (**ESM_RETRO**), see document *2020-05-14_AdditionalItems.pdf*

22 Depression

Patient health questionnaire (PHQ9) *

Gräfe, K., Zipfel, S., Herzog, W., & Löwe, B. (2004). Screening psychischer Störungen mit dem "Gesundheitsfragebogen für Patienten (PHQ-D)". *Diagnostica, 50(4),* 171-181.

** For ethical reasons we did not assess item 9*

23 Motives

Unified Motive Scale (UMS-6)

Schönbrodt, F. D., & Gerstenberg, F. X. R. (2012). An IRT analysis of motive questionnaires: The Unified Motive Scales. *Journal of Research in Personality, 6,* 725–742. doi:10.1016/j.jrp.2012.08.010

24 Dark Triad Personality

Dirty Dozen and Naughty Nine (DIRTY)

Küfner, A. C. P., Dufner, M., & Back, M. D. (2015). Das dreckige Dutzend und die niederträchtigen Neun: Kurzskalen zur Erfassung von Narzissmus, Machiavellismus und Psychopathie = The Dirty Dozen and the Naughty Nine: Short Scales for the Assessment of Narcissism, Machiavellianism, and Psychopathy. *Diagnostica, 61(2),* 76–91.

25 Intelligence

Inventory for testing cognitive capabilities (INT)

Schuhfried (2019). *Manual Inventar zur Testung kognitiver Fähigkeiten (Version 52 – Revision 2)*. Mödling: SCHUHFRIED GmbH.

26 Life events

Inventory of life-changing events (LE)

Siegrist, J. & Geyer, S. (2014). Inventar lebensverändernder Ereignisse. *Zusammenstellung sozialwissenschaftlicher Items und Skalen.* doi:10.6102/zis92*

** unlike the original instrument, we do not ask about events of the last two years, but of the last 6 months*

27 Self-Monitoring

Self-Monitoring Scale (SMS)

Graf, A. (2004). Eine deutschsprachige Version der Self-Monitoring-Skala. *Zeitschrift für Arbeits-und Organisationspsychologie A&O,* 48(3), 109-121. doi:10.1026/0932-4089.48.3.109

Attachment Styles

28 **Experiences in Close Relationships–Revised (ECR)**

Ehrenthal, J. C., Dinger, U., Lamla, A., Funken, B., & Schauenburg, H. (2009). Evaluation der deutschsprachigen Version des Bindungsfragebogens „Experiences in Close Relationships–Revised"(ECR-RD). *PPmP-Psychotherapie· Psychosomatik· Medizinische Psychologie, 59(06),* 215-223. doi:10.1055/s-2008-1067425

29 Autism

Short version of the Autism spectrum quotients (AQK)

Freitag, C. M., Retz-Junginger, P., Retz, W., Seitz, C., Palmason, H., Meyer, J., ... & von Gontard, A. (2007). Evaluation der deutschen version des Autismus-Spektrum-Quotienten (AQ)-die Kurzversion AQ-k. *Zeitschrift für klinische Psychologie und Psychotherapie, 36(4),* 280-289.

30 Psychosis

Psychosis Proneness/Disintegration Scale (PPDS)

Knezevic, G., Savic, D., Kutlesic, V., & Opacic, G. (2017). Disintegration: A reconceptualization of psychosis proneness as a personality trait separate from the Big Five. *Journal of research in personality, 70,* 187-201.

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Buschek, D., Bisinger, B., & Alt, F. (2018). ResearchIME: A mobile keyboard application for studying free typing behaviour in the wild. In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (pp. 1-14).

Carney, C. E., Buysse, D. J., Ancoli-Israel, S., Edinger, J. D., Krystal, A. D., Lichstein, K. L., & Morin, C. M. (2012). The consensus sleep diary: standardizing prospective sleep self-monitoring. Sleep, 35(2), 287-302.

Defren, S., Wesseling, P. B., Allen, S., Shakuf, V., Ben-David, B., & Lachmann, T. (2018). Emotional Speech Perception: A set of semantically validated German neutral and emotionally affective sentences. In Proceedings of the International Conference on Speech Prosody (Vol. 2018, pp. 714-718).

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Preregistration Protocol: Smartphone Sensing Panel Study

This preregistration protocol deals with specific research. Study procedures and further background information are described in the corresponding basic protocol. This template is inspired by the OSF Prereg Challenge template (https://osf.io/).

Working Title

Author(s) of the preregistration protocol

Date

Background

Background Information (Optional; Short description of the theoretical background/introduction to research question)

Research question(s)

Hypotheses

Please provide hypothesis for predicted results. If multiple hypotheses, uniquely number them (e.g. H1, H2a, H2b,) and refer to them the same way at other points in the registration document and in the manuscript.

Variables

Which variables will be used? (see Variables in the basic protocol for an extensive overview of all available variables) *This section shall be used to unambiguously clarify which variables are used to operationalize the specified hypotheses. Please (a) list all variables that will be used in this study and (b) explicitly state the functional role of each variable (i.e., independent variable, dependent variable, covariate, mediator, moderator). It is important to (c) specify for each hypothesis how it is operationalized, i.e., which variables will be used to test the respective hypothesis and how the hypothesis will be operationally defined in terms of these variables. This section is closely related to the statistical models used to test the hypotheses.*

Analysis Plan

Preprocessing

Inclusion criteria (e.g., criteria for including (1) participants (e.g., Do you only use a subsample?, (2) study days (e.g., only weekdays, certain number of study days), (3) any other criteria concerning data quality (e.g., only days with at least x% of logging data) etc. *If you cannot specify these aspects now, please state why.*

Definition of variables based on smartphone sensing. Please specify your degrees of freedom in variable extraction procedures, e.g., ● *time information (e.g., what does night, daily, weekend exactly mean?)* ● *Aggregation measures (e.g., measures of central tendency/dispersion).*

If you cannot specify these aspects now, please state why.

Further preprocessing steps (e.g., transformation of data, handling of missing data/outliers etc.)

Data Analysis

Statistical models *Please specify the statistical model (e.g. t-test, ANOVA, LMM) or algorithms that will be used to test each of your hypotheses. Give all necessary information about model specification (e.g., variables, interactions, planned contrasts) and follow-up analyses. Include model selection criteria (e.g., fit indices), corrections for multiple testing, and tests for statistical violations, if applicable. Please also indicate Inference Criteria (e.g., p-values, effect sizes, performance measures etc.).*

Planned exploratory analysis (Optional)