

Collecting and Analyzing Smartphone (Survey) Data using the GESIS AppKit





31. März 2025 | Dr. Mareike Wieland (GESIS, CSS)

Intro

Introduction Round

Who are you?

- Your name
- Your role / background
- You experiences in mobile methods, smartphones as research tools, intensive-longitudinal data collections (like experience sampling method, momentary assessments), ...
- Your main interest for today: Are you more team "I would like to know the big picture" or rather team "I have a specific project in mind and want to get started right away?"





About today

At the end of the workshop, you will have ...

- An overview of mobile research designs
- Know for which designs you can use the GESIS AppKit
- Tested the GESIS AppKit for a research question of your choice, i.e.
 - got an account,
 - set up a project,
 - created questionnaires,
 - defined survey schedules ,
 - and gained an insight into the processing of the data.



Agenda & Schedule

13:30 – 13:45	Welcome & Intro
13:45 – 14:00	Setting the scene: Smartphones as research tool
14:00 – 14:15	Introducing the GESIS AppKit
14:15 – 14:30	Developing your project / GESIS AppKit use case
14:30 – 14:45	Coffee Break
14:45 – 15:00	Live-Demo: How to use the GESIS AppKit
15:00 – 15:40	Implementing your project
15:40 – 15:50	Short Break
15:50 – 16:20	Working with GESIS AppKit data
16:20 – 16:30	Recap & Outlook



Setting the Scene: Smartphones as Research Tool







The Smartphone in the Social Sciences

Tool and data source

- Ubiquitous and personal companion in everyday life, "at hand" at almost every timepoint
- A large variety of use cases
 - Media usage
 - Interpersonal communication
 - Life organisation
 - Mobility
 - Images
 - Health
 - → Subject of research and **research tool**!





The Smartphone in the Social Sciences

The Smartphone Psychology Manifesto

Geoffrey Miller

University of New Mexico, Albuquerque

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Abstract

By 2025, when most of today's psychology undergraduates will be in their mid-30s, more than 5 billion people on our planet will be using ultra-broadband, sensor-rich smartphones far beyond the abilities of today's iPhones, Androids, and Blackberries. Although smartphones were not designed for psychological research, they can collect vast amounts of ecologically valid data, easily and quickly, from large global samples. If participants download the right "psych apps," smartphones can record where they are, what they are doing, and what they can see and hear and can run interactive surveys, tests, and experiments through touch screens and wireless connections to nearby screens, headsets, biosensors, and other peripherals. This article reviews previous behavioral research using mobile electronic devices, outlines what smartphones can do now and will be able to do in the near future, explains how a smartphone study could work practically given current technology (e.g., in studying ovulatory cycle effects on women's sexuality), discusses some limitations and challenges of smartphone research, and compares smartphones to other research methods. Smartphone research will require new skills in app development and data analysis and will raise tough new ethical issues, but smartphones could transform psychology even more profoundly than PCs and brain imaging did.

Keywords

mobile computing, telecommunications, digital sensors, GPS/GIS, behavioral informatics, human subjects/IRB issues





Data sources and research paradigms

Self-reports

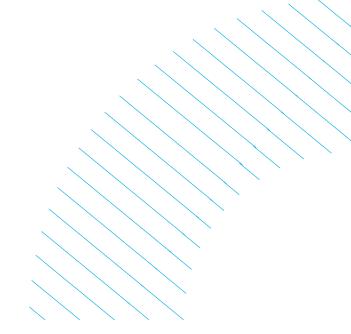
- Mobile surveys
- Intensive-longitudinal surveys



Observations

- Mobile tracking
- Mobile sensing







Mobile self-reports (I)

Another mode for surveys

- High availability and prevalence
- Sampling potentials:
 - Hard-to-reach audiences (z. B. Sugie, 2018)
 - Mobile only (e.g., global south) or Mobile first
 - "Single Touchpoint" for surveys
- Easy data input:
 - Using camera, taking screeshots, scan functions
 - Capturing audio data





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Mobile self-reports (II)



Intensive longitudinal survey designs

- => Experience sampling, ecological momentary assessment, ambulatory assessment, diary style studies
- Intensive survey designs with several questionnaires per day, usually after pushnotification
- The design is old, but took off with the dissemination of smartphones (Csikszentmihalyi & Larson, 2014)





- → From looking at stable differences between people to
- → ...fast-moving, intrapersonal dynamics



Intensive-longitudinal survey designs



The trait-paradigm

- The distinction between traits and states, situational and personality variables goes back to ancient Greece
- However, the investigation of trait-like, crosssituationally stable concepts was prevalent in all social sciences, especially public opinion research
 - (Political) attitudes, interest, efficacy, trust (in institutions), media trust
 - Big Five
 - Values
 - → Often low correlation with behaviour

State variables and the situational vacuum

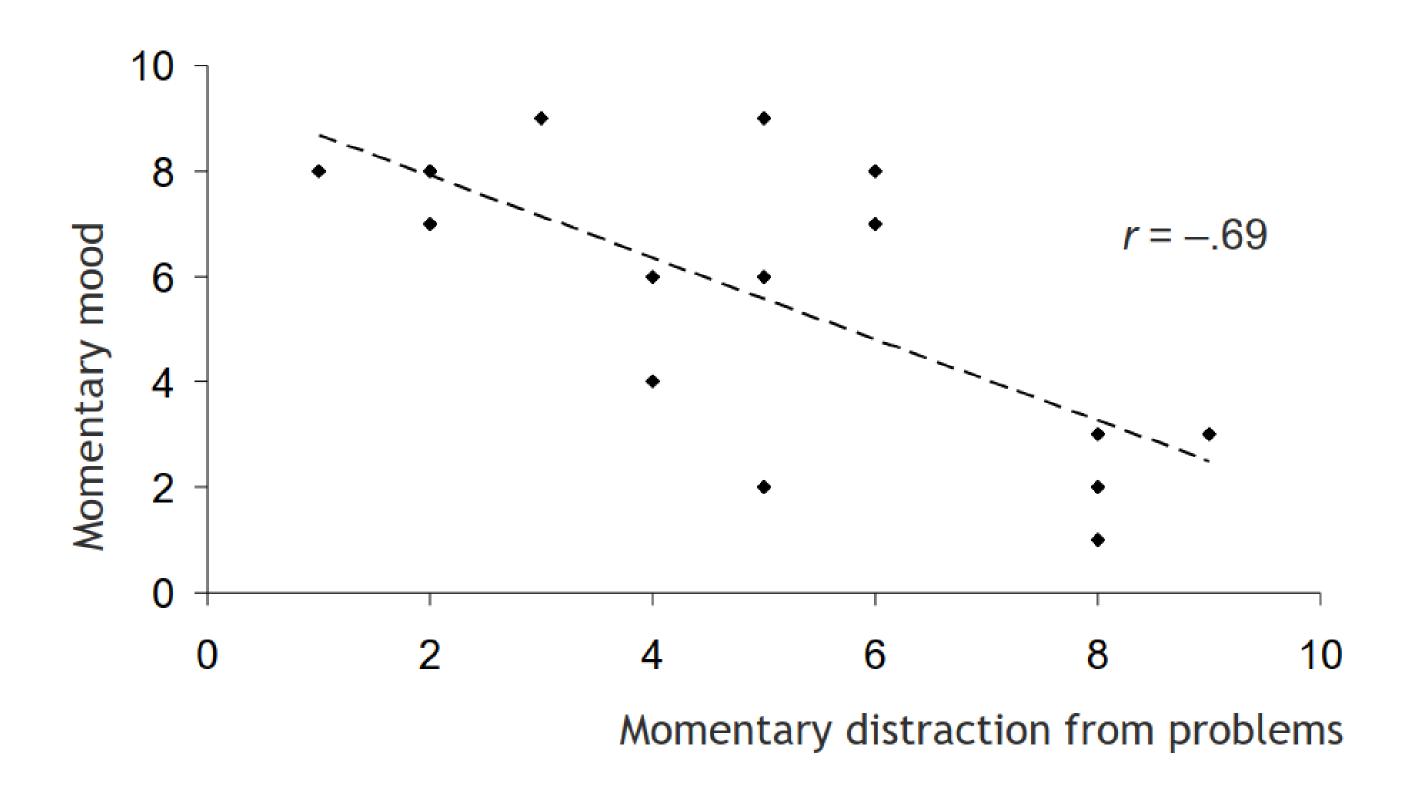
- State, dynamic variables
 - Mood, emotion, well-being
 - Attention, elaboration, information processing
 - Evaluations and perceptions of political candidates, parties, minorities
 - Salience of topics
 - Immediate reactions to media, media usage, interpersonal communication, family/social conflicts
 - (Habitual) behaviour
 - → Many of these variables cannot be measured with usual, retrospective survey designs!

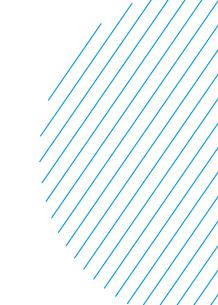




Within- und between-person Prozesse



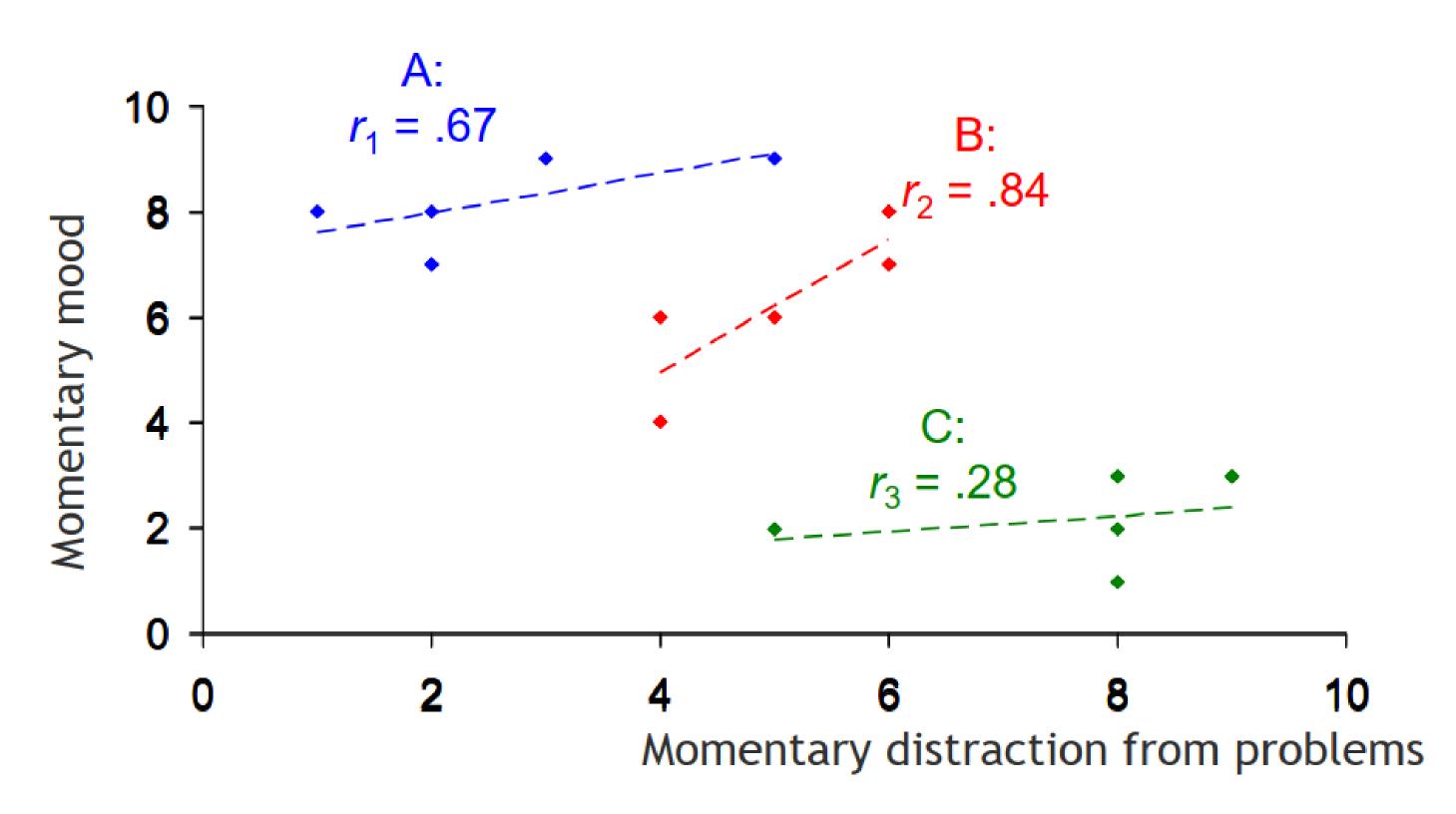






Within- und between-person processes





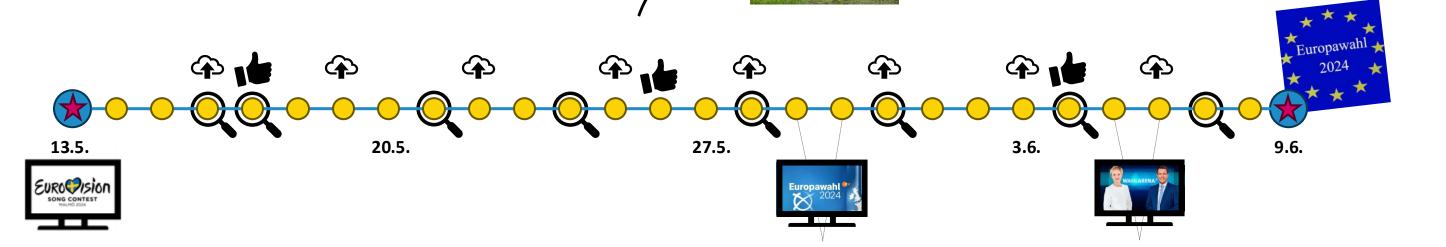
intensive
longitudinal survey
designs - via
smartphone



Study Example: Extensive mobile surveys



- Download the app from Playstore (iOS) or an apk-file and install on Smartphone (Android)
- Login via study code
- **Push-notification** when new questionnaires available



Freiheit statt

Intro questionnaire after first login / exit questionnaire

Daily questionnaire at fixed time

Focus questionnaires (8x, fixed date and time)

Image upload (repeating every 3rd day, starting day after signup, random time)

Evaluation (3x, fixed date and time)

TV events (5x, fixed date and time)

 \rightarrow In total max. 52 surveys (N=7269; Range: 0-50; M=27, SD=13; Median: 34) over 4 weeks



Data sources and research paradigms

Self-reports

- Mobile surveys
- Intensive-longitudinal surveys



Observations

- Mobile tracking
- Mobile sensing





Mobile digital behavioral data

Mobile tracking/logging

- Capturing information on and from the device itself
- E.g. device usage, app usage, battery levels
- E.g. in-app tracking: capturing the content and behaviours on the phone and in apps

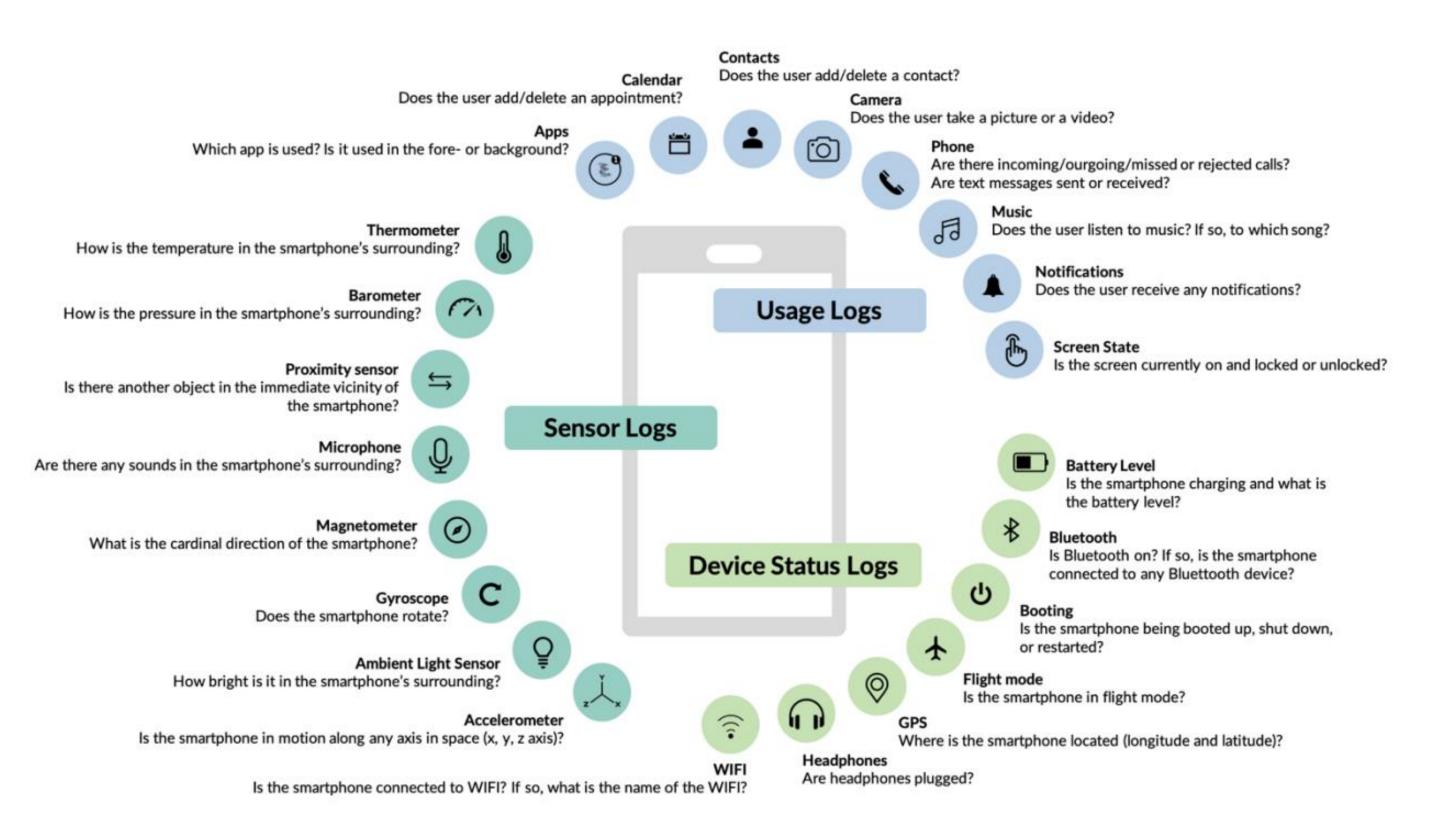


Mobile sensing

- Uses sensors such as the accelerometer, thermometer, camera, to cover information outside of the device
- Location, Mobility, Acceleration & Orientation,
 Light, Temperature, Proximity, etc.
- Wearables and health sensors: Steps, movement, heart rate, sleep

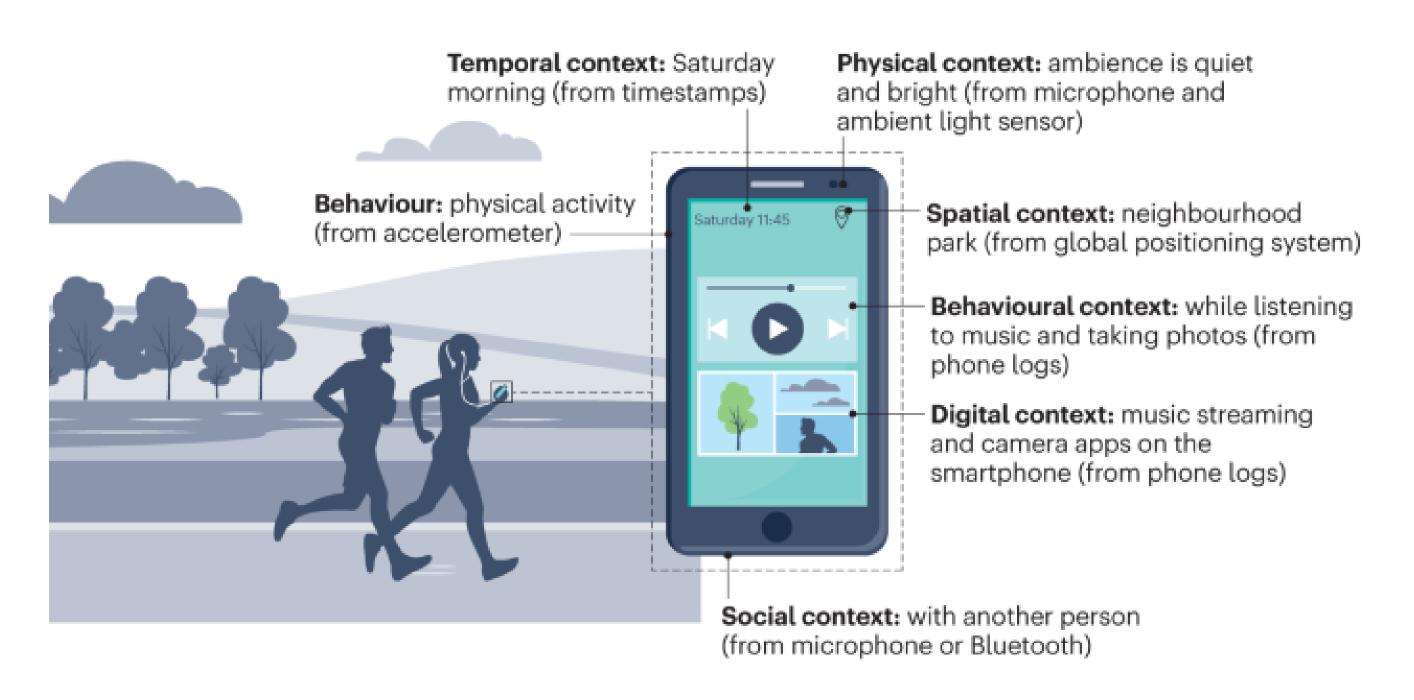


Types of mobile digital behavioral data





Mobile sensing for capturing context



Harari, G.M., Gosling, S.D. Understanding behaviours in context using mobile sensing. Nat Rev Psychol 2, 767-779 (2023).



Data sources and research paradigms

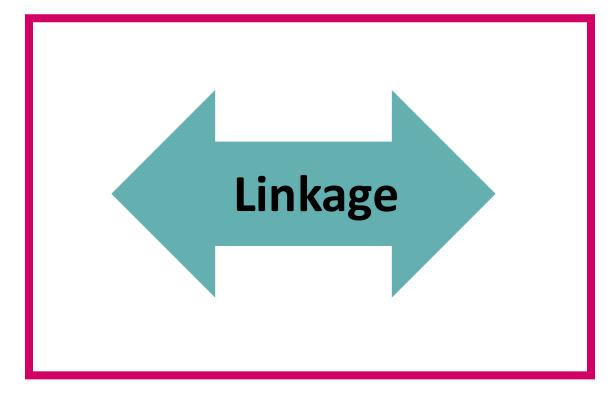
Self-reports

- Mobile surveys
- Intensive-longitudinal surveys

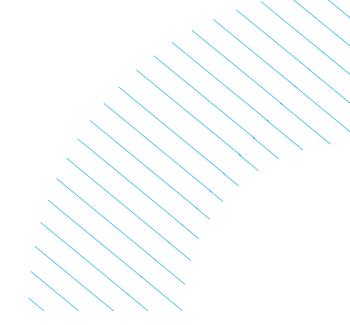
Observations

- Mobile tracking
- Mobile sensing











Linking mobile behavioral data and surveys



Parallel measurement, ex-ante linkage

- Capturing digital behavioral data and survey data in parallel provides a valuable source for the Social Sciences (Stier et al., 2021)
- Mobile DBD provides passive measures of variables that are hard to remember (exact routes during the day) or come with a high burden
- Surveys can be used to capture demographics, personality variables, attitudes etc.
- → Mobile surveys and (mobile) DBD are a "match-made-in heaven"

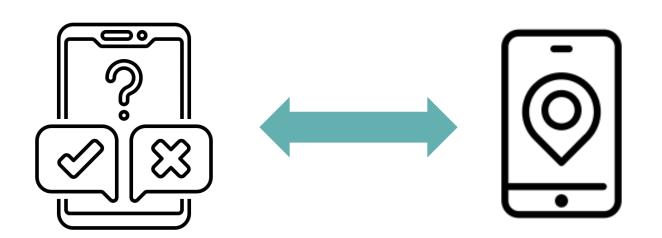




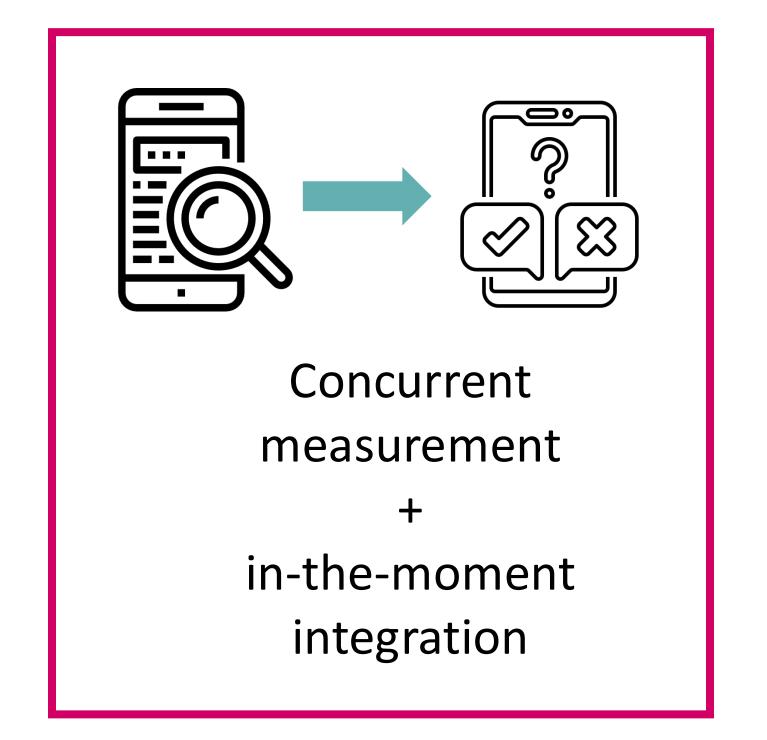




Outlook: From linkage to integration

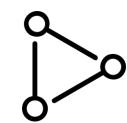


Parallel measurement + subsequent linkage





Recognizing and recording events





Manual event logging: Participants are instructed to recognize an event and actively enter it in the app when it occurs.



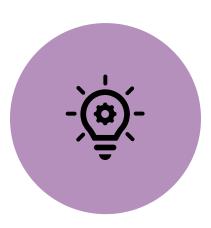
Randomized Survey Prompts: Surveys are sent out at random times. If the event occurred within a defined period, further questions about the event are asked.



Automated event detection + survey triggering: An event is technically detected and a survey is then automatically triggered.



Manual Event Logging



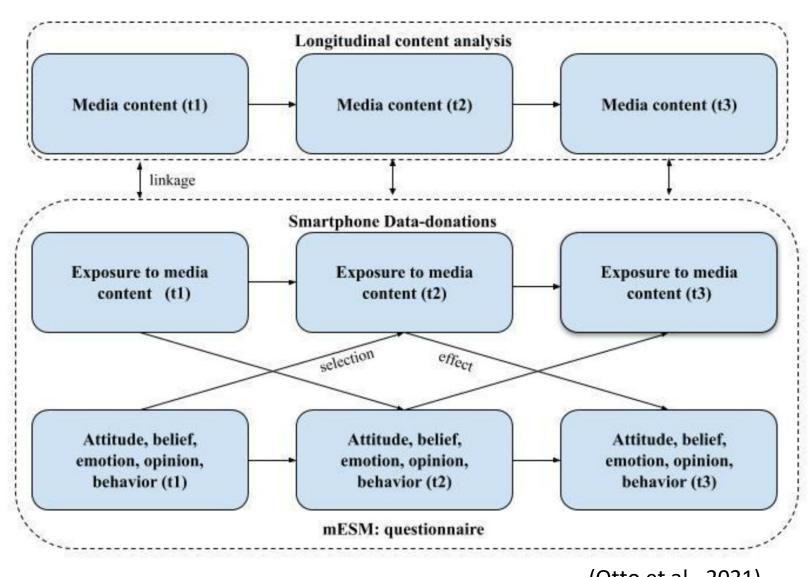
Mobile Intensive Longitudinal Linkage Analysis (MILLA)

Event = Exposure to news item, logging takes place depending on participants' perception

Combines:

- Smartphone data donations (-> media content)
- with mobile experience sampling (-> immediate reactions to the content)
- with follow-up content analysis (-> media effects)

Linking on a situational level, but: Self-selection of events!



(Otto et al., 2021)





TABLE 2 Sex Differences in Momentary Emotion Ratings

Randomized Survey Prompts

	Main Effect (b ₀₁ from eqn 2) Sex of Participant			Average Effect (b ₁₀ from eqn 5) Sex of Partner			Sex of Participant \times Sex of Partner (b ₁₁ from eqn 2)				
							Male Participants		Female Participants		
	M	F	P	M	F	P	M	F	M	F	P
Specific Emotions											
Нарру	3.20	3.22	n. s.	3.20	3.26	n.s.	3.07	3.39	3.32	3.14	.001
Sad	1.47	1.57	n.s.	1.56	1.50	n.s.	1.45	1.51	1.67	1.49	.05
Nervous	1.69	1.61	n.s.	1.71	1.61	.10	1.69	1.72	1.73	1.51	.05
Surprised	2.29	2.39	n. s.	2.38	2.33	n.s.	2.22	2.40	2.55	2.36	.01
Angry	1.54	1.45	n. s.	1.55	1.45	.05	1.55	1.53	1.56	1.37	.10
Embarrassed	1.42	1.23	.07	1.33	1.32	n.s.	1.39	1.46	1.28	1.17	.05
Ashamed	1.29	1.14	.10	1.24	1.19	.10	1.29	1.29	1.20	1.10	.07
General Ratings											
Intensity	3.18	3.48	.02	3.38	3.40	n.s.	3.04	3.47	3.72	3.33	.001
Expression	2.87	3.33	.001	3.09	3.23	.07	2.71	3.18	3.47	3.29	.001

Note: M = male; F = female. Analyses reported for sex of participant are main effects (sex of participant was the only predictor in the regression model). Analyses reported for sex of partner are not main effects, but are the effects for the average individual (in regression equations with interaction terms in which the predictor variables have been centered, the lower-order regression coefficients are not main effects, but instead represent the effect of the predictor on the criterion at the mean of the other predictor variable).

Barrett et al., 1998



Automatisierte Ereigniserkennung und Survey Triggering



Mobile Experience Sampling

- Ereignisbasierte Auslösung
- Eine Woche im März 2021

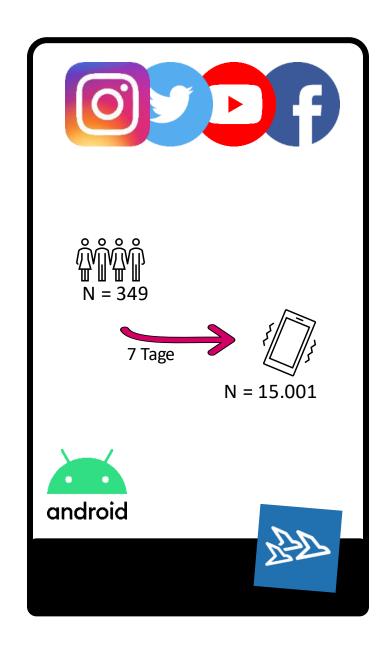


In-situ Fragebogen wenn

- Social Media App gerade geschlossen
- Für mind. 15sec genutzt



- Nächste in-situ Erhebung
- max. 3 in 4 Stunden
- Mind. 30min "cool down"



Sample

- Deutschsprachige mobile Social Media Nutzer (18 - 54J.)
- Online Access Panel (quotenbasiert)
- Männer und höher Gebildete leicht überrepräsentiert
- Nur Android (!)
- + Verknüpfung auf situativer Ebene
- + keine Selbstselektion der Events
- Komplexe Design-Entscheidungen/Trade-Offs auf situativer Ebene
- Technisch voraussetzungsvoll



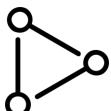
Short Summary

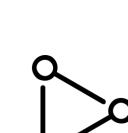
The manifold use cases for smartphones in the social sciences

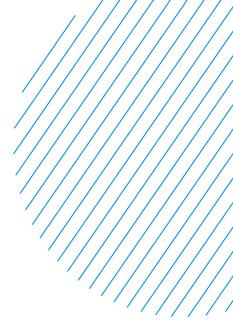
- Mode for survey taking
- Intensive-longitudinal survey designs
 - Situational, state-like variables, immediate reactions, within-person processes
- Mobile tracking and sensing
 - Parallel linkage of (mobile) DBD and (mobile) surveys
 - In-the-moment integration













Introducing the GESIS AppKit

A mobile infrastructure for social science research







GESIS AppKit: A Service with two pillars

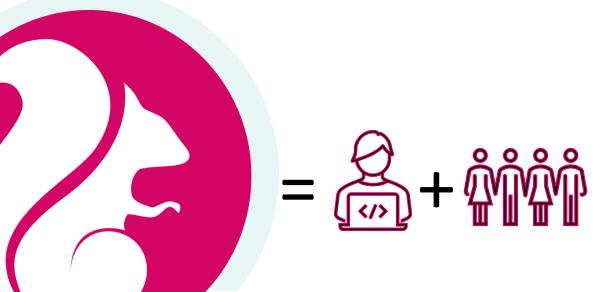
Research Software

- The GESIS AppKit is a research software comprising:
 - A web interface for administering the studies
 - Mobile apps to be installed by study participants for data collection
- Researchers
 - receive their own account (Terms of Use)
 - are responsible for data processing and authorize GESIS to process personal data (AVV)
- Use is free of charge for non-commercial research

Community Hub

The GESIS AppKit is a service for the research community

- We offer training on the tool and methodological trainings
- We advise on study design (for a fee if necessary)
- We provide a central point of contact for researchers working on these topics to exchange findings on methodology and data quality
- We evaluate needs and pool resources to contribute to sustainable research software development in the field

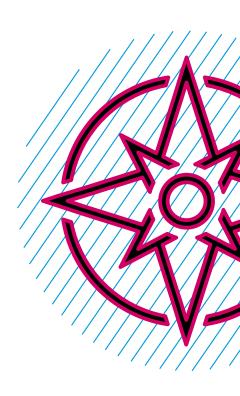




Mission statement

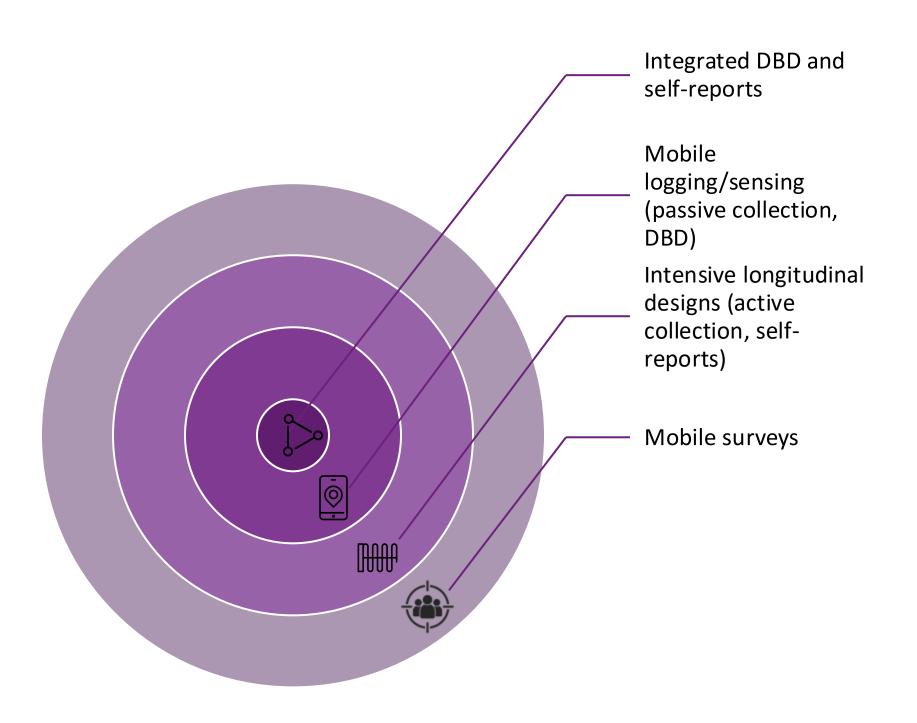
We aim at making smartphones as research tool accessible!

- **Fine-grained data collection**: The GESIS AppKit enables researchers to use smartphones for both active (self-reports) and passive (digital traces, sensor data) data collection at high granularity
- Low technical threshold: No programming skills or advanced technical knowledge (e.g., server management) required
- Researcher independence: Researchers have full autonomy over study design, content, and sample management.
- Software aligns with **open-source principles**:
 - Available as SaaS [and for on-premise installation]
 - Supports independent extensions and development
 - Community actively involved in development processes





Current Status





Future music

e.g., Scrolling newsfeeds study



To be implemented in 2025



Ready to use

e.g., Emotionality study

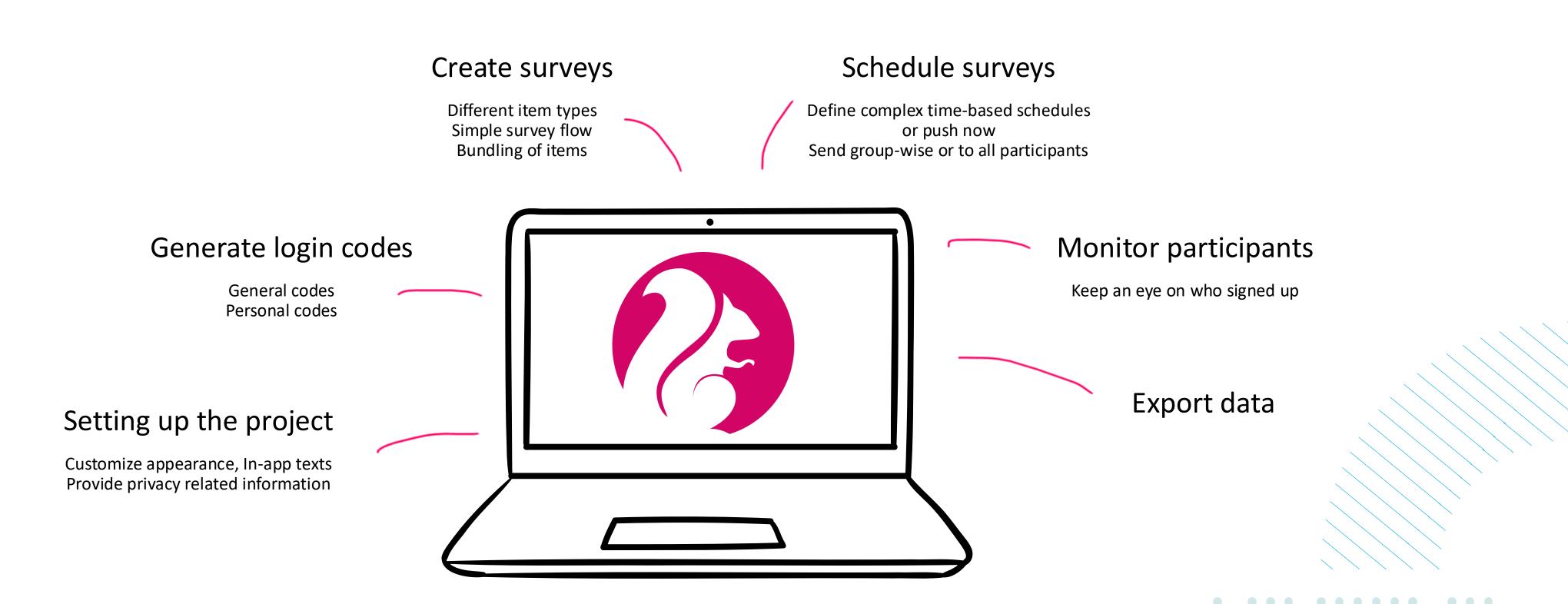


Ready to use

e.g., European Elections study



Web Interface "GESIS AppKit"





Mobile App "GESIS SMART"



Sign into a project via login code

Give informed consent

See your app IDSelect languageLog out

Receive surveys via central inbox
 Get notified if new survey is available
 Answer surveys in the app

 Learn more about the app and the research project (and who is responsible for data processing)

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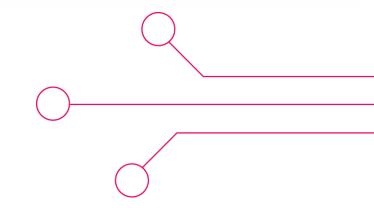
Develop your own project







What to do within the next 15 minutes:



Define your use case

- Clear and simple research question
- Think about 3 to 4 survey questions
- Initial ideas for the design (single or repeated surveys, linking to event?)



Get your own account!

Go to https://admin.appkit.gesi	s.org/
	Sign in to your account
	Password Forgot password?
Register as a user	Sign in Don't have an account? Register here!



Showcase: GESIS AppKit Tool Demo







Implementing your project







What to do within the next 60 minutes:

Log in

- Confirm registration
- Set your own password
- Go to https://admin.appkit.gesis.org/
- Log in ☺



Set up study

- Fill in in-app texts and privacy information
- Create survey items
- Schedule your survey(s)
- Create login code(s)
- Download GESIS SMART app from store
- Test your study

GESIS AppKit manual https://www.gesis.org/gesis-appkit/ressources



Working with GESIS AppKit data







Recap & Outlook





Outlook



Stay informed

- We're constantly developing new features and updating the AppKit
- To stay informed, you can subscribe to our mailing list:

https://lists.gesis.org/mailman/listinfo/gesis-appkit

Get Support

- Do you want to implement a complex ESM study and need support in study design, data processing, or analysis?
- GESIS offers support as a service, either as consulting or through joint projects

https://www.gesis.org/beratung/beratung-zu-digitalen-verhaltensdaten

Get involved

- Do you need new features that are not on our feature list?
- Become a cooperation partner with a joint third-party project

https://www.gesis.org/en/gesis-appkit/about-appkit/cooperations

Check our other Services

- Are you interested in other data types such as surveys, webtracking, webscraping or API-harvesting?
- GESIS offers a wide range of services for survey data and digital behavioral data

https://www.gesis.org/institut/ueber-uns/digitaleverhaltensdaten

Vielen Dank für Eure Aufmerksamkeit!







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Images

Smartphone as a tool by Yrzauwzfbun [https://www.hippopng.com/png-6htred/]

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Scrolling by DeAndre Purdie [https://dribbble.com/shots/3422230-06-100-Scrollin]

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