One App to Assess Them All – Combining Logging, Experience Sampling, and Survey in an Android and iOS App

Keywords: smartphone, research app, survey, ESM, logging

Extended Abstract

In social science, different variables of interest require different measurement instruments for valid assessment. For example, attitudes toward specific issues can be collected in *surveys*, as attitudes are relatively stable concepts and readily available to respondents when asked (Bhattacherjee, 2012). Then again, other variables such as well-being or opinions about news articles, should ideally be measured in the situation of occurrence in order to reduce the retrospection bias present in surveys. This can be accomplished using *in-situ* methods such as the *Experience Sampling Method* (ESM; Larson & Csikszentmihalyi, 2014). For variables that are independent of subjective interpretation, technologically assisted methods such as *logging* (also known as tracking) are preferable – for instance, self-reported and logged digital media use differ considerably from each other (Parry et al., 2021). This is mostly due to the high frequency and short duration of such behavior, which makes it difficult to aggregate it over time in self-reports and warrants the use of logging instead (Parry et al., 2021).

Many studies in communication science and adjacent fields use multiple data collection methods in a single study (e.g., Bjørner, 2016; Naab, Karnowski, & Schlütz, 2018), but use different applications/tools for each of these methods. As using a single method like ESM already introduces considerable study participant burden (Eisele et al., 2020), the combination of and transition between multiple tools and methods within the same study can be expected to increase this burden even further. With smartphones, most people own a device that they have on them virtually all the time and that is capable of implementing all three methods in question. They can therefore be used as universal tools that support 1) logging, 2) ESM, and 3) survey, so that all variables, including smartphone use itself, can be collected in a valid fashion.

With the proposed contribution, the authors present the Android and iOS app *MART* (Mobile Assessment Research Tool), which reduces participant burden as far as possible by allowing for the use of different assessment methods in a single place. The app is currently undergoing beta testing. It will be available *free of charge* according to the principles of open science, *customizable* without programming knowledge, and yet *combines all measurement methods* mentioned before. Other comparable solutions are either subject to cost or collect non-optional sensitive data (e.g., Murmuras, n.d.), require programming knowledge (AWARE, 2022), or are limited to individual data collection methods (e.g., Movisens, 2022).

Logging: On Android devices, MART is capable of accessing a log file which contains all *events* that take place on the smartphone (e.g., opening/closing a specific app, unlocking/locking the phone, accessing specific app functions). On iOS devices, this is not possible (Apple Inc., 2022). Instead, MART instructs users how to copy aggregated phone use duration and frequency from the default iOS app *Screen Time*.

ESM: With MART, researchers can set up time intervals during the day (e.g., 8am–10am, 10am–12am, ...) during which the app regularly signals study participants through notifications, asking them to fill out a short questionnaire. The timing of these signals can be varied (e.g.,

random) and conditionally tied to events (e.g., take place at least 30 minutes after the last signal was shown).

Survey: The most basic functionality of the app is the *survey*, which largely corresponds to online surveys implemented on platforms like *SurveyMonkey* (Momentive, 2022). It is currently possible to set up pages either containing text only (e.g., for instructions) or four different types of items, namely radio buttons, sliders, checkboxes and text input.

Data collected by *MART* are anonymized. The logging function does not collect any data on received content. This way, it is impossible to trace back information to individual participants. Besides that, data protection depends on specific questions posed in questionnaires.

Currently, *MART* is implemented in a way that it pulls all contents and information for survey and ESM setup from a *WordPress* (WP) page set up specifically for this purpose. This enables researchers to adjust the functionality and content anytime during data collection, as the app does not need to be re-compiled from the source code every time something is changed. Communication between the app and WP is achieved through the *WP REST API*.

In its current state, *MART* is functional, but limited to the WP page currently in use. It is therefore not customizable without programming knowledge quite yet, but a solution is in the works. The source code is available on GitHub [ANONYMIZED] and will be maintained and updated regularly. A thorough documentation is currently under development.

References

Apple Inc. (2022). *Meet the Screen Time API.* Retrieved from https://developer.apple.com/videos/play/wwdc2021/10123/

AWARE. (2022). *AWARE.* Retrieved from https://awareframework.com/

Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices* (2nd ed.). Retrieved from https://digitalcommons.usf.edu/oa{_}textbooks/3/

Bjørner, T. (2016). Time Use on Trains: Media Use/Non-use and Complex Shifts in Activities. *Mobilities*, *11*(5), 681–702. https://doi.org/10.1080/17450101.2015.1076619

Eisele, G., Vachon, H., Lafit, G., Kuppens, P., Houben, M., Myin-Germeys, I., & Viechtbauer, W. (2020). The Effects of Sampling Frequency and Questionnaire Length on Perceived Burden, Compliance, and Careless Responding in Experience Sampling Data in a Student Population. *Assessment*, *7001*. https://doi.org/10.1177/1073191120957102

Larson, R., & Csikszentmihalyi, M. (2014). The Experience Sampling Method. In *Flow and the foundations of positive psychology: The collected works of {mihaly csikszentmihalyi}* (pp. 21–34). Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-017-9088-8

Momentive. (2022). *SurveyMonkey.* Retrieved from https://www.surveymonkey.de/

Movisens. (2022). *movisensXS.* Retrieved from https://www.movisens.com/de/produkte/movisensxs/

Murmuras. (n.d.). *Offer & Pricing.* Retrieved from https://academia.murmuras.com/pricing/

Naab, T. K., Karnowski, V., & Schlütz, D. (2018). Reporting Mobile Social Media Use: How Survey and Experience Sampling Measures Differ. *Communication Methods and Measures*, *13*(2), 126–147. https://doi.org/10.1080/19312458.2018.1555799

Parry, D. A., Davidson, B. I., Sewall, C. J. R., Fisher, J. T., Mieczkowski, H., & Quintana, D. S. (2021). A systematic review and meta-analysis of discrepancies between logged and self-reported digital media use. *Nature Human Behaviour*, *5*(11), 1535–1547. https://doi.org/10.1038/s41562-021-01117-5

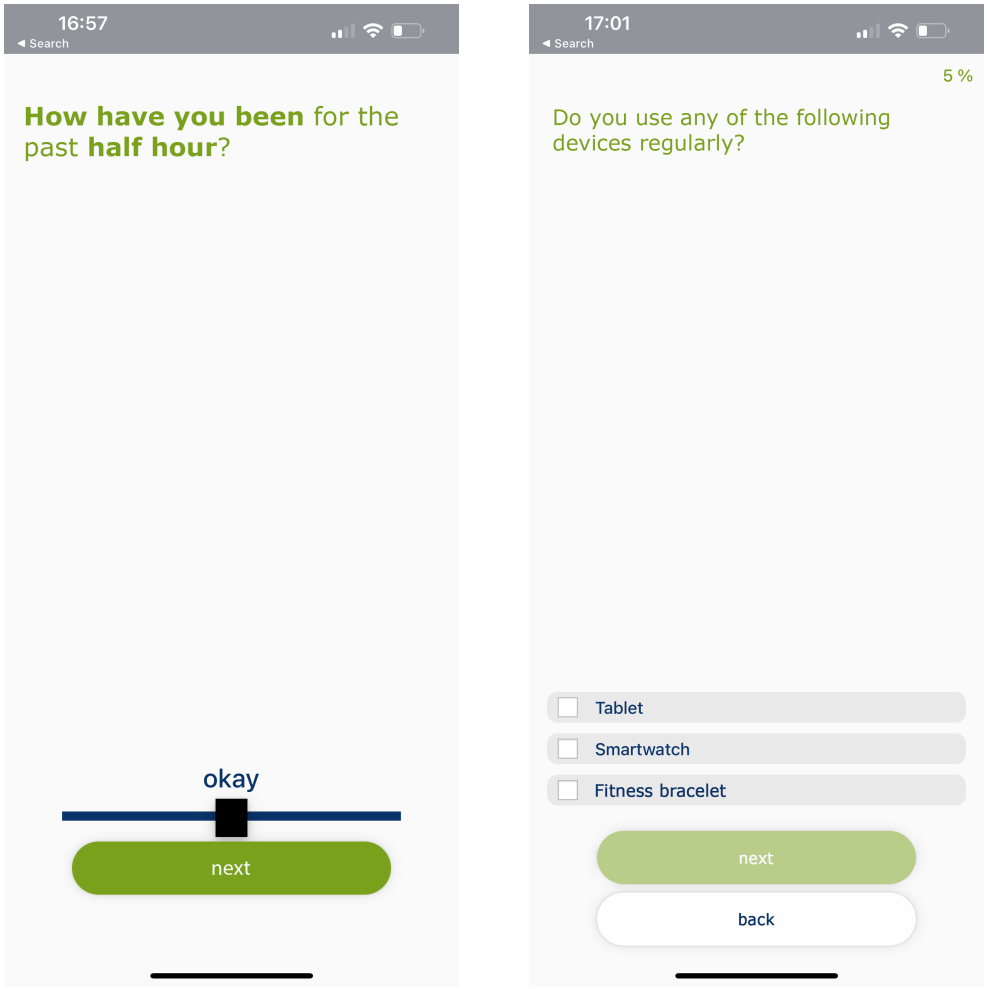

Figure 1: Examples of slider and multiple choice questions in *MART*