# Participants' Compliance and Experiences with Self-Tracking Using a Smartphone Sensing App

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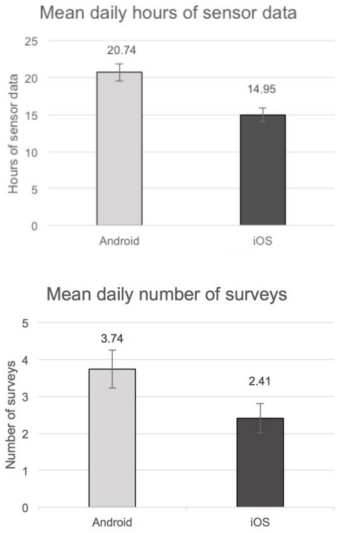
## Abstract
Self-tracking studies using smartphone sensing apps provide researchers with a great deal of detailed personal behavioral data. These methods promise to provide many insights into the links between everyday behaviors and well-being outcomes (e.g., physical and mental health). However, a better understanding of participants' compliance and experiences with self-tracking using smartphones is needed. Here we report on preliminary findings from a large scale self-tracking assignment that college students (N = 575) completed within the context of an online course. Specifically, we explored (1) compliance rates during the 14 days of the self-tracking assignment, and (2) students' experiences with the self-tracking assignment (e.g., satisfaction, perceived intrusiveness, self-insight). We also explored differences among iOS and Android users and discuss how the findings can be used in future study design.

## Author Keywords
Self-tracking; Research design; Smartphone sensing methods; Compliance; User experience

## ACM Classification Keywords
H.5.2. Information interfaces and presentation: User-centered design; J.4. Computer applications: Social and behavioral sciences---Psychology

| | STA | PFR |
|---|---|---|
| Very unsatisfactory | 4 | 4 |
| Unsatisfactory | 19 | 46 |
| Satisfactory | 184 | 239 |
| Very good | 206 | 213 |
| Excellent | 161 | 71 |

**Table 1**: Satisfaction with the self-tracking assignment (STA) and the personal feedback reports (PFR).




**Figures 2 & 3**. Comparing iOS and Android on hours of sensor data and number of EMA surveys.

## Introduction

Smartphone sensing methods (SSMs) can be used to capture people's experiences and behaviors in the context of their daily lives. These methods promise to provide a greater understanding of the behavioral patterns associated with various life outcomes (e.g., [1]). Many studies using SSMs have focused on the links between daily behavior and well-being in college student populations (e.g., [2,3]). Yet, relatively little is known about college students' experiences with self-tracking using SSMs. For example, to what extent do students comply with self-tracking using smartphones over time? Do students enjoy self-tracking? Here we report on preliminary findings from a large-scale self-tracking assignment within the context of an online course. Specifically, we explored (1) compliance with using a smartphone sensing app during a self-tracking assignment, and (2) students' experiences with the self-tracking assignment (e.g., satisfaction, perceptions of intrusiveness, self-insight obtained). To explore differences in compliance and user experience that may be due to operating systems, we also compared iOS and Android users on these metrics.

## Method

*Study procedure*

Students were recruited from an online course at The University of Texas at Austin that enrolled 855 students. As part of a class assignment, students were instructed to self-track for at least 7 days (out of a possible 14 days) using one of three mediums: (1) a smartphone sensing application, (2) emailed surveys sent through the Qualtrics survey platform, or (3) a personal handwritten journal. The incentives for students to use the smartphone application (or Qualtrics emails) to self-track during the assignment were (1) for convenience and (2) to receive personalized feedback reports that graphed their tracked data. In this report, we focus our analyses on the 575 participants who elected to self-track using the smartphone sensing application[1]. Of the students using the app, 110 reported being Android users and 460 were iOS users[2]. Students were able to use their own phones to complete the assignment, so the individual models varied across participants.

SMARTPHONE SENSING APPLICATION

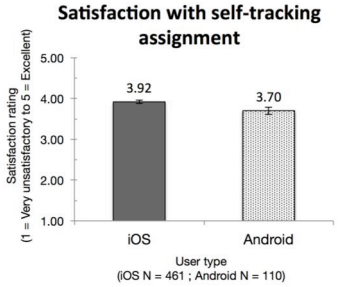
The smartphone sensing app the students used was an iteration of the *StudentLife* app [3]. The app was designed to be compatible with both Android and iOS phones. The app delivered Ecological Momentary Assessment (EMA) surveys 4 times a day at 12pm, 3pm, and 6pm, and 9pm. At these times, participants received a notification to respond to a brief survey about their in-the-moment experiences (e.g., their behavior, mood, activities, and location). The app also collected the following types of sensor data passively in the background of the phone: accelerometer, microphone, call and text logs, and GPS.

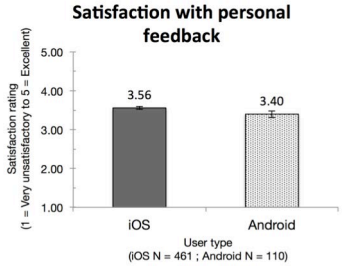
*Measures*

At the end of the assignment, participants were asked to fill out a questionnaire providing feedback about the assignment and their experience with self-tracking. Below we report descriptive statistics from the questionnaire items.

[1] In total, 278 cases were excluded from the analyses because they used the emails to self-track and 2 cases were excluded

[2] Note that 5 users did not report which type of phone they were using.




**Figures 4 & 5**. Compared to Android users, iOS users reported slightly higher levels of satisfaction with the self-tracking assignment and feedback.

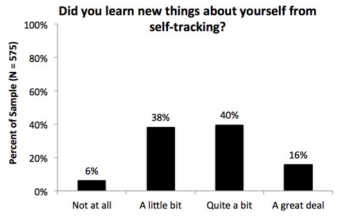



**Figure 7.** Reports of the degree to which participants learned new things from self-tracking.

## Data Analysis

*Compliance with self-tracking*

The compliance measures included both self-reported and objective measures of compliance. For self-reported compliance, participants were asked how many days they self-tracked during the assignment. Nine percent of students reported self-tracking for less than 7 days, 58% reported 7-9 days, 34% reported 10 or more days.

For objective compliance, we computed three metrics: the number of participants per day, the number of hours of sensed data collected per participant per day, and the number of EMAs recorded per participant per day. Figure 1 presents the compliance trends over the duration of the self-tracking assignment. Many students complied with using the app for passive sensing and active logging. However, compliance dropped after day 7. Generally, less than 70% of the sample was considered highly compliant in their self-tracking (operationalized here as more than 15 hours of sensor data and 4 or more EMAs per day). On average, Android users had more sensor data and EMA responses collected per day than did iOS users (as shown in Figures 2 and 3). We suspect that the lower compliance rates among iOS users is due to a constraint of the iOS system. Specifically, the iOS app needed to remain open (i.e., the user could not quit the app) for it to collect data. If the user quit the app, they had to reopen it to resume data collection. In contrast, the Android app could run in the background of the phone and still collect data.

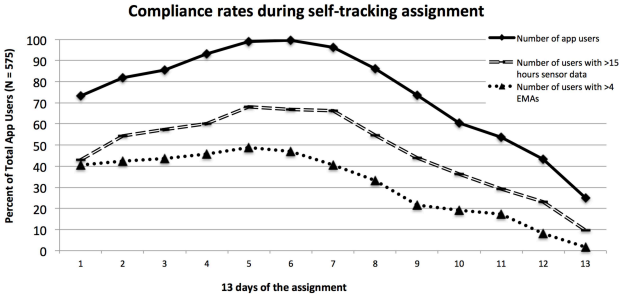



**Figure 1**: Compliance rates for smartphone app users during self-tracking assignment.

*Experiences with self-tracking*

The user experience measures consisted of a 4-item survey. The survey asked participants to rate their level of satisfaction with the self-tracking assignment and personal feedback on a 5-point scale (from 1 *Very unsatisfactory* to 5 *Excellent*; Table 1). Compared to Android users, the iOS users reported higher levels of satisfaction with the assignment and app (Figures 4-5).

Participants were also asked about any issues they experienced while using the app (Figure 6). The most frequently endorsed issues were too many notifications (37% for iOS and Android users) and draining phone batteries (53% Android, 28% iOS). They were also asked whether they learned anything new about their behavioral patterns from self-tracking (Figure 7), and the vast majority of participants reported learning new things about their behavioral patterns.

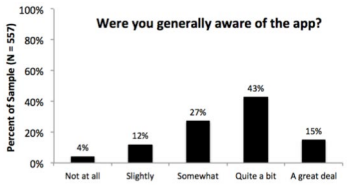



**Figure 8.** Reports of being generally aware of the app.

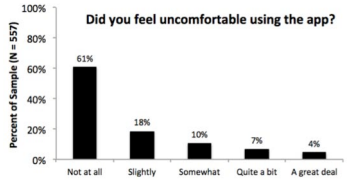



**Figure 9.** Reports of feeling uncomfortable using the app.

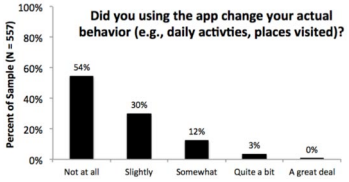



**Figure 10.** Reports of whether using the app changed behavior.

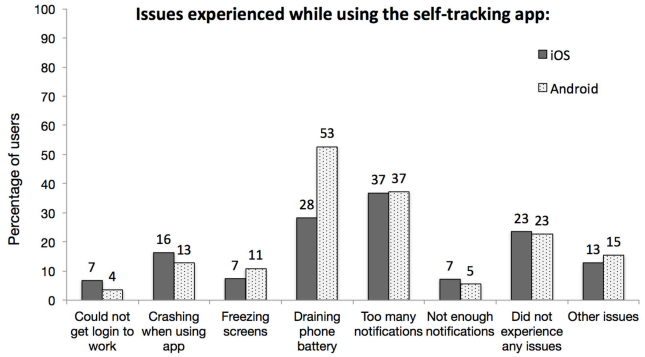



**Figure 6**: Issues students experienced while using the app.

*Perceptions of obtrusiveness*

The obtrusiveness measure consisted of 3 items that asked participants to rate on a 5-point scale (from *Not at all* to 5 *A great deal*) the degree to which: they were aware of the app, uncomfortable using the app, and whether using the app led them to change their behavior (Figures 8 - 10). Overall, participants reported being generally aware of the app. Approximately half of the participants reported being not at all uncomfortable using the app, while the other half did report being uncomfortable using the app. Many participants also reported that using the app changed their behavior.

## Conclusion

The preliminary findings of this study suggest that student participants generally comply with self-tracking using their smartphones, and reported positive experiences doing so. Comparisons between iOS and Android users suggest avenues for future research that aim to improve the user experience for participants using smartphones in self-tracking studies. For example, Android users had more data collected during the assignment but more battery drain issues, compared to iOS users. However, both groups of users reported receiving too many notifications. Overall, our preliminary findings can be used to guide future improvements to study design and app software for self-tracking research.

## Acknowledgements

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