Smartphone Study of Teen Relationships: Anatomy of a Pilot

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Adolescence is a pivotal period for establishing healthy emotional relationships, but also a time of risk-taking that can compromise long-term health prospects. Whether and when romantic relationships are formed, and the course these relationships take (e.g., timing of initiation of sexual activity, existence of abuse), can set the stage for health and wellbeing throughout the life course. This paper documents the lessons from a pilot study, the *Smartphone Study of Teen Relationships,* which uses weekly smartphone "diaries" to collect prospective information on the romantic relationships and sexual behavior of adolescents. Given the novelty of smartphone-based survey research in social sciences, the lessons learned from this pilot provide insights about the promises and challenges for researchers considering use of these new technologies in survey research with youth.

The "diary" methodology used in the *Smartphone Study* draws from the *Relationship Dynamics and Social Life Study* (RDSL), which investigated the determinants of unintended pregnancy among young adult women in Michigan. Its key methodological advance is the use of short, weekly internet surveys to capture the dynamism in interpersonal relationships. Prior studies have suffered from the bias that comes with retrospective reporting on frequently changing behaviors and attitudes. Collecting information on a weekly, real-time basis in the RDSL enabled precise measurement of the timing and sequencing of events in relationships, including changes in relationships that preceded changes in contraceptive use, pregnancy and births (Barber et al. 2012).

The RDSL methods have not been implemented with adolescents, nor administered using mobile technology. That teens are accustomed to using mobile devices to maintain relationships and share information about their lives makes smartphones a promising medium for administering diaries to this age group. The past several years have witnessed massive penetration of mobile devices among teens. A 2012 survey by Pew estimated that 44 percent of all 14-17-year-olds owned a smartphone, and 83 percent owned a cellular phone of any kind; moreover, teens living in the lowest-earning households were just as likely to own smartphones as those living in the highest-earning households (Madden et al. 2013). Compared with computer-based surveys, use of smartphones also has the potential to increase respondent privacy when answering sensitive questions, given that teens often rely on computers in shared spaces like a family living room or library (Madden et al. 2013). Overall, smartphone-based administration of surveys has the potential to reduce study attrition, not only because this modality conforms to teens' existing communication habits, but also because researchers can maintain reliable contact with respondents through the phones via text message, e-mail, and phone.

Pilot Study

The *Smartphone* pilot study seeks to evaluate the viability of using mobile technology to administer repeated surveys over short durations to adolescents. The pilot study consists of several components: development of an android smartphone application (app); administration of two rounds of weekly surveys to test the app and survey questions; and focus groups with participants following the first round of fieldwork. For the first round, we developed a sequence of eight short (3 to 7 minute) "mini-surveys" to be administered over eight consecutive weeks to seven adolescents recruited from a college enrichment program for low-income youth. We

limited the first round to seven participants both for cost control and because the purpose of the pilot was to test the feasibility of administering a longitudinal survey with complex skip patterns and information substitution as well as to evaluate wording of sensitive questions.

Given the sensitivity of the surveys and the age group of the target participants, four app features were critical for this project: 1) high-level data encryption; 2) modular design to allow for rotating of questions between surveys; 3) "double" front-end development (the smartphone app for respondent use as well as a website for researchers to use to control survey content and communications with respondents); and 4) capability for big data management and analytics. The app was designed to securely transmit encrypted responses to a secure Amazon-hosted virtual private server on a question-by-question basis.

The first round of surveys was administered in 2013 between mid-July and mid-September. Study participants received refurbished, second-generation smartphones equipped with the study app, as well as an unlimited data plan for the two months of the study.[1] Upon receiving smartphones during an initial in-person registration session, participants completed a 5-minute Internet survey that collected basic demographic data and information about family background and schooling. Topics covered over the course of the eight weekly smartphone surveys included romantic and sexual relationships (whether respondents were dating, partner characteristics, relationship quality, sexual activity and contraceptive use), as well as emotional wellbeing, family structure and dynamics, household shocks (e.g., parental job loss), and friendships. Variation in survey content over time was designed to maintain respondent interest (particularly for those not in romantic relationships) and to obtain information on time-varying measures that are associated with relationship characteristics and emotional wellbeing. We

[1] Participants in the pilot study were allowed to keep the refurbished smartphones, but the data plan was discontinued after 8.5 weeks.

based our survey questions on those used in other major surveys of youth, including the *Toledo Adolescent Relationships Study (TARS)*, the *National Longitudinal Study of Adolescent Health (Add Health)*, and the RDSL Study.

Figures 1, 2, and 3 present illustrative screen shots from the weekly smartphone surveys. Most survey questions use a multiple-choice format, although some (as in Figure 1) allow for text entry. We programmed complicated skip patterns within and between surveys to minimize respondent burden and to avoid unnecessary repetition of questions. With regard to romantic relationships, respondents who reported having a romantic partner were asked to provide their partner's initials, first name, or a nickname (Figure 1). This permitted tracking of partners across surveys and allowed us to refer to specific partners in questions related to the relationship. Figure 2 shows a question incorporating the partner's name. Figure 3 illustrates how relationship information from a prior survey is fed into subsequent surveys.

(Figures 1-3 About Here)

Instrumentation and Field Results

Every Sunday, a new survey was posted on the app platform and participants received a text message requesting their participation. Respondents who had not completed the weekly survey by Monday afternoon received a follow-up message; if necessary, a second text reminder was sent on Tuesday. Participants were offered a $20 Amazon gift card each time they completed four consecutive surveys. The phone devices and smartphone app functioned well for the study participants. Technical support was readily available through multiple channels; yet, no support requests were made with respect to the phones, and only two minor instances of technical support were needed for the app.

During the first eight-week survey deployment there was no attrition. A single reminder to complete the weekly survey was necessary for one to two respondents in four of the eight weeks; second reminders were necessary on two occasions. Respondents proved willing to answer all questions—even highly sensitive questions about intimate relationships. Table 1 summarizes the amount of time respondents spent on each weekly survey. On average, the surveys took respondents between one minute and six minutes to complete. Variation in response times between and within surveys depended in large part on the number of questions in the particular survey and whether respondents had a romantic partner or skipped out of the relationship questions.

Analyses of the data transmission revealed that variation in Internet connectivity results in data loss unless responses are saved in encrypted format on the mobile device until Internet connectivity is restored. Furthermore, because teens are prone to multi-tasking, incoming calls and texts frequently lead to mid-survey exits. Therefore, particularly for surveys with skip patterns and inter-wave partner information links, mobile survey apps must be able to retrieve stored responses until the survey is completed.

Preliminary Lessons Learned

Through the process of developing the smartphone app and administering the first round of mobile surveys, we have gleaned several preliminary lessons about use of mobile devices for survey research with youth. The first is that researchers should consider carefully the trade-off between creating a smartphone app, as in the current project, and sending respondents an online survey that is accessed and completed via a mobile Internet browser. One of the advantages of the app approach is that the survey can be completed without the need for persistent Internet

connectivity; furthermore, pacing of the survey should not have to depend on the strength of the internet connection at the time the survey is completed (Buskirk and Andrus 2012). Another advantage is the ability to customize surveys with an app (in our case, allowing for complicated skip patterns between surveys). However, question layout must be optimized for a mobile phone to avoid the need for scrolling and zooming. Finally, an app can also automate survey notifications and reminders using text messages, which appears to be a preferred source of electronic communication among teens (compared with email, for example).

Survey design considerations are distinct for a smartphone survey, compared with other survey types. Because smartphone screens are small, survey questions and response categories must be short. Certain question formats, such as a table format, are not at all suited for these screens. In addition, because teens' attention spans are short on phones, the number of questions asked per sitting should be minimized; long surveys are not well suited for this technology. The survey questions that are included should be designed with an eye to maintaining youth interest.

Despite its appeal, the app approach to surveys with adolescents has some drawbacks. Our experience reaffirmed findings from other studies (e.g., Buskirk and Andrus 2012) that app development requires complex programming and sufficient allotment of time for coding as well as extensive testing on both Android (which we used) and iOS platforms. Respondents must be able to download the survey app should updates be necessary in the course of a longitudinal survey. Although our beta app was installed in the smartphones pilot respondents received, at least one participant had to reinstall the app in the course of the 8-week deployment.

Development of an app suitable to administer customized longitudinal surveys imposes several programming challenges. Because little open access code exists for app development, it is important that the programming staff understand the general project objective and the survey

design in particular. Familiarity with panel survey design also is essential to develop correct partner substitution patterns; for the first pilot these inter-survey partner substitutions were handled manually, but must be automated in a full-scale deployment. The PI team must include sufficient expertise to supervise the programmer(s) and ensure high data quality. Finally, investigators should consider whether app code will be made available as open source (when and how) or licensed (and where). This decision should reflect study goals, institutional guidelines and funder regulations. The university licensing office is an important source of information about these considerations. Licensing guidelines should be explicit in programmer contracts.

Finally, because smartphone ownership is not yet universal among teens, researchers should consider carefully whether to distribute smartphones to study participants. Providing phones may increase participation and reduce the bias inherent in limiting the sample to youth who own smartphones; however, this strategy is potentially difficult to scale. Setting up, monitoring, and troubleshooting multiple smartphones requires a great deal of time and effort. Data plans are also relatively expensive, particularly if the study is ongoing over a long period. A mixed strategy, such as providing smartphones to respondents who do not already own one, may be viable. However, whether youth own an iOS or Android phone, which generation of phone they own, and which data access package they possess can all influence their availability for response.

Next steps

The focus group with first round participants will occur in October 2013. We will solicit feedback on the smartphone app, question wording and formats (including appropriate terminology for this age group for concepts like “dating”), and, more generally, the study and its demands. This information will be used to fine-tune the survey instruments and improve the

study app for the second field deployment. In early 2014, after refinements to the app and survey questions are completed, we will field another round of surveys with a new group of respondents. In this second round, we will vary the periodicity of the diaries, administering the surveys on a bi-weekly basis. Lessons learned from the focus group and second survey deployment will be incorporated into the final paper.

Table 1.

Survey	Mean time	Min	Max
1	3:57	1:50	6:18
2	6:02	5:11	6:47
3	3:34	1:34	6:44
4	2:28	1:21	3:20
5	3:01	0:51	5:42
6	1:09	0:31	2:18
7	2:06	0:45	5:12
8	1:54	0:35	5:28

Figure 1.

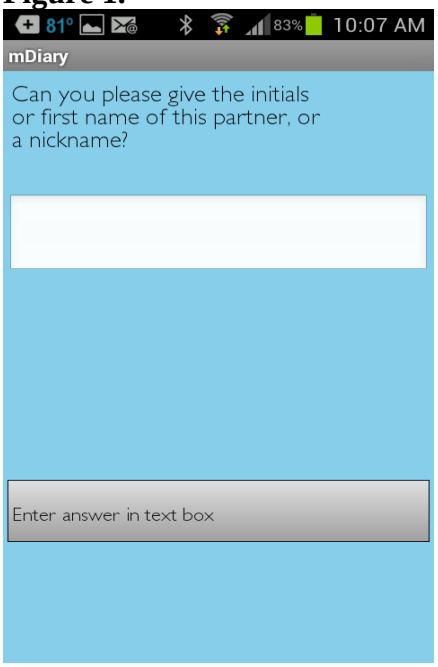

Figure 2.

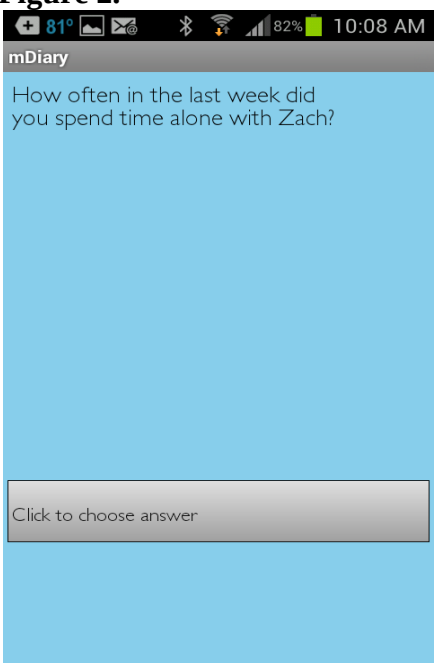

Figure 3.