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App vs. Web for Surveys of Smartphone Users

*Experimenting with mobile apps for
signal-contingent experience
sampling method surveys*

**FOR FURTHER INFORMATION
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About This Report

This report utilizes a form of survey known as “signal-contingent experience sampling” to gather data about how Americans use their smartphones on a day-to-day basis. Respondents were asked to complete two surveys per day for one week (using either a mobile app they had installed on their phone or by completing a web survey) and describe how they had used their phone in the hour prior to taking the survey. This report examines whether this type of intensive data collection is possible with a probability-based panel and to understand the differences in participation and responses when using a smartphone app as opposed to a web browser for this type of study.

This study is a complement to the core data collection of the report [The Smartphone Difference](#), which examined the increasingly important role that smartphones play in helping Americans access, share, and create information and communicate with others. It places a particular focus on the sometimes-fragile financial and technical circumstances of those who rely heavily on their smartphones for internet access.

These findings are based on 2,011 smartphone users in Pew Research’s American Trends Panel in November 2014.

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This report is a collaborative effort based on the input and analysis of the following individuals.

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Introduction

Most people live busy lives, filling their days with a wide range of activities and experiences. While retrospective questions on traditional surveys have been the typical method employed to measure these experiences, they suffer from a number of weaknesses, most notably the inability of people to accurately recall the minute details of what they do and the way they interpreted those experiences in the moment. A vast literature chronicles the difficulties and biases inherent in such retrospective measurement (Tourangeau, Rips, & Rasinski, 2000).

A particular form of survey research known as “experience sampling” offers an alternative that addresses some of the weaknesses of traditional surveys in this respect. Proponents of this method argue that its strength is “to capture daily life as it is directly perceived from one moment to the next, affording an opportunity to examine fluctuations in the stream of consciousness and the links between the external context and the contents of the mind” (Hektner, Schmidt and Csikszentmihalyi, 2007).

Experience sampling entails short, repeated data collection from a sample of individuals at specified times, usually upon a signal from the researcher. When first introduced, experience sampling required special technology for contacting individuals and required them to carry a copy of the survey with them or to answer a telephone call. The growth of the use of smartphones has made it feasible both to contact people and collect data from them using short, self-administered surveys.

This study presents the results of an experiment with “signal-contingent experience sampling” using smartphones to study attitudes and behavior related to smartphone use itself. In addition to documenting the use of experience sampling among a nationally representative survey panel, the study examines the feasibility, costs and benefits of using mobile software applications (smartphone “apps”) rather than web-based means of contact and data collection for studies of this nature. Among the research questions this study intended to begin to address was whether panelists would respond to experience sampling method surveys in the first place, how the response rate to these surveys would differ by assignment to the app vs. web treatment, whether different demographic groups would be more or less likely to respond using the app and how the substantive survey responses would differ by the experimental treatment.

Literature Review

The research literature on using mobile apps for survey research is sparse. The majority of research has not been published but was rather publicly presented at conferences such as the American Association for Public Opinion Research's annual meeting. The bulk of the studies were conducted by the Nielsen Company, primarily in regard to their TV viewing diary app.

While these studies focus on the use of apps and mobile devices more generally, their results are limited for the purposes of the Pew Research Center. Many focus on game and social mechanics, which is less than ideal number of reasons. The burden in terms of both cost and time to program them is too high (Lai, J., M. Link, L. Vanno (2012)). They appeal most to certain subsets of respondents, such as young adults, technology savvy respondents or minorities (Lai, J., M. Link, K. Bristol, S. Duan (2014); Lai, J., K. Bristol, S. Duan, M. Link (2013); Link, M., J. Lai, K. Bristol, S. Duan (2013); Lai, J., M. Link, L. Vanno (2012)). Finally, there is some concern that "gamification" could undermine efforts to convey that the seriousness of a political or social science research endeavor.

In addition, many of the studies that have been made public thus far were not randomized controlled experiments, limiting the ability to apply their findings to other research. For example, in some cases users were able to self-select whether they used the mobile app, a web browser ("web app") or both (Lai, J., M. Link, K. Bristol, S. Duan (2014)) to take the surveys. In others the focus was on the device respondents chose to use to complete the survey (computer vs. mobile device) meaning it was not possible to know whether mobile device users were then using the mobile app or the web browser (Link, M., J. Lai, K. Bristol, S. Duan (2013); Link, M., S. Duan, K. Bristol, J. Lai (2014)). In instances where there was a randomized controlled experiment, it was testing the effects of introducing game and social mechanics (Vanno, L., J. Lai, J. Scagnelli, M. Link (2012); Link, M., J. Lai, and L. Vanno (2012)).

Finally, in many of the presentations the outcomes measured were based on self-reported attitudes and behaviors from a follow up survey, rather than actual outcomes of the experiment itself such as response rates or data quality (Lai, J., M. Link, K. Bristol, S. Duan (2014); Lai, J., K. Bristol, S. Duan, M. Link (2013); Lai, J., M. Link, L. Vanno (2012); Link, M., S. Duan, K. Bristol, J. Lai (2014)).

One particularly relevant Nielsen non-TV diary study (Scagnelli, J., J. Bailey, M. Link, H. Moakowska, and K. Benezra (2012)) tested event-contingent experience sampling in the context of a food purchase study over a month long field period. However, its goal was to test feasibility rather than testing and comparing different approaches. The study used a non-probability sample of 268 Millennials in southern California, and provided respondents with smartphones

pre-loaded with an app in order to have the capacity to capture GPS location, use barcode scanning and take pictures. The study found that there was some change in respondent behavior over the course of the field period, in terms of participants reporting that they became more aware of purchases and opted for healthier and cheaper options. A second relevant finding and an advance in terms of the possibility of verification: the GPS capability on the phones showed that most respondents completed their surveys away from the point of sale, contrary to instructions.

Another Nielsen non-TV diary study (Scagnelli, J., K. Bristol (2014)) also used event-contingent experience sampling. The goal of the study was to measure feasibility of collecting data with this method, and employed a nationally representative pilot study in South Africa involving barcode scanning of household purchases.

In summary, while several interesting studies have used smartphone apps, they had limited relevance for the types of studies conducted by the Pew Research Center. There is a gap in the literature for studies that use a probability sample with a randomized controlled experiment unrelated to TV viewing or purchasing behavior.

Methods

This signal-contingent experience sampling method study was conducted using the Pew Research Center's American Trends Panel, a probability-based, nationally representative panel of US adults. Panelists were recruited from the 2014 Political Polarization and Typology Survey, a large (n=10,013) national landline and cell phone random digit dial (RDD) survey conducted January 23rd to March 16th, 2014 in English and Spanish. At the end of that survey, respondents were invited to join the panel. In 2014, panelists took surveys monthly, primarily by web with a small portion taking the survey by mail and sometimes phone.

This study began during the October 2014 monthly wave of the panel, conducted October 3rd to 27th, 2014 (n=3,181). All panelists were asked what type of cell phone they had. Those with an eligible smartphone (iPhone, Android or Blackberry) were randomly assigned to the web or the app treatment and asked to participate in a follow up study using the respective data collection mode. Sixty percent of the eligible panelists were assigned to the app treatment and 40% to the web treatment. Panelists with a smartphone that was incompatible with the survey app were assigned to the web group but are excluded from the experimental analysis (they are called the "non-experimental web group"). Panelists who were assigned to the app group but refused were invited to take the follow up survey via the web ("APP2WEB group"). The reason for this design was so that combined respondents from all groups -- the app group, the experimental web group, the non-experimental web group and the APP2WEB group -- would be representative of

all smartphone users, while the first two groups could be compared for experimental purposes. The results presented here focus mainly on the app and experimental web groups. ConfirmIT software was used for the web surveys and the ConfirmIT SODA app was used for the app surveys.

The survey questions and text for the invitation to participate in the signal-contingent experience sampling method follow up study can be found in Appendix A. The invitation explained that respondents would be alerted twice a day for seven days when it was time to complete a two minute survey for a total of 14 two-minute surveys. The app group was told they would need to download an app to take these surveys while the web group was told they could use their smartphone, tablet,

laptop or desktop. The invitations to these surveys would come via text message, email and for the app group, via push notification.

Respondents would be given \$5 for agreeing to take part in the follow up surveys, \$1 for each completed survey and an additional \$5 for completing 10 or more of the 14 follow up surveys, potentially totaling \$24. The invitation to participate also

contained a disclaimer to the app group that the app would not collect any additional data from their smartphone, but that it was a third-party app and thus could have some risk associated with it. Finally, the invitation explained that the purpose of the study was to understand how and why people use their smartphones and how it makes them feel.

All who agreed to participate in the study were then asked for consent to receive text messages with survey invitations, as the surveys needed to be completed within two hours of receiving the invitation. For those who consented, cell phone numbers were confirmed or obtained. Finally, panelists were told the alerts themselves would come at a different time each day, adjusted for the time zone, so the final question confirmed or obtained the panelist's time zone for the period in question (November 10th to November 16th, 2014).

All panelists who agreed to participate in the follow up study were sent an advance letter and a \$5 incentive if a mailing address was on file. All panelists were also emailed the same advance

Survey Administration Contacts

Date	First Survey	Second Survey
Monday, November 10	8am	3pm
Tuesday, November 11	9am	4pm
Wednesday, November 12	10am	5pm
Thursday, November 13	11am	6pm
Friday, November 14	12pm	7pm
Saturday, November 15	1pm	8pm
Sunday, November 16	2pm	9pm

Respondent reported local time.

American Trends Panel (experience sampling survey). Survey conducted November 10-16, 2014.

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message. For those without a mailing address on file, the email contained a \$5 Amazon gift card. Those in the app group also received instructions for downloading the app in the mailed letter and a link to do so in the email

Surveys were conducted at the days and times (in the respondents' reported local time) shown in the accompanying table. The surveys were open for two hours each, as the content was time sensitive. The web group received a text message with a link to take the survey, while the app group received a text message telling them to go to the app; this message included a link to download the app if they had not already done so. Both groups received emails with this information as well. The app group received a push notification that took them directly to the survey in the app.

The survey itself asked respondents about the activities they had engaged in on their cell phone in the past hour, aside from answering the survey. If the respondent had used their cell phone in the past hour, they were asked where they were when they used it, what they used their phone to help them do (e.g., look for directions, settle an argument or avoid being bored), and what feelings they experienced regarding their cell phone during that time. If they had not used their phone in the last hour they were asked when they most recently used it, why they did not use it in the last hour and whether this was typical usage for them. Appendix B includes the full the questionnaire. For full results of this survey please see *The Smartphone Difference*.

Results

Sizeable majorities of both the app and web groups agreed to take part in the study, and majorities of those who signed up actually participated in one or more of the individual surveys. The web group outperformed the app group in terms of cooperation rates and responses rates, both overall and to each of the 14 surveys. This is perhaps due to the fact that panelists assigned to the web treatment knew they could and did respond via smartphone, tablet, laptop or desktop while the app panelists were restricted to a mobile device.

The experimental web group was more likely to agree to participate in the follow up surveys than the app group. The agreement rate was 90% for the experimental web group and 76% for the app group. Of all panelists in the app group, 16% did not agree to participate using the app but said yes to using the web (APP2WEB). Overall 91% of those invited to participate in the follow up surveys agreed to do so; however this includes all of the app, experimental web, non-experimental web and APP2WEB groups.

In total, 80% of those who agreed to participate using an app actually downloaded the app. This corresponds to 61% of those invited.

App Group Responded at Lower Rate than Experimental Web Group

Levels of Participation by Experimental Treatment

	Sample size		Response Rate ¹		Completion Rate ²	
	App Group	Experimental Web Group	App Group	Experimental Web Group	App Group	Experimental Web Group
Invited to participate	1211	800	—	—	—	—
Agreed to participate	919	717	76%*	90%	—	—
No to app, agreed to web	195	—	16%	—	—	—
Consented to text messages	845	628	70%*	79%	92%*	88%
Downloaded app	735	—	61%	—	80%	—
Completed at least 1 survey	697	673	58%*	84%	76%*	94%
Completed 10 or more surveys	484	424	40%*	53%	53%*	59%
Completed all 14 surveys	106	119	9%*	15%	12%*	17%

1. Responded/Invited; 2. Responded/Agreed; * App and experimental web differences statistically significant.
American Trends Panel (experience sampling survey). Survey conducted Nov. 10–16, 2014.

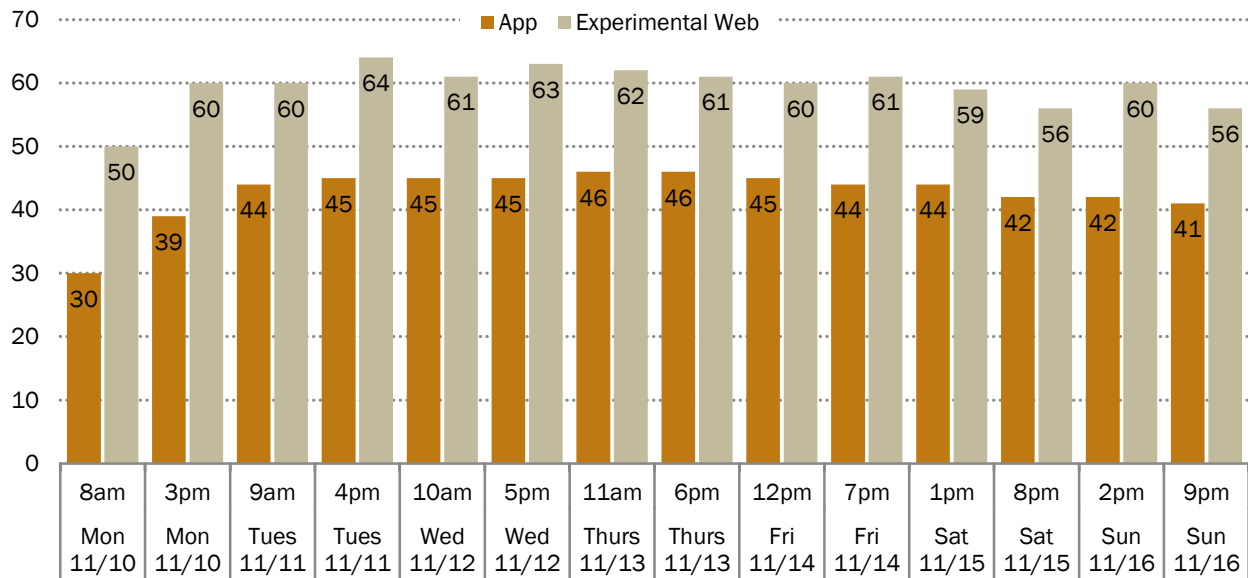
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The experimental web group was also more likely to respond to individual survey requests. Of those invited, the overall experimental web response rate (one or more completions) was 84% vs. 58% for the app group. Additionally 53% of the experimental web group vs. 40% of the app group completed 10 or more surveys, and 15% vs. 9% completing all 14 surveys, respectively. Of those who agreed to participate the overall completion rate was 94% for the experimental web group vs. 76% for the app group. Looking at those who completed 10 or more surveys these numbers drop to 59% and 53% respectively and when we look at who participated in all 14 surveys they decrease further to 17% and 12%, respectively.

Looking at the surveys across the field period, the app response rate was lower than the experimental web completion rate at every day and time. Additionally, we see a lower response rate on the first day than the second day for both modes, except when comparing the afternoon web surveys of the first two days. Of the subsequent days, each day is not statistically significantly higher or lower than the day before.

App Response Rate Lower at Every Day and Time

% responding to each survey...



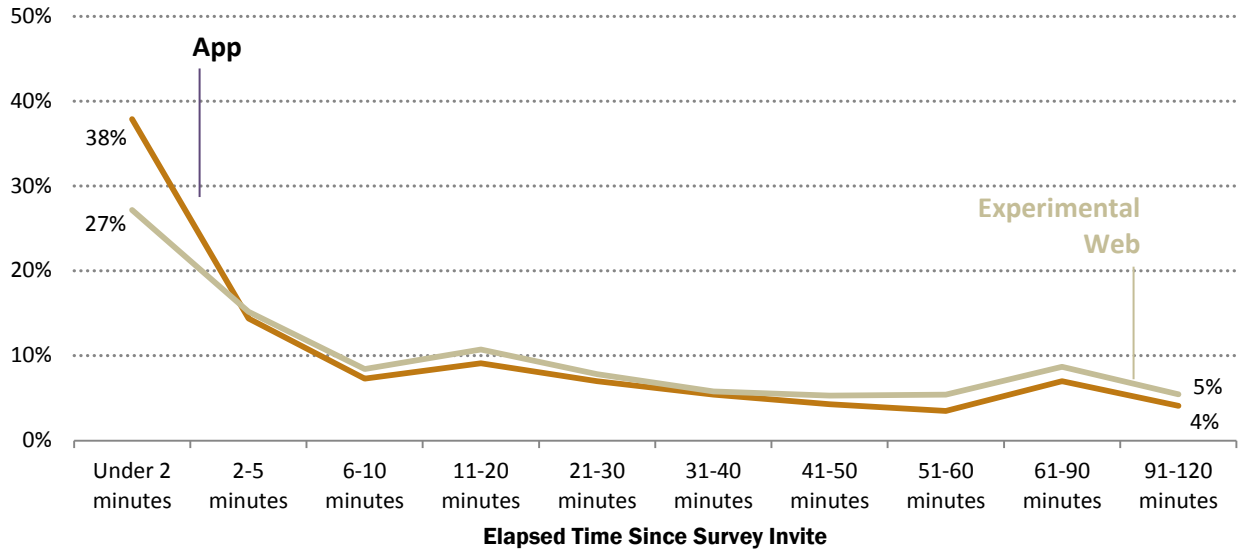
American Trends Panel (experience sampling survey). Survey conducted Nov. 10-16, 2014.

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Combining all completed surveys by treatment across all days and times, we looked at when each completed survey was initially accessed within the two hour survey window. We find that a plurality of both the app and experimental web surveys was initially accessed within the first two minutes after the invite was dispatched, but a higher percent of the app surveys were accessed within that time frame compared to the experimental web group. Perhaps the push notifications the app group received, in addition to the text messages and emails both groups received, accounts for some of this increase. It could also be related to the demographics of the app group, discussed below.

Plurality of Completed Surveys Initially Accessed Within 10 Minutes of Invitation

% of all completed surveys initially accessed within each time frame



American Trends Panel (experience sampling survey). Survey conducted Nov. 10-16, 2014.

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The original research plan called for capturing the device used to complete each survey, for each panelist regardless of experimental treatment. However, due to an oversight, the device information for the experimental web group was captured for only the respondent's last survey. Keep in mind that for some respondents their last survey could have been the second survey and for others the 14th survey. While the vast majority (80%) completed their last survey on a mobile phone, 7% used a tablet and 14% used a desktop or laptop computer.

The app group's smartphone or tablet operating system was captured for every survey. iOS users (iPhone, iPad) outnumbered Android (smartphone, tablet) users 57% to 42% in the initial survey, a ratio that gradually narrowed to 51% to 48% by survey 14.

One in Five Web Respondents Used Non-Smartphone

Experimental Web Device Type

Mobile phone	80%
Tablet	7
Computer	14
<i>Sample size</i>	673

Device used on respondents' last completed survey.

American Trends Panel (experience sampling survey). Survey conducted Nov. 10-16, 2014.

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iOS Margin Decreased Over Field Period

Smartphone, Tablet Operating System Used on App Surveys

	Android	Blackberry	iOS	Sample size
	%	%	%	
Survey 1	42	0	57=100	369
Survey 2	45	0	55	477
Survey 3	45	0	54	534
Survey 4	45	0	54	551
Survey 5	46	0	54	547
Survey 6	46	0	54	549
Survey 7	46	0	53	554
Survey 8	46	0	54	554
Survey 9	46	1	53	543
Survey 10	48	0	51	532
Survey 11	47	0	53	530
Survey 12	48	0	52	506
Survey 13	48	0	52	514
Survey 14	49	0	51	502

American Trends Panel (experience sampling survey). Survey conducted Nov. 10-16, 2014.

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The unweighted demographic composition of the study’s participants and the weighted full sample of smartphone users from the October wave of the panel were very similar, suggesting that either experimental group could have been used to represent all smartphone users. However, app respondents represented all smartphone users slightly better than did experimental web respondents, in the sense that they were more likely to be young and not registered to vote. There were some relatively modest demographic differences between the app and web groups. For example, in comparing app vs. web for both those who agreed to participate and those who actually responded, the profile of the app group was younger, more likely to be from the Midwest and less likely to be registered to vote compared to those who agreed to participate and those who responded in the experimental web group.

One possible factor that could have contributed to the age difference between the app and web groups was that numerous panelists had technical difficulties in trying to download the app. Approximately 100 panelists emailed or called the panel help line reporting problems such as not knowing what the Google Play or Apple App Store were, not having their accounts configured to use said stores, not knowing how to download an app or even trying to download the app on their computer. If we assume that these less tech savvy panelists may perhaps have been older, this would skew the demographic composition of the app treatment towards younger panelists who were able to download the app.

Little Difference Between App, Web Demographics

% in each demographic group among agreeers and responders by experimental treatment

	Agreed to Participate		Responded		All Smartphone users
	App	Experimental Web	App	Experimental Web	
	%	%	%	%	%
18-29	23	20	24*	19	30
30-49	39	36	40	36	40
50-64	27	29	26	28	22
65+	11*	16	9*	16	8
Male	47	48	47	48	47
Female	53	52	53	52	53
College Grad+	59	60	59	61	33
Some College	27	28	28	27	35
HS Grad or Less	13	12	12	12	31

*App statistically significantly different than web.

Figures unweighted except “All smartphone users. Figures read down. Don’t know responses not shown. Smartphone users figures from American Trends Panel (wave 8), conducted October 3-27, 2014. American Trends Panel (experience sampling survey). Survey conducted Nov. 10-16, 2014.

Little Difference Between App, Web Demographics Continued...

% in each demographic group among agreeers and responders by experimental treatment

	Agreed to Participate		Responded		All Smartphone users
	App	Experimental Web	App	Experimental Web	
	%	%	%	%	%
White	77	74	78	74	65
Black	7	9	7	9	12
Hispanic	9	9	9	9	14
Northeast	16	20	16	20	19
Midwest	25*	20	26*	21	19
South	32	36	31	36	36
West	27	24	27	24	25
Married	56	56	58	57	50
Never been married	22	21	23	21	28
Protestant	39	42	38	42	46
Catholic	17	21	18	21	20
Unaffiliated	28	24	28	25	23
Other	14	12	15	12	11
\$75k+	44	45	44	46	34
\$30k-<\$75k	33	34	33	34	36
<\$30k	19	16	19	15	27
Registered to vote	81*	85	80*	86	76
Republican	22	23	22	23	24
Lean Republican	16	19	15	18	15
No Lean	7	7	7	7	11
Lean Democrat	20	19	20	19	18
Democrat	35	32	35	33	32
Sample Size	919	717	697	673	2,146

*App statistically significantly different than web.

Figures unweighted except "All smartphone users. Figures read down. Don't know responses not shown. Smartphone users figures from American Trends Panel (wave 8), conducted October 3-27, 2014. American Trends Panel (experience sampling survey). Survey conducted Nov. 10-16, 2014.

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In addition to tabular comparisons of cooperating and non-cooperating groups, researchers conducted a multivariate analysis of the factors predicting whether an individual responded as a way to test whether panelists invited to the app treatment were less likely to respond regardless of demographics. The dependent variable was whether an invited panelist responded to any of the 14 follow up surveys or not. The base is thus all invited, not just those who agreed to participate.

The model controlled for age, gender, education, race and ethnicity, census region, marital status, religiously affiliated or not, registered to vote, political party affiliation, treatment group (app vs. experimental web) and two-way interactions between treatment and select demographics (age, education and gender). The interactions were not significant and thus were dropped from the model.

The analysis found that the app group was less likely to respond than the web group even when controlling for demographics. Of the demographics, age was a significant predictor of responding with younger panelists more likely to respond regardless of treatment (app vs. web). Those from the Midwest were more than to respond than those from the West and those who were married were more likely to respond than those who had never been married.

App Treatment Less Likely to Respond Controlling for Demographics

Regression Results Predicting Responding vs. Not Responding

	B	S.E.	Wald	df	Sig.	Exp(B)
18-29	1.327	.223	35.545	1	.000	3.770
30-49	.892	.161	30.665	1	.000	2.439
50-64	.256	.156	2.706	1	.100	1.292
65+						
Male	-.087	.106	.667	1	.414	.917
Female						
College graduate or higher	.321	.165	3.799	1	.051	1.378
Some college	.333	.177	3.519	1	.061	1.395
High school or Less						
Non-Hispanic Black	.320	.224	2.043	1	.153	1.377
Hispanic	.041	.199	.042	1	.838	1.042
Non-Hispanic Other	.192	.241	.630	1	.427	1.211
Non-Hispanic White						
Northeast	.026	.162	.025	1	.874	1.026
Midwest	.348	.154	5.121	1	.024	1.416
South	.037	.138	.074	1	.786	1.038
West						
Married	.409	.168	5.903	1	.015	1.506
Other	.161	.186	.749	1	.387	1.175
Never Married						
Affiliated religiously	-.152	.131	1.335	1	.248	.859
Unaffiliated religiously						
Registered to vote	-.098	.159	.376	1	.540	.907
Not Registered to vote						
Republican/Lean Republican	-.212	.118	3.225	1	.073	.809
No Lean	.020	.225	.008	1	.928	1.020
Democrat/Lean Democrat						
App	-1.504	.119	159.071	1	.000	.222
Experimental Web						
Constant	.802	.333	5.791	1	.016	2.230

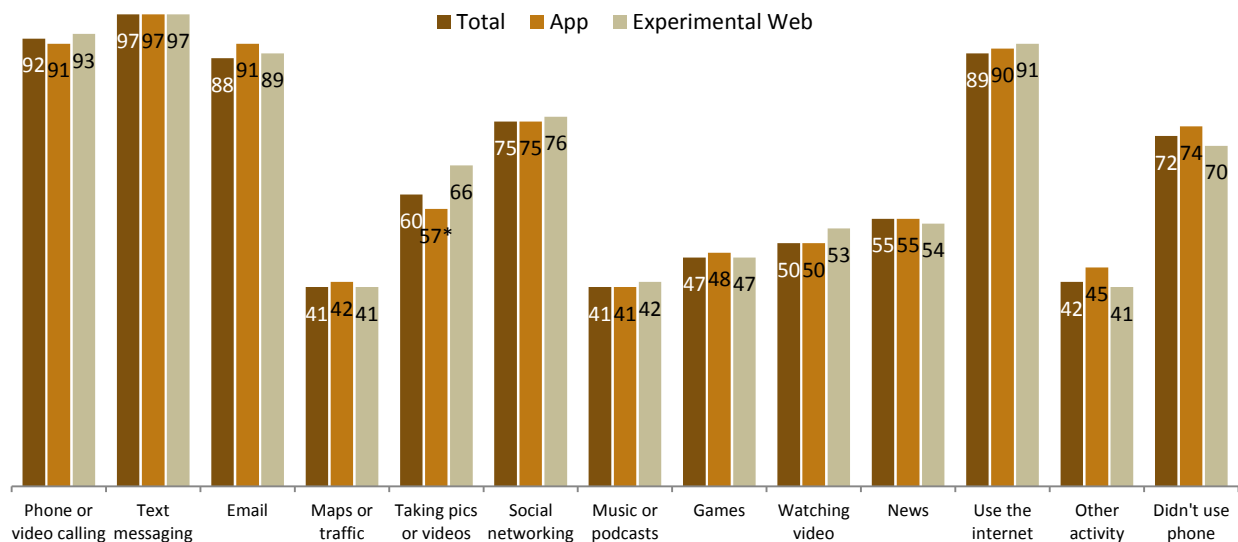
American Trends Panel (experience sampling survey). Survey conducted Nov. 10-16, 2014.

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Of greatest interest, of course, are the substantive questions in the study. Do the app and web versions yield different results for the questions at the heart of the research? The answer is no. The weighted¹ substantive results from the app and the web groups do not differ. The app and the web groups were each separately weighted to targets for all smartphone users. Responses were compared for which activities respondents did at least once over the week, in which location, for what purpose and how it made them feel. On only one item out of 34, “taking pictures or videos,” was the app group significantly different from the experimental web group (app respondents were less likely to report having done so). Thus, this study suggests the choice of using an app or a web implementation of the survey would likely not affect the results of a future study attempting to represent all smartphone users at least on this topic.

App and Web Respondents Differ Only in Frequency of Taking Pictures or Videos

% of respondents reporting each activity at least once throughout field period



*App statistically significantly different than web.

Restricted to respondents who answered 10 or more surveys. Each group weighted to targets for all smartphone users. Total includes non-experimental web and app2web in addition to experimental web and app groups.

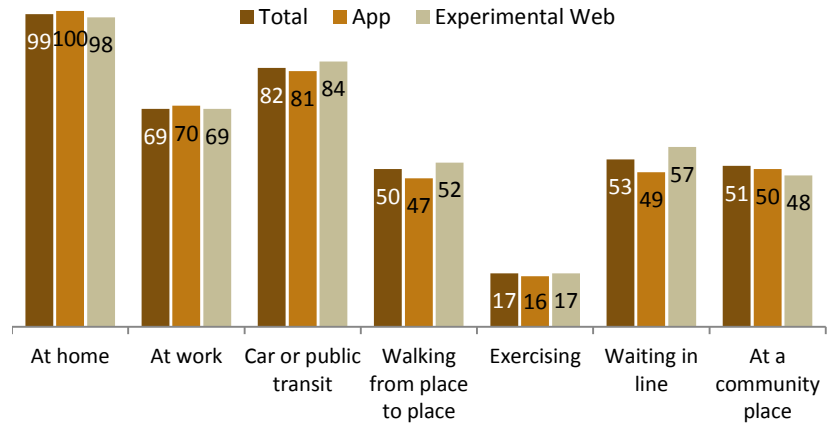
American Trends Panel (experience sampling survey). Survey conducted Nov. 10–16, 2014.

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¹ See appendix D for more information on how the data were weighted.

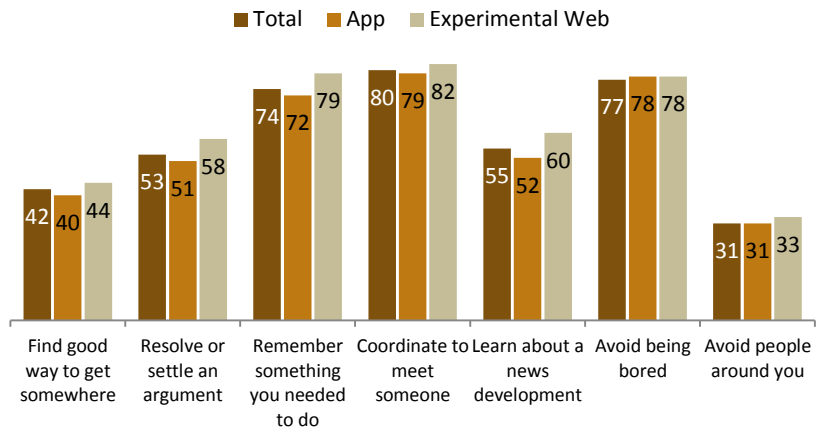
App and Web Respondents Do Not Differ in Where They Use Smartphones

% of respondents reporting each location at least once throughout field period



... Or in Outcomes of Smartphone Use

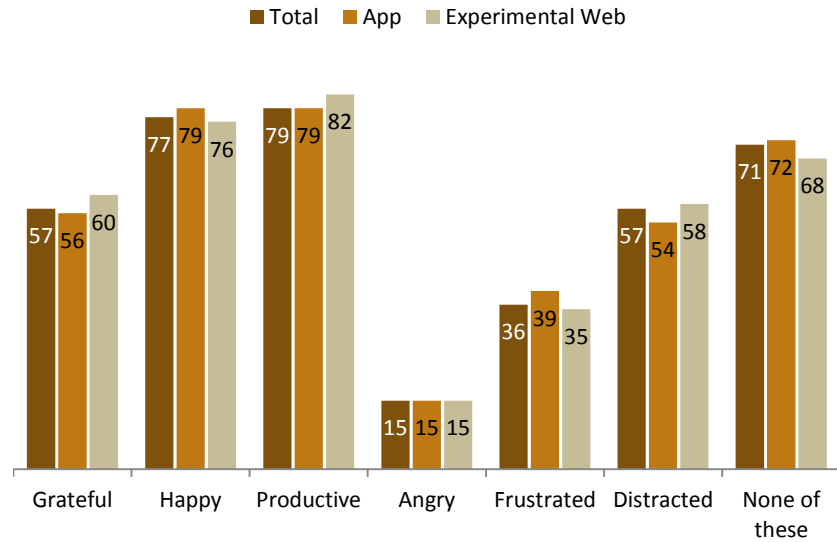
% of respondents reporting each outcome at least once throughout field period



Restricted to respondents who answered 10 or more surveys. Each group weighted to targets for all smartphone users. Total includes non-experimental web and app2web in addition to experimental web and app groups. American Trends Panel (experience sampling survey). Survey conducted Nov. 10–16, 2014.

App and Web Respondents Do Not Differ in How Smartphones Make Them Feel

% of respondents reporting each emotion at least once throughout field period



Restricted to respondents who answered 10 or more surveys. Each group weighted to targets for all smartphone users. Total includes non-experimental web and app2web in addition to experimental web and app groups.

American Trends Panel (experience sampling survey). Survey conducted Nov. 10–16, 2014.

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Discussion

The purpose of this study was to examine the feasibility of conducting experience sampling method surveys with a nationally representative survey panel, as well as the costs and benefits of doing so using an app vs. web-based data collection. The first research question was whether panelists would respond to an experience sampling method study given its intensive nature. An overwhelming majority of panelists did respond, making this a viable data collection protocol for the future.

The next question was whether response rates would differ by experimental treatment. Panelists assigned to the web treatment were much more likely to respond than panelists assigned the app treatment. This has implications for both statistical power and costs for future studies.

The next question was how the demographic characteristics of the app respondents would differ from the web respondents, and how both groups would differ from the demographic characteristics of all smartphone users, as a measure of what's known as non-response bias. The app and web respondents were quite similar demographically. However, the app respondents were younger, more likely to be from the Midwest and less likely to be registered to vote. These characteristics actually made them more representative of all smartphone users than were the web respondents. This result means that either group could represent all smartphone users in a future study and that non-response bias in the app group does not make them less representative of all smartphone users.

As a caveat to the demographic findings it is important to reiterate the technical difficulties experienced by some panelists assigned to the app treatment. Over 100 panelists called or emailed because they had trouble downloading the app or even understanding what an app was. This is most likely partially to blame for the differences in respondent age between the app and web group. For future app surveys, this may warrant limiting app use to more tech savvy individuals or providing more clear instructions on what an app is and how to download it.

The final question was how the weighted substantive survey responses would differ between the app and web respondents. There was basically no difference between the two groups save for on one of the 34 items measured. As such, either group could be used to represent all smartphone users in terms of weighted estimates from the data.

Apps certainly do have certain advantages beyond the findings of this study. Apps allow for features such as barcode scanning, taking and uploading pictures using the smartphone's camera, and capturing the GPS location of the smartphone. It's important to note though that many of these features are now available in web surveys using HTML5. If granted permission by

the phone's owner, they also allow for passive capture of data from the phone such as what other apps are running and for what purpose. This study did not utilize either the additional features or passive data collection capabilities of the app.

Apps also allow for offline data collection. This means that push notifications can be sent and survey responses can be captured even when the phone is not connected to the internet. This is helpful in a study like this one where the survey was time-sensitive and only open for two hours. However as you can see, this feature not increase the app response rate over the web group.

Apps have clear disadvantages as well. Data collection via the app cost substantially more than via the web for this study. This was primarily due to a per survey charge imposed for the app responses, which means a charge for each of the 14 surveys. For an experience sampling method study that employs intensive data collection this is not ideal. Additionally as mentioned above the lower response rate on the app would lead to higher costs if a minimum number of completes were required. This necessitates the use of additional sample and incentives for agreeing, since a large portion of the app group agreed to respond, were mailed the \$5 incentive, but did not actually respond.

The app also had design constraints that were unexpected. For instance, the "next" button could not be moved from the top of the screen. This is problematic for a smartphone since the small screen makes scrolling necessary to see all questions or response options. If the next button is at the top there is the danger that respondents won't realize there is more on the screen that they can't see. Another example is that the check boxes had to be to the right of the response option labels, which is not best practice nor how they were displayed on the web version.

Finally, the app was also mobile-centric. Panelists assigned to the app group could only download it to their smartphone or tablet and thus had to complete their surveys using a mobile device. Web respondents on the other hand had the option to respond using a smartphone, tablet, laptop or desktop. The greater number of devices available to the web group is perhaps partly the reason for their higher response rates. This study did have its limitations. Some of the findings have uncertain applicability to a cross-sectional study because the sample used here was a well-established panel rather than a fresh sample of respondents from or for a cross-sectional study. This study was a part of the seventh wave of data collection and a considerable degree of trust had been established among the panelists. Asking respondents in a one-off or cross sectional sample to download an app or to take part in a series of surveys presumably would result in a lower rate of cooperation than we experienced.

While the app performed about the same as the web for data collection in this experiment, apps may or may not work as well for taking one-off surveys or as part of an ongoing panel.

Respondents weigh the time and effort to download an app and understand how to use it, as well as any privacy concerns they may have, against the expected benefit the app can provide. If they are accessing surveys often, as was the case in this study with 14 surveys over seven days, they may see the value in downloading an app to facilitate accessing and completing the surveys. For instance even when respondents are outside the range of cellular service the app still alerts them and allows them to complete surveys, which is not the case with a mobile browser. However for a one-off survey or even surveys once a month, respondents may see this trade-off as more than they are willing to do. In addition to considerations about burden and privacy concerns associated with the app, a web browser also allows them the flexibility to use a mobile device (smartphone or tablet) or a traditional computer (laptop or desktop).

Conclusion

It is possible to conduct experience sampling method studies with a nationally representative survey panel. It is also possible to use an app for this purpose. App respondents can be used to represent all smartphone users both demographically and in their substantive survey responses. Apps also offer innovative features such as barcode scanning, passive data collection and offline capabilities.

However due to the disadvantages of using apps for surveys, researchers should proceed with caution. Apps results in lower response rates than web-based data collection, partly due to the technical difficulties that some potential respondents experience. The lower response rate in conjunction with a per survey cost structure make apps more costly than the web, especially for intensive data collection efforts like experience sampling. Apps also have design constraints that are not present in web surveys. Finally, apps limit data collection to a mobile device which affects both response rates and who can participate in app surveys. For these reasons, apps are best used under certain conditions, when particular innovative features are necessary or the population of interest lends itself to using an app.

APPENDIX A: Survey Invitation to Participate in the Follow-Up Study

IF HAVE IPHONE, BLACKBERRY, OR ANDROID (SMARTPHONE_1=1 OR SMARTPHONE_2=1 OR SMARTPHONE_3=1), RANDOMLY ASSIGN 60% TO EXPERIMENTAL_GROUP=1 (APP) AND 40% TO EXPERIMENTAL_GROUP=2 (WEB)

IF HAVE WINDOWS PHONE, SYMBIAN OR OTHER KIND OF SMARTPHONE (SMARTPHONE_4=1, SMARTPHONE_5=1 or SMARTPHONE_6=1) EXPERIMENTAL_GROUP=3

In early November we plan to do a special follow up study for our panelists who have smartphones. Panelists who agree to take part in this study would **[EXPERIMENTAL_GROUP=1: download an app on their smartphone to]** complete a set of very short follow up surveys **[EXPERIMENTAL_GROUP=2,3: on their smartphone, tablet, laptop or desktop computer.**

These surveys take no more than two minutes each, conducted twice a day for seven days]. Invitations to these surveys will be sent via **[EXPERIMENTAL_GROUP=1: text message, email and by notifications from the app./EXPERIMENTAL_GROUP=2,3 text message and email.]**.

We would give you \$5 for agreeing to take part in the follow up surveys, \$1 for each of the 14 follow up surveys you complete and an additional \$5 for completing 10 or more of the follow up surveys. If you complete all the surveys you'd receive \$24 in total. It's important we have respondents complete as many surveys as possible over the week.

[EXPERIMENTAL_GROUP=1: The app you download will only be used to take surveys. This app will NOT be used to collect any data, photos or media files from your phone or any usage or location information. This is a third-party app not developed by us but one we use for conducting surveys. Any third-party app could have some risk associated with it; however, we believe the source to be trustworthy.]

The purpose of this follow up study is to understand how people use their smartphones, why they use them and how it makes them feel. The information will be based on your answers to the survey questions.

FOLLOW_UP Would you be willing to [**EXPERIMENTAL_GROUP=1**: download the app and] take part in these follow up surveys?

1 Yes

2 No

ASK IF APP GROUP AND SAY NO OR REFUSED (EXPERIMENTAL_GROUP=1 AND FOLLOW_UP=2, 99)

APP_TO_WEB Would you be willing to complete these follow up surveys using a regular web survey that would not require you to download an app to your smartphone? You'd be able to take these on your smartphone, tablet, laptop or desktop computer.

1 Yes

2 No

PROGRAMMING NOTE: IF APP_TO_WEB=1, EXPERIMENTAL_GROUP=4

ASK IF IN FOLLOW UP SAMPLE (FOLLOW_UP=1 OR APP_TO_WEB=1)

TEXTCONSMOD It is important that you complete each follow up survey within 2 hours of receiving the invitation. For that reason, we would like to send you invitations to these follow up surveys via text message in addition to email [**EXPERIMENTAL_GROUP=1** and notification from the app]. Standard text messaging rates may apply, depending upon the plan you have with your cell phone service provider.

May we have your permission to send you invitations to the follow up surveys via text message?

CATEGORIES

1 Yes

2 No

IF PERMISSION TO TEXT (TEXTCONSMOD=1) AND NO CELLPHONE NUMBER FROM TYPOLOGY OR PRIOR WAVES (PCELLNUMB=MISSING):

CELLNUMA So that we may send you invitations to surveys via text message what is your cell phone number including area code?

() - - - - -

IF PERMISSION TO TEXT (TEXTCONSMOD=1) AND HAVE A CELLPHONE NUMBER FROM TYPOLOGY OR PRIOR WAVE (PCELLNUMB=MISSING):

CELLNUMB So that we may send you or invitations to surveys via text message, is this the best cell phone number to use? [Auto populate with cell phone number on file]

() - - - - -

CATEGORIES

1 Yes

2 No

**IF RESPONDENT SAYS AUTOFILL NUMBER IN CELLNUMB IS NOT THEIR
CELLPHONE NUMBER ASK:**

CELLNUMC So that we may send you invitations to surveys via text message what is your cell phone number including area code?

(___) ___ - ____

ASK IF IN FOLLOW UP SAMPLE (FOLLOW_UP=1 OR APP_TO_WEB=1)

TIMEZONE_CONFIRM So that we send you invitations at the correct times, can you please confirm that this is the time zone you will be in from November 10 to November 16?

**[AUTOPOPULATE WITH TIME ZONE BASED ON MOST RECENT SELF-
REPORTED ZIPCODE OR RSTATE (VARIABLE = TIMEZONE)]**

1 Yes this is the correct time zone

2 No, this is not the correct time zone

ASK IF IN FOLLOW UP SAMPLE (FOLLOW_UP=1 OR APP_TO_WEB=1) AND

(TIME ZONE ABOVE IS INCORRECT OR REFUSED (TIMEZONE_CONFIRM =2,99))

TIMEZONE_ASK So that we send you invitations at the correct times, can you please tell us what time zone you will be in from November 10 to November 16?

1 Eastern Time Zone

2 Central Time Zone

3 Mountain Time Zone

4 Pacific Time Zone

5 Alaskan Time Zone

6 Hawaiian Time Zone

7 Other (SPECIFY)

8 Not Sure

APPENDIX B: Questionnaire

SPLASH PAGE FOR WEB SURVEY

Welcome! We are glad to have you as a member of the American Trends Panel! Thank you for participating in this very short follow-up survey!

The survey should take less than 2 minutes for most people to complete.

Here are some helpful hints:

- Please do not use your browser's back button to go back to previous questions. Instead, use the navigation buttons on each web page to move through the survey.
- If you have any technical questions, [IF ENGLISH VERSION: please call 866-296-9644/IF SPANISH VERSION: please call 888-853-5436] or send an email to trendspanel@srbi.com

SPLASH PAGE FOR APP SURVEY

Welcome! We are glad to have you as a member of the American Trends Panel! Thank you for downloading the app and participating in this very short follow-up survey!

The survey should take less than 2 minutes for most people to complete.

Here are some helpful hints:

- You have the option to pause the survey and finish it later by closing the SODA app. To resume taking the survey, simply open the SODA app and continue where you left off.

- If you have any technical questions, [IF ENGLISH VERSION: please call 866-296-9644/IF SPANISH VERSION: please call 888-853-5436] or send an email to trendspanel@srbi.com

Basic activities

ASK ALL

Q.1 Besides answering this survey, which of the following apps or features on your cell phone have you used IN THE PAST HOUR?

[Check all that apply]

[**PROGRAMMING NOTE:** please randomize a through k, with l and m in order at the bottom of the list. Capture randomization order for Android and iOS (we know Blackberry is not feasible)]

[**PROGRAMMING NOTE:** m is a radio button and when checked it greys out a-L. For non-javascript any a-L punched and m will cause an error when Next button is checked and force respondent to either uncheck a-L or m]

[HARD PROMPT IS OK: If none of these apply, please mark that you did not use your phone in the past hour]

- a. Phone or video calling

- b. Text messaging
- c. Email
- d. Maps or traffic
- e. Taking pictures or videos
- f. Social networking
- g. Music or podcasts
- h. Games
- i. Watching video
- j. News
- k. Use the internet
- l. Some other kind of activity not listed above

- m. I did not use my smartphone in the past hour [EXCLUSIVE PUNCH]

Place and logistics of the activity

ASK IF USED SMARTPHONE IN LAST HOUR (Q1a-k=1)

Q.2 Please note all the places where you used your smartphone IN THE PAST HOUR.

[Check all that apply]

[**PROGRAMMING NOTE:** please randomize a through g, with h always at the bottom of the list. Capture randomization order for Android and iOS (we know Blackberry is not feasible)]

[**PROGRAMMING NOTE:** h is a radio button and when checked it greys out a-g. For non-javascript any a-g punched and h will cause an error when Next button is checked and force respondent to either uncheck a-h or g]

[SOFT PROMPT: If none apply, please select the button at the bottom; if you want to skip, click Next.]

- a. At home
- b. At work
- c. Riding in a car or on public transit
- d. Walking from place to place
- e. Exercising
- f. Waiting in line or for something else to happen
- g. At a community place like a coffee shop or park

- h. None of the above [EXCLUSIVE PUNCH]

ASK IF DID NOT USE SMARTPHONE IN THE LAST HOUR (Q1M=1)

[SOFT PROMPT: If you are sure you want to skip, click Next]

Q.2a Please indicate when you most recently used your smartphone for any reason, such as phoning, texting, photos, or accessing information?

1. Earlier today
 2. Yesterday
 3. Longer ago than that
-

[SOFT PROMPT: If you are sure you want to skip, click Next]

Q.2b Were there any particular reasons you did not use your smartphone in the past hour?

OPEN-END TEXT BOX – ABOUT 3 LINES

[SOFT PROMPT: If you are sure you want to skip, click Next]

Q.2c In a typical day, do you normally use your smartphone more or less than you used it today?

1. Typically use it more
 2. Typically use it less
 3. Typically use it this much
-

Outcomes/impacts of phone

ASK IF USED SMARTPHONE IN LAST HOUR (Q1a-k=1)**Q.3 IN THE PAST HOUR did you use your phone to help you:**

[Check all that apply]

[PROGRAMMING NOTE: please randomize a through g, with h always at the bottom of the list. Capture randomization order for Android and iOS (we know Blackberry is not feasible)]

[PROGRAMMING NOTE: h is a radio button and when checked it greys out a-g. For non-javascript any a-g punched and h will cause an error when Next button is checked and force respondent to either uncheck a-g or h]

[SOFT PROMPT: If none apply, please select the button at the bottom; if you want to skip, click Next.]

- a. Find a good way to get somewhere
- b. Resolve an issue or settle an argument

- c. Remember something you needed to do
 - d. Coordinate with someone to meet them
 - e. Learn about an important news development
 - f. Avoid being bored
 - g. Avoid dealing with the people around you

 - h. My phone did not help me do any of these things [EXCLUSIVE PUNCH]
-

Feelings about phone

If Q1a-k=1, then ask

Q.4 IN THE PAST HOUR did your cell phone make you experience any of these feelings?

[Check all that apply]

[PROGRAMMING NOTE: please randomize a through f, with g always at the bottom of the list . Capture randomization order for Android and iOS (we know Blackberry is not feasible)]

[PROGRAMMING NOTE: g is a radio button and when checked it greys out a-f. For non-javascript any a-f punched and g will cause an error when Next button is checked and force respondent to either uncheck a-f or g]

[SOFT PROMPT: If none apply, please select the button at the bottom; if you want to skip, click Next.]

- a. Grateful
- b. Happy
- c. Productive
- d. Angry
- e. Frustrated
- f. Distracted

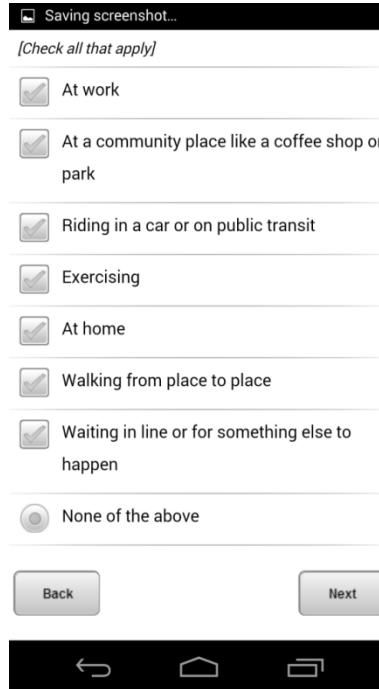
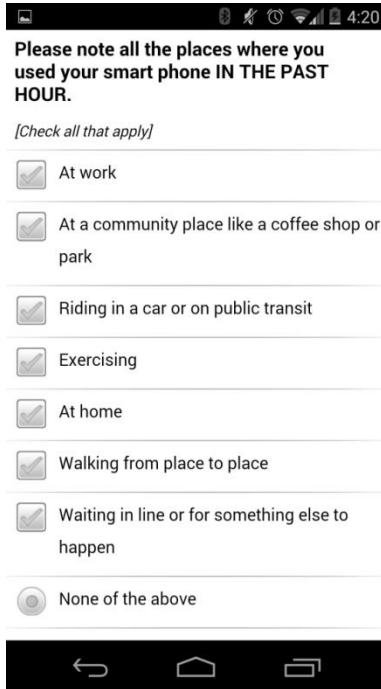
- g. None of the above [EXCLUSIVE PUNCH]

CLOSING: Thank you. Please look for the next survey notification.

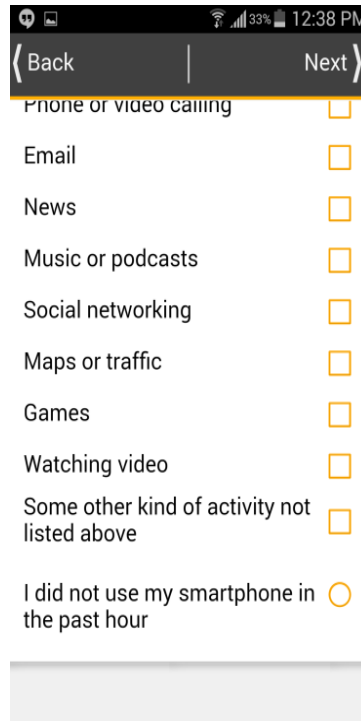
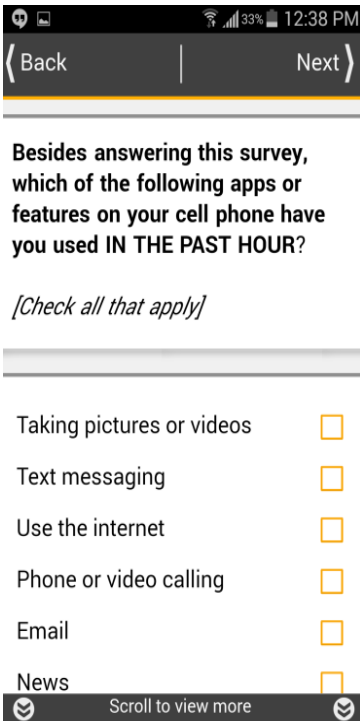
CLOSING to 11/16 9pm survey: Thank you for your participation in this special survey. Your regular November survey will be sent by email this week.

APPENDIX C: Screen shots

Mobile web browser screen shots



App screen shots



Computer screen shot

Besides answering this survey, which of the following apps or features on your cell phone have you used **IN THE PAST HOUR?**

[Check all that apply]

- News
- Maps or traffic
- Social networking
- Use the internet
- Music or podcasts
- Email
- Watching video
- Taking pictures or videos
- Text messaging
- Phone or video calling
- Games
- Some other kind of activity not listed above
- I did not use my smartphone in the past hour

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APPENDIX D: Weighting Procedures

The ATP data were weighted in a multi-step process that begins with a base weight incorporating the respondents' original survey selection probability and the fact that some panelists were subsampled for invitation to the panel. Next, an adjustment was made for the fact that the propensity to join the panel and remain an active panelist varied across different groups in the sample. The next step was a weighting cell adjustment for non-response to the experience sampling study since the response rate differed somewhat across the treatment groups. The final step in the weighting uses an iterative technique that matches gender, age, education, race, Hispanic origin, region and smartphone type to parameters for US adults who have a smartphone from the October 2014 wave of the ATP. Normally ATP samples are calibrated to benchmarks for the US adult population. For this study, however, the target population was US adults who have a smartphone. There are no official government statistics on the demographics of this population. The best available data were from the October 2014 wave of the American Trends Panel, which featured a national probability-based sample of 2,188 adult smartphone users.

The margins of error reported and statistical tests of significance are adjusted to account for the survey's design effect, a measure of how much efficiency is lost from the weighting procedures. The Hispanic sample in the American Trends Panel is predominantly native born and English speaking. In addition to sampling error, one should bear in mind that question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of opinion polls.

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