

**Innovation or violation? Leveraging mobile technology to conduct socially responsible
community research**

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Abstract

Mobile technology is increasingly being used to measure individuals' moods, thoughts, and behaviors in real time. Current examples include the use of smartphones to collect ecological momentary assessments (EMAs; assessments delivered "in the moment"), wearable technology to passively collect objective measures of participants' movement, physical activity, sleep, and physiological response, and smartphones and wearable devices with Global Positioning System (GPS) capabilities to collect precise information about where participants spend their time. While advances in mobile technology offer exciting opportunities for measuring and modeling individuals' experiences in their natural environments, they also introduce new ethical issues. Drawing on lessons learned while collecting GPS coordinates and EMAs measuring mood, companionship, and health-risk behavior with a sample of low-income, predominantly racial/ethnic minority youth living in Chicago, this manuscript discusses ethical challenges specific to the methodology (e.g. unanticipated access to personal information) and broader concerns related to data conceptualization and interpretation (e.g. the ethics of "monitoring" low-income youth of color). While encouraging researchers to embrace innovations offered by mobile technology, this discussion highlights (just some) of the many ethical issues that also need to be considered.

Keywords: mobile technology, ethics, GPS, EMA

In the past 20 years there has been a dramatic increase in the use of mobile technology to conduct applied social science research. This increase has occurred in tandem with advances in technology that had made it easier for researchers to access and utilize mobile technology for research purposes. As technology evolves, the types of questions that researchers can ask increase exponentially. Current examples of mobile technology being used in social science research are extensive and varied; smartphones are used to collect ecological momentary assessments (EMAs) of participants' mood, thoughts, and behaviors in real time (e.g. Mennis et al., 2016; Walz, Nauta, & aan het Rot, 2014), wearable technology is used to passively collect objective measures of participants' movement, physical activity, sleep, and physiological response (e.g. El-Sheikh, Buckhalt, Mize, & Acebo, 2006; Cooper et al., 2010), smartphones and wearable devices with Global Positioning System (GPS) capabilities allow researchers to collect precise information about where participants spend their time (e.g. Browning & Soller, 2014; Byrnes et al., 2015), and mobile applications allow researchers to deliver behavioral interventions in real time via smartphone (e.g. Spruijt-Metz et al., 2015). As with the advent of any new research methodology, the use of mobile technology in research raises new questions about ethical relationships between researchers, participants, and theory, questions that researchers need to consider and address while embracing the innovation that mobile technology has to offer.

For community psychologists interested in neighborhood characteristics and development, mobile technology offers an exciting opportunity to better understand (1) how youth navigate neighborhood space, (2) when and where youth come into contact with environmental characteristics that can be risky or protective, and (3) how these exposures may shape youths' thoughts and behaviors. To this end, I am using mobile technology to collect

detailed information on where youth spend their time and examine relationships with youths' mood and behavior. In a recent study, a sample of low-income, racial/ethnic minority youth living in Chicago carried a GPS-enabled Samsung Galaxy 6 smartphone for a one-week period. The project-provided phones were pre-programmed with a mobile EMA application (mEMA), developed by the company ilumivu (<https://ilumivu.com/>). The mEMA app was programmed to record GPS coordinates at one minute intervals or whenever the phone moved more than 5 meters at any time that the phone was turned on and the app was running. GPS coordinates collected from youth are being mapped against publically available information on locations of "environmental risks" such as violent crime, abandoned buildings, and alcohol and tobacco retailers. The City of Chicago's Data Portal provides detailed information on the location (and time of occurrence, in the case of crime) for each of these types of environmental risk, making it possible to determine whether youths' GPS coordinates fall within a specified distance of any environmental risks. Participating youth also received EMAs five times over the course of each day (9am, 12pm, 3pm, 6pm, 9pm) of the study period in which they were asked about current mood, companionship, and any risk-taking behavior (e.g., alcohol and drug use, delinquent activities) engaged in in the previous three hours. Integrating the information obtained from the EMAs with data on youths' exposure to environmental risks will allow me to examine the timing and directionality of the relationship between environmental risk exposure and changes in youths' mood and risk-taking behavior with a level of precision that has previously not been possible.

Over the course of planning and implementing this study, several ethical issues and challenges have arisen. Some of the challenges are specific to the methodology used in this particular project, while others apply to the use of mobile technology more broadly and data

conceptualization and interpretation. In the following sections I highlight these challenges and discuss approaches for addressing or minimizing them.

The Potential to Incriminate Youth in Illegal Activity

A primary component of the study is the use of mobile technology to collect youths' GPS coordinates over the course of a one-week period. Part of the innovation in this approach is the ability to know youths' precise location at specific points in time, which will provide a nuanced understanding of how urban youth utilize and navigate space. Used in combination with Chicago's publically available data on environmental characteristics, I will be able to determine with a high level of precision (within several feet) whether youth are in the vicinity of specific characteristics at specific points in time. As a researcher, this information will be invaluable in understanding when and where youth are exposed to dangerous settings; insight that can be leveraged to implement targeted prevention strategies. However, there is also the possibility that this information could be used to implicate youth in illegal activity. Because I am interested in understanding the degree to which urban youth are exposed to crime, I will be linking youths' GPS coordinates with locations of crime, therefore creating a measure of whether youth are in the vicinity of a crime at the specific time a crime occurs. The precision of this information raises the possibility that it could be used against youth either as evidence of involvement in illegal activity or to compel youth to testify as witnesses of a crime.

As stated by the American Psychological Association's (APA) Code of Conduct, psychologists have "a primary obligation...to protect confidential information obtained through or stored in any medium" (Code 4.01; APA, 2010). Although psychologists may disclose confidential information to protect participants or others from harm (Code 4.05; APA, 2010), they are not required to report participants' involvement in or witness to illegal activity. As such,

several actions have been taken to protect youth against this possibility. First, both youth and their parents were clearly informed that we would be collecting GPS information; we did not attempt to hide this fact from participants in any way. In addition, although we ask youth to keep the phones with them and turned on at all times, youth are not penalized if they fail to respond to EMAs or have the phone turned off for a period of time. Therefore, youth have the ability to limit their participation if they do not want information on their locations to be collected at certain points in time. More importantly, I applied for and received a Certificate of Confidentiality (CoC) from the National Institutes of Health (NIH; <https://humansubjects.nih.gov/coc/index>). The CoC allows me to refuse to disclose names or other identifying information in response to legal demands, which means that there is no way that youths' GPS data can be subpoenaed for use in any type of legal proceedings. It is important for researchers to note that CoCs are not limited to research supported by federal funding; any researcher conducting sensitive research with human participants is eligible to apply for a CoC.

Despite the ethical guidelines laid out by the APA and protections offered through mechanisms such as the CoC, it is likely that ethical dilemmas will arise to which the appropriate response on the part of the researcher is not clear. For example, imagine a scenario in which a homicide has occurred and based on GPS data that have been collected, the researcher knows that one of the study participants was in the vicinity of the crime when it occurred. Although this information is protected against forced disclosure, does the researcher have a responsibility to encourage the youth to come forward with any information that they may have about the crime? In this situation, the researcher would have to weigh the potential benefit of the information obtained (e.g., preventing harm to others) against the additional risks that coming forward may expose the participant to and potential violations of the participant's right to privacy. In complex

situations such as this, researchers may find themselves moving beyond established ethical guidelines to consider moral responsibility, and as Ferdinand and colleagues (Ferdinand, Person, Rowe, & Worthington, 2007) have argued, to whom this responsibility is owed.

Unanticipated Access to Personal Information

One of the benefits to youth participating in this study was the personal use of the phone during the study period. Although some of these youth had personal cell phones, many did not. Moreover, of those who did have cell phones, a small number had access to unlimited data and texting capabilities. The decision was made not to restrict youths' personal use of the phones during the study period for two reasons. First, we found that it was not possible to easily monitor data usage in vivo or block data access after a certain capacity was passed. Therefore, in order to ease staff burden and avoid unexpected project costs, the decision was made to sign up for unlimited data and texting up front. Second, although there are applications (e.g., SureLock) that allow you to limit the functions and applications that can be accessed via a mobile device, we felt that this would greatly reduce the benefit and appeal of participating in the study, potentially negatively affect relationships with participants, and adversely affect the quality of collected data. In an effort to minimize "inappropriate" phone usage, we informed youth that we would be reviewing the phones after they were done and would therefore see all apps downloaded and websites visited. Moreover, parents were made aware of the phone capabilities and had to agree to their child having this level of access.

One of the ethical principles put forth by the APA is Respect for People's Rights and Dignity (Principle E; APA, 2010) which includes the "rights of individuals to privacy, confidentiality, and self-determination". By providing youth with unrestricted access to project phones, we unintentionally collected large amounts of personal information (e.g., texts, pictures,

search histories) from youth that youth had not consented to be used for research purposes. Therefore, to protect youths' rights to privacy, it was necessary for project staff to remove all personal information stored on the phone between participants' use. The 10 phones allocated to data collection were shared across all participants. Therefore, in a given week we aimed to have these 10 phones out with study participants. At the end of the week, phones were retrieved from participants and reconfigured before being reassigned to the next week's participants. Part of the reconfiguration process involved removing all personal information recorded on the phone over the course of the prior week. This included removing all phone numbers and text messages stored in the phone, deleting any applications installed on the phone, deleting all pictures saved on the phone, and deleting all search histories from relevant sites (e.g. Google, You Tube). Despite these efforts, one parent reported discovering personal information recorded on the phone by a participant who used the phone prior to her child. This fact was immediately reported to the IRB and we learned the necessity of factory resetting devices between participants.

The Ethics of “Monitoring” Low-income Youth of Color

In developing this work, questions have emerged about the ethics of recording the movement of low-income youth of color in the context of the discriminatory monitoring that these youth routinely face. Ongoing evidence of discriminatory police policy (e.g., stop-and-frisk) and practice (e.g., the unprovoked shooting of young Black men) sends youth a message about society's perceptions of them and expectations for their behavior. Moreover, there has been a recent shift towards “electronic monitoring” as a cost-effective alternative to incarceration for youth offenders. Despite the appeal of this strategy based on ease and cost, there is little empirical evidence demonstrating its effectiveness while the burden it places on youth and families is disproportionately felt by the poor and people of color (Weisburd, 2015). In this

broader context of racial and economic inequity in the policing and monitoring of low-income youth of color, there is a concern with unintentionally sending a message of distrust and an expectation for bad behavior by asking to record youths' movements.

Despite this concern, a decision was made to pursue the research and the challenge has become minimizing participants' negative perceptions and maximizing the utility of the collected data. One of the study's strengths is the long history that families and children have with had with project staff. Participating youth and their families are part of a larger longitudinal study that has spanned approximately 14 years. The relationship that study participants have built with the research team over the years is reflected in the high rates of retention that have been maintained over time. This relationship makes it possible to ask difficult questions of participants while maintaining a respectful and trusting relationship between researcher and participant. The hope is that this relationship will help youth interpret their participation as a positive, rather than a predatory, experience.

Researchers using mobile technology in data collection also need to think creatively about how data might be used to benefit or empower study participants. This perspective has been embraced by the researchers of the NoiseTube research project housed at the Software Languages Lab at the Vrije Universiteit Brussel (<http://www.noisetube.net/>). The research group developed a publically available mobile app that records and maps sound with the goal of enabling citizens to measure the sound exposure in their everyday environments. In addition, NoiseTube users can participate in creating a collective map of noise pollution by sharing geolocalized measurement data with the NoiseTube community. These data are publically available and can be used to advocate for targeted strategies for addressing noise pollution. Other researchers using mobile technology in data collection might employ similar strategies for

putting data in the hands of their participants and facilitating advocacy on the behalf of individuals and communities.

Putting Youth at Risk

In keeping with the APA's Principle of Beneficence and Nonmaleficence (Principle A; APA, 2010), a primary goal of research is to do no harm to research participants. However, by providing youth with mobile technology such as smartphones or wearables and asking them to keep the devices with them at all times, there is the possibility that we might be unintentionally making them targets of theft. Despite this concern, the increase in risk is likely to be minimal. A 2015 Pew Research Center study (Lenhart, 2015) reported that nearly three quarters of U.S. 13 to 17 year-olds have access to a smartphones, with rates of access being highest among African American youth (85%), relative to Latino and white youth (both 71%). Given the high level of access to technology among U.S. youth, the chances that providing youth with mobile technology for the purposes of data collection will increase their risk of theft is relatively small. In addition, none of the youth participating in our study reported feeling unsafe or targeted as a result of carrying the phone.

Several preemptive steps were taken to minimize and/or respond to situations of risk that youth might encounter over the course of the study period. First, a list of local resources (e.g., mental health, education and employment, domestic violence) was stored on each phone in an effort to link youth with multiple types of service providers if they were in need. Second, each study participant was assigned a research assistant (RA) to be their primary point of contact. The number for the RA's phone was programmed into the phone assigned to the participant and participants were encouraged to contact the RA if they encountered any problems throughout the study period. To the extent possible, RAs responded to participant communication within 30

minutes of receipt between the hours of 9am and 10pm. Finally, participant safety was emphasized as our primary goal in both the training of RAs and communication with participants. All participants were told that if they encountered a situation in which someone did try to steal the phone, their priority should be their own safety rather than the protection of the phone. Luckily this situation never arose and all of the project phones were returned without damage at the end of the study.

Potential for the Violation of Privacy

There is also a question of whether using mobile technology to collect data has the potential to increase the likelihood of violating participant privacy. Most studies that use mobile technology in data collection ask participants to carry or wear devices over a period of days or weeks. If participant data are stored on the device, this may increase the chances that participant data could be accessed by individuals outside of research staff. This might occur if devices are lost or shared with participants' family members or friends. Moreover, researchers need to ensure that all information stored on the phone is deleted before using devices with other participants.

Concerns about the possibility of increased opportunities for participant data to become public can be minimized with different types of data collection strategies. As the use of mobile technology in research has become more common, a number of software companies looking to meet the needs of researchers using mobile technology have emerged. One of the services that these types of companies can provide is data storage and security. In the research described here, we have used the mEMA app available through ilumivu. Once launched, the app runs in the background of the phone continuously collecting GPS data (which is function specific to the purposes of this research) and prompting participants to complete EMAs at the scheduled times.

After an EMA is completed, participants are prompted to press an “upload” button on the app which uploads all data collected up until that point (including GPS data) to a secure server managed by ilumivu. Once the data have been uploaded to the server, it is no longer stored on the phone and cannot be accessed via the phone. In this way, the researcher is able to minimize opportunities for violations of privacy. In addition, ilumvui provides the researcher with personal login information so that it is possible to access and monitor data as they are collected. In this way the researcher knows if data are not showing up on the server and can reach out to participants to encourage them to upload their data and/or troubleshoot any technical problems they might be encountering.

Too Much Focus on Risk – Not Enough Focus on Resilience

A central tenet of the field of community psychology is a focus on individual and community *strengths*, rather than problems and pathology. Despite this fact, the study described above focuses primarily on “environmental risks” (e.g., violent crime, abandoned buildings, and alcohol and tobacco retailers) and risk-taking behavior (e.g., substance use and delinquency). Although the initial plan for this work was to examine how youths’ exposure to both risky and protective characteristics were related to both risk-taking and pro-social behaviors, it soon became apparent that it was easier to identify (and there was more publicly available data on) environmental characteristics that were unequivocally “bad” than characteristics that were unequivocally “good”. For example, although one might expect that coming into contact with violent crime would be bad for youth development, it is less clear cut as to whether spending time in parks or community organizations would be protective. Despite research that has demonstrated that these settings can promote positive behaviors such as physical activity (e.g., Jago, Baranowski, & Baranowski, 2006; Scott, Evenson, Cohen, & Cox, 2007) or prevent

delinquent behaviors (e.g., Molnar, Cerda, Roberts, & Buka, 2008), this may vary dependent on both the quality and the context of these settings. Moreover, positive environmental characteristics might be more a function of relationships (e.g., trust, pride, collective efficacy) and therefore be less tangible and/or easy to observe. Therefore, additional research is needed to understand how youth interpret and take meaning from “bad” and “good” environmental characteristics and how these representations motivate individual attitudes and behaviors. This type of understanding is required before researchers can comfortably quantify positive dimensions of public space in order to embrace dimensions of both risk and protection.

Highlighting risk over resilience is in and of itself not an ethical challenge. However, for many community psychologists, and other researchers committed to carrying out socially responsible research, there is a desire (and a sense of responsibility) to conduct research that upholds the values of the field. This desire can be challenged by the numerous structural and organizational barriers that researchers must navigate while developing, funding, and implementing their research. These barriers can be relatively minor, such as having a lack of clear theory and/or available data (as previously described), or more serious, such as developing meaningful and equitable relationships with research participants given time constraints (e.g., finishing graduate school, obtaining tenure) or obtaining funding to conduct our research, particularly in a political climate where our work may not be valued. As such, the barriers can force us to re-think and/or re-frame how we ask our questions and carry out our research. Figuring out how to navigate these barriers while upholding our professional (and personal) values is a moral challenge that many researchers face.

Conclusions

The ethical issues and challenges outlined here are in no way comprehensive nor are the approaches to addressing them exhaustive. In addition, many of these challenges are specific to one particular research study and approach. It is likely that other researchers using different types of mobile technology (e.g., wearables) and methodologies (e.g., just-in-time behavioral interventions) have encountered challenges not described in this article. The hope is that our analysis can provide one perspective on a topic that will continue to evolve as mobile technology itself and the use of mobile technology in research also evolve. With the introduction of any new methodology, the potential for new and unexpected ethical challenges is great. These can be challenges that threaten our research participants, but they can also be ones that threaten our own perspectives and theories. Therefore, when embracing a new methodology, we need to be thorough in thinking through and responding to its accompanying ethical challenges. In part, this means weighing the novelty and potential benefits of the approach against the potential for unintended and unexpected ethical costs. This step is key if research innovations are going to be adopted in an ethical and socially responsible way.

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