The BlackBerry Project: Capturing the Content of Adolescents' Text Messaging

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Abstract

This brief report presents an innovative method for capturing the content of adolescents' electronic communication on handheld devices: text messaging, email, and Instant Messaging. In an ongoing longitudinal study, adolescents were provided with BlackBerry devices with service plans paid by the investigators, and use of text messaging was examined when participants were 15 years old and in the 10th grade (N=175, 81 girls). BlackBerries are configured so that the content of all text messages, email messages, and Instant Messages is saved to a secure server and organized in a highly secure, searchable, online archive. This paper describes the technology used to devise this method and ethical considerations. Evidence for validity is presented, including information on use of text messaging to show that participants used these devices heavily and frequencies of profane and sexual language in a two-day sample of text messaging to demonstrate that they were communicating openly.

Keywords

Adolescents rely heavily on text messaging to communicate with peers. According to a large scale survey on teens and texting conducted by the Pew Internet and American Life Project, 75% of 12 – 17-year-olds own cell phones, 72% of all adolescents (88% of cell phone users) use text messaging regularly, 75% of teenagers who use cell phones have service plans for unlimited text messaging, and 54% contact friends daily via text messaging (Lenhart et al., 2010). This same study found that adolescents interact with their friends via text messaging more frequently than via face-to-face communication. According to the Pew study, 14 – 17-year-olds report sending and receiving 60 or so text messages per day; 15% of youth who use text messaging send more than 200 text messages per day (more than 3,000 per month, Lenhart et al., 2010). Adolescents report that their social lives would end or be greatly worsened if they could not use text messaging (54% of girls and 40% of boys, CTIA, 2008).

Like other forms of online or electronic communication, text messaging on mobile phones may pose risks such as interference with face-to-face communication or cyberbullying. The Internet Safety Technical Task Force concluded "mobile phones are increasingly playing a role in sexual solicitation, harassment, and access to problematic content" (2008, p. 55).

However, text messaging may also provide important developmental opportunities for close communication with peers, microsocial planning, communicating about schoolwork, and

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exchanging information (Guan & Subrahmanyam, 2009; Subrahmanyam & Greenfield, 2008). Frequent texting may well be a "life phase phenomenon" (Ling, 2010, p. 277), a practice prized in adolescence because it is inexpensive, discreet even to the point of being subversive, can be done in many settings in which cell phone calling and Internet communication are not possible, is more private from adults, and is a forum in which youth can play with slang and develop their own language for interaction.

This brief report presents an innovative method for capturing the content of adolescents' electronic communication. In an ongoing longitudinal study, adolescents were provided with BlackBerry devices with service plans paid by the investigators, configured so that the content of all text messages, email messages, and Instant Messages is saved to a secure server and organized in a highly secure, flexible, searchable online archive. This paper will describe the technology used to devise this method and ethical considerations. Text messaging will be the primary focus, because this mode of communication is used most heavily by adolescents (Lenhart et al., 2010). Evidence for the validity of this method will be presented. To show that adolescents actually used these devices provided for research purposes, use of text messaging will be examined. To show that participants were communicating at least somewhat openly without censoring too much, this study will examine frequencies of profane and sexual language in a two-day sample of text messaging collected in the fall of 2009.

Little previous research has investigated the content of adolescents' text messages. Given that text messaging has become adolescents' primary mode of communicating with peers and the extraordinary amount of time they spend sending and receiving texts (Lenhart et al., 2010), it is important to understand how exactly youth communicate in this medium. Examining the content of adolescents' text messaging could reveal much about their developing social relationships with peers, emerging romantic relationships, communication with parents during this period of increasing autonomy, relationships with authority figures, and the extent to which youth communicate with strangers. This method was developed as a way to observe adolescents' social interactions directly but unobtrusively, and to overcome the many problems associated with self-reports of electronic communication.

The few previous published studies of text messaging rely on adolescents' self-reports (Bryant, Sanders-Jackson, & Smallwood, 2006; Lenhart et al., 2010; Ling, 2005; 2010; Pierce, 2009; and Reid & Reid, 2007). Although these pioneering studies have been vitally important in helping us understand the extent to which adolescents are entranced with electronic communication, self-reports may be subject to all kinds of bias. Youth may be truly unaware of the extent to which they engage in text messaging, they may not be conscious of their own cyberbullying or levels of antisocial communication, and they may choose not to report the level of their involvement to try to present themselves in a positive light and for fear that adults in their lives will take away their electronic devices. No previous published research has provided adolescents with cell phones or smart phones and recorded the content of their electronic communication. The only previous study that measured the content of text messaging required college students to write down all text messages for a 24-hour period in a diary (Ling & Baron, 2007). This brief report adds to previous research by computing actual numbers of messages sent and received by detailed examination of billing records. This study determines the frequency of illicit communication in text messages by examining the content of a two-day sample of text messages collected in the Fall of 2009, when the sample was 15 years old and in the 10th grade.

Gender and Frequency of Text Messaging

Results of survey studies suggest that girls engage in text messaging more than boys. Girls report sending and receiving 80 texts per day as compared to 30 for boys, 86% of girls

report that they send text messages to friends several times per day as compared to 64% of boys, and 84% of girls report engaging in lengthy text messaging exchanges about intimate personal matters as compared to 67% of boys (Lenhart et al., 2010). Girls were also more likely to report using cell phones to contact friends daily (59% of girls compared to 42% of boys). A survey of over 17,000 Norwegian adolescents also found that girls were higher than boys on self-reported use of text messaging and voice calling (Ling, 2005). Another recent study with high school students found that girls reported using text messaging more and being more comfortable with all forms of Socially Interactive Technologies than boys (SIT's, Pierce, 2009).

However, there are important reasons to move beyond self-report questionnaires in examining gender differences in electronic communication. Admitting to talking a great deal via any form of communication may be more consistent with the female gender stereotype (Blakemore, Berenbaum, & Liben, 2009; Leaper & Smith, 2004). Therefore, girls may be more aware of the extent of their own text messaging and more likely to admit to frequent electronic communication when responding to questionnaires. This study will examine electronic billing records to investigate gender differences in frequency of text messaging.

The Content of Adolescents' Electronic Communication

The few previous studies of the content of adolescents' online communication have examined communication in teen chat rooms (Greenfield & Subrahmanyam, 2003; Subrahmanyam, Smahel, & Greenfield, 2006) and online weblogs (Subrahmanyam, Garcia, Harsono, Li, & Lipana, 2009). One study examined the content of 583 participants' communication in both unmonitored and monitored chat rooms designed for adolescents (Subrahmanyam et al., 2006). The content of chat was coded for identity information, sexual themes, and profane language. In the unmonitored chat rooms, 8% of utterances included identity information, 5% included obscenities, and 6% had a sexual theme. These previous studies did not include any other information about participants' off-line social lives because online communication was studied in anonymous public contexts. Another study investigated identity construction by having ten college students give guided video tours of their MySpace profile walls and photograph pages; the MySpace pages were coded for construction of social identities (Salimkhan, Manago, & Greenfield, 2010). In one of the few other studies of the content of online communication, Facebook pages were examined for young adults who had participated in a longitudinal study as adolescents (Mikami et al., 2010). Fewer than half of young adult participants agreed to allow investigators access to their Facebook pages, but for those who did, number of friends on Facebook and quantity of supportive communication on Facebook walls was related to positive friendship qualities and adjustment in young adulthood.

No previous research has examined the actual content of adolescents' text messaging (and email and Instant Messages) in the context of an ongoing longitudinal study that allows investigation of relations between adolescents' electronic communication and their offline social lives. Although research relying on self-reports suggests that there may be strong connections between adolescents' online and off-line lives (Subrahmanyam, Reich, Waechter, & Espinoza, 2008), experts have argued, "Future research should start with adolescent users and attempt to connect their online and off-line worlds and also identify the factors that influence the extent of connectedness or divergence between the two worlds" (Subrahmanyam et al., 2009, p. 242).

Method

Participants

Participants were 175 15-year-old adolescents (81 girls, 94 boys) who were taking part in an ongoing longitudinal study of origins and outcomes of social and physical aggression. The sample was 23% African American, 50% Caucasian, and 15% Hispanic, which was representative of the county in which the research was conducted (U.S. Census Bureau, 2000). Parents reported family income on a 5-point scale: 11% reported less than $25,000, 18% reported $26,000–$50,000, 18% reported $51,000–$75,000, 18% reported $76,000–$100,000, 25% reported greater than $100,000 per year, and 9% did not disclose annual incomes. Participants were recruited for the longitudinal study when they were either finishing 3rd grade or beginning 4th grade by sending letters home inviting families to take part in a five-year study involving target children, best friends, and parents coming to the laboratory for yearly visits. The initial consent rate for the five-year study was 55%, which is commensurate with and even higher than most school based studies of typical students involving only a single data collection (Betan, Roberts, & McCluskey-Fawcett, 1995; Sifers, Puddy, Warren, & Roberts, 2002). Because the focus of this investigation is users of text messaging, only those participants who sent and received more than 10 text messages per month were included here (175, 88% of the sample). Users of text messaging were compared with non-users on friendship qualities and parent-reported adjustment, and did not differ on almost all variables (the one exception was that those who did not use text messaging were higher on social aggression ($M = 2.32$, $SD= .90$) toward others than those who did use text messaging ($M = 1.94$, $SD = .85$), $t(192) = 2.0$, $p = .047$ (two-tailed).

Procedure

Participants in the longitudinal study were assessed yearly, first in the laboratory from 2003 – 2008, and then in their homes or the lab in 2008 and 2009. At the research visits in the summer before 9th grade, participants were provided with BlackBerry devices with paid service plans, unlimited texting, and data plans providing direct access to the Internet. Participants were encouraged to use these BlackBerries as their primary communication devices, but to maximize the ecological validity of the study and for ethical reasons, were not constrained from communicating online using computers and other phones. At this same research visit, and in all subsequent years, participants and parents completed questionnaires to assess the child's relationships and psychological adjustment. Research visits lasted approximately 2 hours, and concluded with the participant being given the BlackBerry and instructed in its use. State telecommunications contracts provide for a new device for participants each year, which is a recent model that is highly attractive. Voice minutes are provided, despite the cost, to add to the ecological validity of the study and to encourage adolescents to use the BlackBerries as their primary communication device. Participants share a large pool of voice minutes that averages out to 300 minutes per month per participant. Survey data shows that the majority of adolescents (69%) in the United States who use text messaging have unlimited text messaging service and share voice minutes with their families on group plans (Lenhart et al., 2010).

Using Telecommunications Technology to Capture the Content of Electronic Communication

This method for capturing the content of electronic communication relies on products and services from four different telecommunications companies, which are easily available but rarely used for research purposes. The initial technological solution for this study was devised over a period of several months with the help of a Sprint Solutions Engineer. For the period of data collection highlighted below, participants were provided with a BlackBerry 8730e, developed by Research in Motion (RIM). Service plans have been provided by Sprint

and AT&T during the life of this study, and could be offered by any provider that supports BlackBerry devices. BlackBerry technology is required for this method because BlackBerry devices can be programmed to store text messages, email, and Instant Messenger communication securely on a BlackBerry Enterprise Server (BES). Each BlackBerry device was configured with the participants' preferred Instant Messenger program, which for most was AIM (America Online Instant Messaging). Using these widely available programs was viewed as preferable to BlackBerry Messenger, which can only be used between two people who both own BlackBerries and which is not able to be archived. Although the technology does not allow recording of BlackBerry Messaging, web searches and all postings on Facebook, many Facebook users have settings that send notifications of Facebook postings to email and all Facebook-related email is archived.

For this study, all electronic communication was stored on BES's maintained by Ceryx and archived by Global Relay. Ceryx and Global Relay are companies that specialize in data security, and work together to store and archive electronic communication data, primarily for financial corporations who need to monitor their employees' communications to ensure compliance with federal laws. Although working on this project was the first time that Ceryx and Global Relay had offered their services for research purposes, the manner in which data are stored by Ceryx and archived by Global Relay is well-suited for research. Our telecommunications partners have been highly supportive of our goals, have featured our work in case studies for their promotional materials, and have indicated their interest in working with other researchers. The servers managed by Ceryx permit easy monitoring and archiving of communication, and allow us access to participants' phone contacts; this access helps us label transcripts with the designator that adolescents have used in their own contact lists. The archiving and storage provided by Global Relay maintains a record of all email and Instant Messages sent and received by the devices in real time, coded by time, and labeled with the user name of the sender or the recipient. This archive can easily be organized by participant, date, and interaction partner, and searched by key words.

Ceryx and Global Relay work together to provide a daily digest of text messages for each participant, which provides a detailed record of all text messages sent and received, again labeled with date and time, and phone number of the sender and the receiver. Because participants' contacts entered into their BlackBerries are also stored by Ceryx, when preparing transcripts, we can replace phone numbers with however the participant has labeled that person in their contacts (e.g. "Mom" or "Sarah" or "BFF"). This provides important clues as to identity of those sending and receiving text messages and allows us to analyze messages by interaction partner. An excerpt from a de-identified transcript is provided in Appendix A.

The total telecommunications costs for this study are $1026 per participant, per year ($624 for the service plans providing unlimited text messaging, data plans for Internet, and voice minutes; $276 for server and email management by Ceryx; and $126 for archiving and storage by Global Relay). The state telephone contract provides for one free upgraded smart phone per year. However approximately 85 BlackBerries are lost and damaged each year; some are replaced by older model phones turned in by participants when they received their upgrades but some handsets must be replaced at the cost of approximately $163 each.

Ethical Issues

Precisely because studying electronic communication provides "a window into the secret world of adolescent peer culture" (Greenfield & Yan, 2006, p.392), using this method raises important ethical issues. These research procedures have been fully approved annually by our university Institutional Review Board, and have been reviewed carefully for ethical

concerns by scientific review groups at the National Institutes of Health. Below we outline how we navigate the most important ethical challenges.

First, the ethical principle of informed consent requires that adolescents as well as their parents be informed that all electronic communication is being monitored. Participants and parents sign detailed consent forms yearly that clearly state that all electronic communication is recorded and monitored. Many might wonder whether this results in adolescents censoring the content of their communication, but we will present data below that suggest that many of our participants communicate openly and frankly despite our monitoring. We believe this may be because most of these youth have been participating in our study for years and understand our policies on confidentiality. In fact, we see evidence of this in the archive. For example, when a friend was texting openly about selling drugs, our participant reminded the person "Hey, be careful, the BlackBerry people are watching, but don't worry, they won't tell anyone."

A second related issue is that although we have informed consent and parental permission for all of our participants, we do not have these for those who send messages to our participants, which also end up in our archive. Pioneering researchers studying online communication have argued that electronic communication can be observed without permission in some contexts because the information need not be uniquely identifiable, unless the individual has chosen to make his or her online user name their actual names (see Subrahmanyam et al., 2006; Whitlock, Powers, & Eckenrode, 2006). In our study, although we do have access to participants' phone contacts and can see how they have labeled individuals there, these are rarely uniquely identifiable because most adolescents choose to label contacts with first names only or with nicknames.

A third issue concerns the fact that many participants are so open in their discussion of various forms of deviant behavior. Because the ongoing longitudinal study focuses on outcomes related to aggression, it is important that we be able to assess antisocial behavior fully, without needing to intervene every time we see discussions of rule-breaking activities. Prior to giving the longitudinal sample the BlackBerry devices, we obtained a Federal Certificate of Confidentiality from the National Institutes of Health, which protects us from having to report antisocial behavior to the police (though our responsibility to report child or elder abuse and suicidality or imminent danger of harm remains). Assent and consent letters convey this clearly to participants and parents.

The fourth and perhaps most serious issue concerns our responsibility to monitor the communication for content related to child abuse or imminent intent to harm self or others. The archive provided by Global Relay is configured so that electronic searches are possible, so the archive can be monitored carefully for any communication that indicates child abuse, intent to harm, or suicidality. Weekly searches are conducted for a long list of words such as "rape", "kill myself," or "older man." Instances of these worrisome communications are immediately explored by reading backwards and forwards in the archive, to understand more about what might be happening. If needed, we contact the appropriate authorities and the family to make sure that the child is safe.

Although parents of our participants understand fully that their adolescent's electronic communication is highly confidential, a few situations have arisen where parents have asked for information about their child's text messages because the teenager had run away. In each of these situations, we used the BlackBerry to communicate with the participant, urged them to contact their parents, and reminded them that their participation in our study and their having access to the BlackBerry depends on their parents continuing to give consent. We have effectively resisted providing parents with access to the adolescent's electronic

communication in these situations by working with them to get in touch with their children, and are relieved to report that all of these incidents were resolved with the participants returning safely home.

Measures

BlackBerry Use Questionnaire—Participants completed a brief survey to assess self-reported use and liking of the BlackBerry devices we provided. Items included ""How often do you USE the BlackBerry given to you by the BlackBerry project?", "How much to you LIKE the BlackBerry…?", "How often do you text on another phone than the one given to you by the BlackBerry project?", and "How often do you sleep with your BlackBerry nearby and turned on so you can hear messages coming in?" Participants responded on a 5-point scale, where 1 was "Never" or "Not at all" and 5 was "Always" or "Like it a lot."

Use of Text Messaging from Billing Records—Adolescents' use of text messaging and voice minutes was measured by examining electronic billing records to compute the exact numbers of text messages sent, text messages received, and voice minutes used for the months of September, October, and November of 2009. Average daily usage numbers were computed by summing the September, October, and November numbers for text messaging and voice minutes, and dividing by 91 days.

Coding the Content of Adolescents' Text Messages – Linguistic Inquiry and Word Count (LIWC)—To determine the number of obscene and sexual words in adolescents' text messaging, a two-day sample from a Friday-Saturday during the fall of 2009 was prepared and analyzed using software called Linguistic Inquiry and Word Count (LIWC, Pennebaker, Francis, & Booth, 2001). A large transcript was prepared containing 170 participants' text messages during this period (five participants did not text during this timeframe), then prepared for analysis for obscene language and sexual themes by writing out phrases indicated by common abbreviations (for example, "lmao" was converted to "laughing my ass off", following Slatcher & Pennebaker, 2006). Transcripts were analyzed with the LIWC program, which provides information regarding use of standard linguistic dimensions and the frequency of particular categories of words. LIWC examines text files by carefully comparing each word to a large internal dictionary containing words rated by judges as indicating specific linguistic dimensions or psychological states. To begin to examine the validity of this method by assessing the extent to which participants might be communicating openly using these devices, LIWC was used to determine percentages of words that contained profane language and sexual themes. The LIWC dictionary for swear words included 53 words, such as "damn," "piss," and "fuck". The LIWC dictionary for sexual words included 96 words such as "boob," "fucked," "erection," "horny," "orgasm," "pussy," and "sex."

In keeping with our overarching research goals of investigating developmental origins and outcomes of aggression and antisocial behavior (Underwood, Beron, & Rosen, 2009; 2011), we have also developed a micro-coding system for electronic communication that we are using for two, two-day transcripts per year, one collected in the fall near Homecoming events and one near Valentine's Day. An overview of our micro-coding is system is presented in Appendix B. Two different coding teams have been trained to reliability using this system (all kappa coefficients exceed .6). Because this method captures all of adolescents' communication on the devices and can be searched by date, participant, and communication partner, many different types of coding systems could be devised to examine a variety of types of developmental questions.

Results

Did adolescents use the BlackBerry devices provided in this study?

Table 1 presents mean daily averages of text messages sent, received, total text messages, and voice minutes as determined from billing records. Participants made heavy use of their BlackBerries for text messaging and voice calling. One male participant was an extremely high user with over 19,000 messages sent and received per month, and was such an extreme outlier that his data are not included in Table 1 or in the correlations reported below.

In response to the survey question "How much do you USE your BlackBerry given to you by the BlackBerry project?," participants' average response was between "most of the time" and "always" ($M = 4.64$, $SD = .70$). There was only a trend for self-reported BlackBerry use to be correlated with use as determined from billing records, $r = .14$, $p = .09$. Participants reported liking the BlackBerry a great deal ($M = 4.65$, $SD = .72$, between "like it" and "like it a lot" on the five point scale). Adolescents reported texting on another phone "sometimes" ($M = 2.95$, $SD = 1.74$). Participants reported often sleeping with the BlackBerries nearby and turned on ($M = 3.66$, $SD = 1.49$, between "sometimes" and "a lot" on the scale). Together, these questionnaire responses strongly suggest that our BlackBerries were the primary communication devices for most participants, though to maximize ecological validity, they were not prevented from communicating electronically on other devices. Currently in our ongoing study, only five participants have communicated to us that they regularly use another phone.

Are there gender differences in use of text messaging?

For usage measured both by self-reports and determined by billing records, no gender differences were found. Total numbers of text messages sent and received were strikingly similar and highly correlated ($r = .99$ for both genders), and sending text messages and use of voice minutes were positively but moderately correlated ($r = .24$, $p < .05$ for girls and $r = .46$, $p < .01$ for boys).

What proportion of adolescents' text messages contains obscenities and sexual themes?

The two-day sample of text messaging gathered in the fall of 2009 included 43,305 text messages, for an average of approximately 127 messages sent and received per participant per day. Usage was likely higher for these two day samples than over the three month period because these were taken on a Friday and Saturday of the weekend of Homecoming, a major school social event involving a football game and a dance. Analysis of the transcript using LIWC indicated that the total word count was 299,103, for an average of 6.9 words per text message. The LIWC program counted a total of 2,841 sexual words, which when divided by total number of text messages, indicates that the approximate percentage of utterances containing sexual themes was 6.6%. The LIWC program counted a total of 3,021 swear words, which suggests that approximately 7% of text messages contained profane language. These estimates of proportions of text messages containing sexual themes and obscenities are approximate; adolescents may use multiple sexual and profane words in the same message. Regular searches of the archive for words related to abuse sometimes yield text messages that are too profane for the pages of this journal. However, given the extremely brief mean length of text messages and the limit of 160 characters, dividing total number of obscene or sexual words by total text messages seems a reasonable way to estimate proportions of utterances with profane or sexual content.

Discussion

Overall, these preliminary data offer evidence for the validity of this method for capturing the content of adolescents' electronic communication. Our analyses here focused on text messaging because this was by far the most extensively used type of electronic communication for our sample, and also for youth in the United States according to national surveys (Lenhart et al., 2010). Examining the content of adolescents' text messaging provides rich, detailed observations of their interactions with peers, parents, and other adults. Our archive is replete with examples of youth using text messaging to be wonderfully supportive of each other, terribly mean, and surprisingly intimate with parents as well as peers.

This method is high on ecological validity because the service plans provided in this study are similar to those used by the majority of US teenagers according to a large recent survey, unlimited text messaging with a finite number of shared voice minutes on a group plan (Lenhart et al., 2010). Daily usage as examined across three months was high and comparable to results found in survey studies (Lenhart et al., 2010). Across three months, girls sent an average of 54 and received an average of 57 text messages per day and boys sent 51 and received 51 text messages per day. Youth reported using and liking the BlackBerries a great deal. Although they reported texting on other phones "sometimes," the high rate of use of text messaging and voice minutes on the phones we provided strongly suggests that these were their primary communication devices. Surveys indicate that adolescents often send text messages on friends' and family members' phones, and that teens move flexibly among different communication channels on different devices: text messaging, email, voice calling (Lenhart et al., 2010). Attempting to constrain adolescents to communicating only on our BlackBerry devices would have likely increased our attrition rate, would have resulted in poor compliance, and would have compromised ecological validity by forcing these participants to use these devices differently than youth typically do. By providing them with a highly attractive device with free unlimited text and Internet access and voice minutes, we believe we maximized the chances that these devices would be used heavily and in a manner typical of adolescents in the United States.

The content of the text messages strongly suggested that youth were communicating openly. When a two day transcript was examined with LIWC, the results indicated that similar proportions of utterances contained profane language (7%) and sexual themes (6.6%) as had been found in previous studies of the content of adolescent conversations in unmonitored online chatrooms (Subrahmanyam et al. 2006 found 5% with bad language and 6% with sexual themes).

In this study, self-reports of BlackBerry use were not significantly correlated with actual usage of text messaging as determined from billing records (although there was a trend). One reason for this weak relation may have been that the questionnaire item asked about general use (which could have included voice calling, email, and Internet use), whereas we examined usage only for text messaging because this was by far the predominant form of electronic communication on these devices. This low correlation may also be due to adolescents' lacking awareness of the extent to which they use text messaging, or misreporting to represent themselves in a more positive light. This result further emphasizes the importance of moving beyond self-reports in seeking to understand adolescents' electronic communication.

Contrary to results of survey research showing that girls report texting more than boys (Lenhart et al., 2010) and that college women have longer Instant Messaging exchanges then college men (Baron, 2004), no gender differences emerged for use of text messaging in our

examination of billing records. One possible explanation for these discrepant findings is that girls may be more likely than boys to be aware of and to acknowledge their use of text messaging on questionnaires because talking a lot is consistent with the female gender stereotype (Blakemore et al., 2009). The fact that gender differences did not emerge when usage of text messaging was determined from billing records further suggests that gathering non-self-report data may be important for understanding how adolescents use electronic communication. However, it is important to note that in our sample, there were no gender differences in self-reported use of BlackBerries, but here again, that may have been because we asked about overall use which may have included voice calls and Internet use.

Perhaps most importantly, our experience after providing youth with BlackBerry devices for almost three years so far is that these data can be collected with respect and care for participants. Youth know we are monitoring their communication; yet many communicate openly, perhaps because they believe our policies on confidentiality but also because they are entranced with the devices and with the ability to communicate freely with their peers any time and place of their choosing. We are able to use the technology to monitor the communication efficiently to ensure participants' safety.

This method is not without its limitations. Adolescent participants cannot be constrained to use only the research devices, though usage of the BlackBerries was so high that these data likely represent the majority of their electronic communication for most. The technology cannot archive Instant Messaging using BlackBerry Messenger, nor can it directly record all web searches and Facebook communications. The telecommunications costs are high. Because adolescents are prone to losing or damaging handsets and because the volume of the text messaging is so high, the telecommunications portion of this project requires a full-time staff person to work with the telecommunications partners, help adolescents with deactivated or broken phones, and to monitor the archive for communication indicating abuse, intent to harm others, and suicidality. The amount of data is so large as to be overwhelming; microcoding is underway but is highly labor intensive. The ultimate value of this method for capturing the content of adolescents' electronic communication will rest on well-developed coding systems to examine theoretically motivated research questions.

Still, this method is potentially powerful because it permits us to examine the actual content of adolescents' daily, ongoing, online communication and the extent to which they engage in particular forms of communication with peers, parents, romantic partners, and even strangers. By providing them with a device that they use eagerly and frequently, we are allowed a window into their social worlds, without having to rely on their self-reports, without teenagers having to stop what they are doing to answer questions for time sampling questionnaires or to complete diary entries, and without having to bring adolescents into the lab to observe interactions in an artificial environment. We have developed a highly reliable microcoding system that will allow us to code the content of participants' text messages (as well as email and Instant Messages), to examine further how the content of adolescents' communication relates to the quality of their relationships and to their adjustment. This innovative method for capturing the content of adolescents' electronic communication could be used by other investigators to answer diverse research questions. This information could have important policy implications for how much access adolescents should have to these electronic devices: for example, whether adolescents should be allowed to text message on their cell phones at school, the extent to which parents might want to monitor electronic communication, and from whom youth need to be protected against electronic victimization.

Acknowledgments

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Appendix A - Excerpt from a Text Messaging Transcript

(John D. is the participant)

(09:00:35 PM EDT) **Anna sa**ys to John D. (SMS): Oh Haha ya our director was pissed today

Haha… How long is your camp

(09:01:14 PM EDT) **Sarah K** says to John D. (SMS): Yeahh

(09:01:15 PM EDT) John D. says to **Anna** (SMS): 730 to 5

(09:01:18 PM EDT) John D. says to **Sarah K** (SMS): My bro and sis brought home a stray dog :D

(09:01:20 PM EDT) **Sarah K** says to John D. (SMS): Haha are you watching the olympics?

(09:01:30 PM EDT) John D. says to **Sarah K** (SMS): No u?

(09:01:42 PM EDT) **Sarah K** says to John D. (SMS): Yes and the asians are lighting up!

(09:01:44 PM EDT) John D. says to (SMS): Haha I gotta c it

(09:01:46 PM EDT) says to John D. (SMS): Crazy asians and their fancy pantsy lights

(09:01:48 PM EDT) John D. says to **Sarah K** (SMS): How neat haha

(09:01:50 PM EDT) **Sarah K** says to John D. (SMS): Haha there was a weird comercial for computers that had flying sumo wrestlers

(09:01:52 PM EDT) John D. says to **Sarah K** (SMS): Hahaha saweeeeet I'm still tryin to picture how that works

(09:13:15 PM EDT) **Sarah K** says to John D. (SMS): Haha yeah so am I this opening ceremony is so weird

(09:13:17 PM EDT) John D. says to **Sarah K** (SMS): It must be

(09:13:19 PM EDT) **Sarah K** says to John D. (SMS): Now there's little kids doing karate

(11:04:53 PM EDT) **Emily** says to John D. (SMS): Haha im not exactly sure cuz im not in texas now but i think thats it

(11:04:55 PM EDT) John D. says to **Emily** (SMS): Yeh its the one channel I don't get haha

(11:04:56 PM EDT) **Emily** says to John D. (SMS): Seriousy? That majorly sucks!

Appendix B - Overview of Micro-coding System for Text Messaging

Each text message is coded for:

Time	Sender	Receiver	Content	Agent	Target

Content Codes Include:

> Chain Messages, Mass Messages, and Auto-generated Messages
>
> Positive Talk
>
> Directives
>
> Advice
>
> Neutral Talk
>
> Negative Talk about Specific Peers, Family Members, Adults
>
> Friendship Manipulation and Social Exclusion
>
> Social and Physical Victimization
>
> Defending against/ Avoiding Social Aggression
>
> Antisocial Talk, Fighting, and Property Damage

Sexual Behavior Codes – reminiscing about, currently engaging in, planning, or refusing several sexual behaviors: arousal, kissing, petting/rubbing, oral sex, sexual intercourse

Substance Use Codes – discussions of acquiring, using, and refusing several types of substances: alcohol, tobacco, marijuana, prescription drugs, hallucinogenic drugs, crack, amphetamine, opiates, household supplies, and drugs in general.

Table 1

Daily Means for Use of Electronic Communication, by Gender (standard deviations in parentheses)

	Girls	**Boys**	*t* **(1, 172)**	*p*
Outgoing Texts	53.02 (50.77)	56.39 (51.11)	−.40	.69
Incoming Texts	55.24 (52.17)	56.36 (51.84)	−.68	*.50*
Total Texts	109.01 (102.53)	113.45 (102.57)	−.54	.59
Voice Minutes	30.46 (36.25)	31.25 (45.79)	−.013	.99