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The BlackBerry Project: The Hidden World of Adolescents' Text Messaging and Relations With Internalizing Symptoms

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Abstract

In this naturalistic study of adolescents' text messaging, participants (N = 172, 81 girls, age 14) were given BlackBerry devices configured to save their text messages to a secure archive for coding. Two, 2-day transcripts collected four months apart within the same academic year were microcoded for content. Results showed that most text message utterances were positive or neutral, and that adolescents sent text messages primarily to peers and to romantic partners. Only a few sex differences emerged. Frequency of text messages containing negative talk positively predicted overall internalizing symptoms and anxious depression. Text messaging about sex was positively associated with overall internalizing and somatic complaints for girls, but not for boys.

Adolescents rely on text messaging to communicate with their friends more than any other form of contact, including face-to-face interaction (Lenhart, Ling, Campbell, & Purcell, 2010; Lenhart, 2012). According to a large survey study, 77% percent of adolescents own cell phones, 63% communicate via text messaging every day, and 49% send and receive text messages with friends every day (Lenhart, 2012). Youth ages 12 – 17 report sending an average of 60 text messages per day (an increase from an average of 50 in 2009, Lenhart, 2012). Many teenagers claim that their social lives would end or be seriously impaired if they could not have access to text messaging (54% of girls and 40% of boys, Cellular Telecommunications Industry Association, 2008).

Despite adolescents' fervent involvement in text messaging, little is known about the content of text messaging communication and how involvement in text messaging relates to adjustment. Most previous studies have relied on adolescents' self-reports (Bryant, Sanders-Jackson, & Smallwood, 2006; Coyne et al., 2011; Drouin & Landgraff, 2011; Frank, Dahler, Santurri, & Knight, 2010; Igarashi, Motoyoshi, Takai, &Yoshida, 2007; Jin & Park, 2009; Lenhart et al., 2010; Lenhart, 2012; Ling, 2005; 2010; Madell & Muncer, 2007; Mahatanankoon & O'Sullivan, 2008; Pierce, 2009; Reid & Reid, 2007; Skierkowski & Wood, 2012; Thomee, Eklof, Gustaffson, Nilsson, & Hagberg, 2004; and Van Cleemput, 2010). These pioneering studies have advanced our understanding of the extent to which adolescents and young adults are engaged in text messaging. However, adolescents' self-reports of text messaging may be subject to serious biases. Youth may not be aware of the

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extent to which they engage in text messaging, they may not be cognizant of their own antisocial communication and cyberbullying, and they may deliberately choose not to report their high level of involvement in text messaging out of fear that adults might confiscate their electronic devices or to present themselves in a more positive light.

A few investigators have moved beyond questionnaires in investigating text messaging. Several diary studies have been conducted; participants were asked to copy all text messages into a diary for 24 hours (Ling & Baron, 2010), one week (Conti-Ramsden, Durkin, & Simkin, 2010) and two weeks (Faulkner & Culwin, 2005). In another study, participants were asked to share the content of their text messages in telephone surveys (Ling, 2005). French adolescents were invited to "Donate your SMS messages to science" by forwarding them to linguistic researchers, but the entire sample of text messages for 115 participants included only 802 text messages (Guomi, Volckaert-Legrier, Bert-Erboul, & Bernicot, 2011). Given that adolescents report sending about 60 text messages per day (Lenhart, 2012), these participants were likely selective in the messages they shared. In laboratory studies, participants were asked to respond to text messages from an experimenter in the laboratory (Durkin, Conti-Ramsden, & Walker, 2011) or were ostracized by being excluded from a three-way text messaging interaction (Smith & Williams, 2004). Use of emoticons was examined by giving college students iPhones for 6 months, configured so that the content of text messages could be logged, but "Privacy was maintained by anonymizing users and the obfuscating of word content" (Tossell, Kortum, Shepard, Barg-Walkow, & Rahmati, 2012, p. 660). None of these studies examined large samples of adolescents' daily text messaging.

The purpose of this investigation was to examine the actual content of adolescents' text messaging to answer four primary questions about how teenagers use text messaging with their naturally occurring social partners in their ongoing daily lives. First, with whom are adolescents communicating via text messaging? Second, what types of content are they communicating in this context? Third, are there gender differences in how adolescents use text messaging? Last, does sending particular types of text messages relate to internalizing problems over the first year of high school? Illuminating the hidden world of adolescents' text messaging could reveal much about their social relationships and adjustment.

Developmental Risks and Benefits of Text Messaging for Adolescents

Experts have expressed strong concerns about adolescent text messaging because they fear it might be a venue for cyberbullying and for inappropriate sexual interactions with peers and adults (Internet Safety Technical Task Force, 2008). Others fear that text messaging will impair literacy because of the creative use of language (see Crystal, 2008), yet text users and non-text users do not differ on standard measures of literacy (Drouin & Davis, 2009). The most serious danger related to older adolescents' text messaging is likely texting while driving (Lee, 2007; Owens, McLaughlin, & Sudweeks, 2011); their sense of urgency about texting is so great that 33% report having texted or emailed while driving a car (Centers for Disease Control and Prevention, 2012).

Despite these fears, text messaging may serve positive developmental functions for adolescents. Youth use chat room communication to explore developmental issues, such as identity and sexuality (Subrahmanyam, Smahel, & Greenfield, 2006). Text messaging is a more intimate form of communication than Internet chat because it is more private and conducted between dyads or small groups who must know each other's phone numbers, whereas chat room communication is more public and accessible to anyone. Text messaging may meet adolescents' developmental needs for conversation with friends in the service of self-exploration, involving core processes such as self-disclosure, gossip, problem solving, information exchange, and conflict (Gottman & Mettetal, 1986). Text messaging allows youth to communicate in real time but to consider how they want to express their thoughts and respond to others (Reid & Reid, 2010). Adolescents report valuing text messaging because "When I text, I can say just what I want to say" (Lenhart et al., 2010, p.48); 75% reported engaging in lengthy text message exchanges about personal issues. Frequent texting may be a "life phase phenomenon" (Ling, 2010, p. 277), highly valued in adolescence because it is inexpensive, widely available, possible to do in many settings in which phone calling and Internet communication are not feasible, private from adults and highly discreet, and a context in which youth can play with slang and develop their own language. Cell phones serve to emancipate teenagers from their parents, and help them communicate intimately with peers (Ling, 2005). Text messaging could also afford opportunities for microsocial planning (discussing details about where and when to meet), communicating about academic work, and exchanging a variety of types of valuable information (Guan & Subrahmanyam, 2009; Subrahmanyam & Greenfield, 2008).

With whom do adolescents communicate via text messaging?

The results of the Pew Surveys suggest that most text messages will be sent to adolescents' peers (Lenhart et al., 2010; Lenhart, 2012). Of adolescents who use text messaging, 81% text friends at least once a day. These survey data also suggest that adolescents frequently send text messages to romantic partners; 46% of adolescents in romantic relationships reported texting daily with romantic partners (Lenhart et al., 2010). Fifty percent reported texting their parents daily, although 20% of adolescents reported never texting their parents (Lenhart et al., 2010).

What do adolescents say in text messaging?

Despite adolescents' ardent engagement in texting, no previous research has examined what adolescents actually say in their daily text messages. The only diary study that examined content was conducted with a small sample of young adults and found that the most frequent types of messages were signoffs (remarks to close off conversations, such as "gotta go" or "talk to you later," 19.63%), personal information (18.84%), and questions (18.74%, Faulkner & Culwin, 2005). Other frequent types of content were instructions (9.42%), future rendezvous (5.13%), sign-ons (brief greetings, such as "hi, what's up?" 4.68%), and jokes (4.54%). Although the large surveys conducted by the Pew Study of the Internet and American Life did not directly assess content (Lenhart et al., 2010; Lenhart, 2012), adolescents' self-reports indicate that they use texting for reasons such as saying hello and

chatting (95%), reporting where they are (89%), micro-coordination (85%), personal matters (75%), and managing school work (70%).

Text Messaging and Gender

The Pew survey concluded “Girls more fully embrace most aspects of cell-phone based communication” (Lenhart et al., 2010, p. 3). Girls reported sending and receiving 80 texts per day as compared to 30 for boys; 84% of girls reported engaging in lengthy text messaging exchanges about intimate personal matters as compared to 67% of boys. In other survey studies, high school girls reported texting more than boys (Ling, 2005) and being more comfortable with all forms of Socially Interactive Technologies (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 lot via any form of communication is more consistent with the female gender stereotype; therefore, girls may be more likely to admit to frequent electronic communication on questionnaires. In one of the few studies to examine the content of adolescents’ text messages (Guomi et al., 2011), younger adolescent girls were more prolific texters than boys and sent more messages with relational content. However, these gender differences were less evident for 17-18 year-olds.

Text Messaging and Internalizing Symptoms

This study investigated whether frequency and content of text messaging in the first year of high school predicts internalizing symptoms. Relations between antisocial text messaging and aggression and rule breaking were examined in another investigation with this same sample, guided by theories about deviancy training and peer coercion between dyads (Dishion, Spracklen, Andrews, & Patterson, 1996; Piehler & Dishion, 2007). Internalizing symptoms were the focus here because this developmental period, from age 14 to 15, is the beginning of the highest risk period for major depression (6.1 % for ages 15 – 24, Blazer, Kessler, McGonagle, & Swartz, 1994), and a period of growth in symptoms of depression, especially for girls (Twenge & Nolen-Hoeksema, 2002). Theories of depression in adolescence emphasize the role of interpersonal stress as both a predictor and an outcome (Rudolph, 2009); frequency and negative content of text messaging could generate interpersonal stress for youth.

The scant evidence available suggests that text messaging may relate to internalizing symptoms: anxious depression, withdrawn depression, and somatic complaints. Self-report studies found that involvement in text messaging related to social anxiety (Pierce, 2009), and that heavy cell phone use related to depression (Sachez-Martinez & Otero, 2009), to anxiety and insomnia (Jenaro, Flores, Gomez-Vela, Gonzalez-Gil, & Caballa, 2007), and to low self-esteem, insomnia, and suicidal tendencies (Yang, Yen, Ki, Cheng, & Yen, 2010). Texting has been found to relate to depression for undergraduate men and to prolonged stress for undergraduate women (Thomee, Eklof, Gustafsson, Nilsson, & Hagberg, 2005). High school students involved both in high levels of texting (>120 messages per day) and social networking (> 3 hours per day) were at twice the risk for perceived stress, cybervictimization, suicidal ideation, missing school, and sleeping in class as compared to

those with lower levels of involvement in text messaging and social networking (Frank, Dahler, Santurri, & Knight, 2010).

Text messaging may relate to the development of depression and anxiety for several reasons. First, text messaging may increase involvement in what Marwick and boyd (2012) refer to as “drama,” interpersonal conflicts that are played out in front of an audience, which may lead to increased interpersonal stress for youth. Adolescents may send or receive hurtful remarks via text messaging that would not occur face-to-face, which can easily be forwarded, adding fuel to interpersonal conflicts and creating even greater pain for victims. Involvement in drama via text messaging may result in strong feelings of regret; 47% of adolescents who own cell phones reported regretting having sent a text message (Lenhart et al., 2010). Second, text messaging may be a context in which adolescents experience the pain of social rejection and exclusion. University students who were excluded from three-way text messaging reported increases in anger and negative moods (Smith & Williams, 2004). Third, text messaging may involve cyberbullying, which has been linked to depression and anxiety (see Beran & Li, 2005; Mishna, Saini, & Solomon, 2009; Mitchell, Ybarra, & Finkelhor, 2007). In the large Pew survey, 26% of youth reported having been bullied or harassed by text messaging or calls on mobile phones (Lenhart et al., 2010). Frequently sending and receiving text messages raises the odds that adolescents will experience regret and embarrassment, social exclusion, and cyberbullying in this context.

Text messaging may relate to somatic complaints as part of an internalizing syndrome for the reasons described above, but also because sending and receiving text messages involves physiological arousal and may interfere with sleep. When sending and receiving text messages, college students showed elevations in respiration, heart rate, skin conductance, and shoulder and thumb tension (Lin & Peper, 2009). An observational study of posture found that while texting participants had flexed necks and wrists in unnatural positions, which could contribute to musculoskeletal disorders such as arthritis and tendonitis (Gold et al., 2011). Frequent texting likely interferes with sleep; 87% of US adolescents who use text messaging reported sleeping with cell phones on or near the bed (Lenhart et al., 2010), and a survey of media and adolescent health in the Netherlands found that 43% of youth reported being awakened at night by incoming text messages (Van den Bulck, 2003). Not getting adequate sleep relates to depression for adolescents and could well lead to various somatic complaints (Dahl & Lewin, 2002).

The BlackBerry Project: A Naturalistic Study of Adolescent Text Messaging

This investigation examined the frequency and content of adolescents’ text messaging for four days during their first year of high school (9^{th} grade, age 14-15, in 2008-2009). Participants in this study were provided with BlackBerry devices with paid service plans, configured so that the content of their text messages was securely stored for later coding. The details of this method and ethical considerations are outlined in (Underwood, Rosen, More, Ehrenreich, & Gentsch, 2012). The content of adolescents’ text messaging was coded using a microanalytic coding system for two, 2-day samples, one from the fall collected near each participant's school Homecoming weekend (involving a special football game and a dance) and one from the winter collected near Valentine's Day, so as to sample periods of

heavy social interaction. The current study answered the need noted by previous investigators for quantitative studies of text messaging among youth (Walsh, White, & Young, 2008). In acknowledging the limitations of self-reports, Jin and Pena (2010) noted, "It would be desirable for future studies to make use of phone bills or other behavioral residue to quantify more correctly and reliably communicative behaviors over mobile phones" (p. 49).

Hypotheses

We predicted that adolescents would use text messaging much as they use other forms of electronic communication, for intimate conversations, planning social events, and information exchange (Guan & Subrahmanyam, 2009; Subrahmanyam & Greenfield, 2008). We hypothesized that most of adolescents' text messaging would be positive or neutral, but that there would be a significant amount of negative talk, perhaps in the range of 15% or so of text messages involving negative talk. We expected that girls would engage in more text messaging than boys (Lenhart et al., 2010; Lenhart, 2012), and that girls would use text messaging more to communicate with friends than boys will. We hypothesized that negative content of text messaging would predict internalizing symptoms at the end of the first year of high school. We predicted that positive or neutral content of text messaging would be related to lower levels of internalizing symptoms because these types of messages may be sources of intimacy and companionship. We hypothesized that text messaging about sex would positively predict internalizing symptoms for this young sample because it is likely a source of interpersonal stress and possibly regret. Last, we expected that texting would predict somatic complaints more than other internalizing symptoms because of the physiological demands and the likelihood that heavy involvement in text messaging may interfere with sleep.

Method

Participants

Participants were 171 14-year-old adolescents (80 girls, 91 boys) who are part of an ongoing longitudinal study of relationships and adjustment. The ethnic composition of the sample was 19% African American, 46% Caucasian, 13% Hispanic, 2% Asian, 4% Biracial, and 16% did not report ethnicity. At the time of initial recruitment, this sample was representative of the urban county in the southern United States in which the study was conducted (U.S. Census Bureau, 2000). Parents reported family income on a 5-point scale: 11% indicated less than $25,000, 18% indicated $26,000 - $50,000, 18% indicated $51,000 - $75,000, 18% indicated $76,000 - $100,000, 25% indicated greater than $100,000 per year, and 9% did not report family incomes. Participants were invited to be part of the longitudinal study when they were either finishing the third or beginning the fourth grade of a large public school district, by sending home letters asking families to join a 5-year study involving target children, best friends, and parents coming to the laboratory. The initial consent rate for the longitudinal study was 55%, which is equal to or even higher than most studies involving a single data collection in schools with typically developing children (Betan, Roberts, & McCluskey-Fawcett, 1995; Sifers, Puddy, Warren, & Roberts, 2002). The focus of this study was participants involved in text messaging during their 9th grade

year, thus only those participants who sent and received text messages were included here (*n* = 171, 86% of the sample involved in the longitudinal study in this year of data collection). Users of text messaging were compared with nonusers on all measures of internalizing symptoms in grades 8 and 9 and no significant differences were found (all *p* values exceeded .24).

Procedure

Participants in this longitudinal study were assessed yearly in laboratory visits from 2003 – 2008, then in their homes or in the lab from 2009 – 2012. At the yearly assessment 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 the BlackBerries as their primary cell phone, but they were not prohibited from communicating online using computers and other devices so as not to constrain ecological validity. At this same assessment and in all subsequent years, participants and parents completed questionnaires to assess the adolescents' relationships and psychological adjustment. The questionnaire data presented here were collected in the months of June and July prior to participants' 8th and 9th grade years.

The technology used to capture the content of participants' text messaging relied on services designed for financial corporations to archive their employees' electronic communication so as to monitor compliance with federal laws. Participants' text messaging was stored on a BlackBerry Enterprise Server maintained by a company called Ceryx and was archived by a company called Global Relay; both of which specialize in data security. Ceryx and Global Relay worked together to provide a daily digest of text messages sent and received for each participant, labeled with the date and time and phone number. At the time this study was conducted, only regular text messages were able to be archived, and not text messages sent by Internet based programs such as BlackBerry Messenger. However, because all participants had unlimited text messaging plans paid for by the investigators, concerns about the costs of sending regular texts were minimized. Because Ceryx also stored participants' contact information as entered into their cell phones, when preparing transcripts, it was possible to replace phone numbers with whatever name or phrase used by the participant to label the contact (e.g., Mom, Fred, or BFF). This information provided clues as to participants' relationship with the interaction partners.

All of these procedures were reviewed carefully for ethical concerns by scientific review groups at the National Institutes of Health, and were reviewed and approved yearly by our university Institutional Review Board. A detailed discussion of the ethical challenges is provided in Underwood et al. (2012). In brief, participants and their parents were fully aware that all electronic communication was being stored and monitored, we obtained a Federal Certificate of Confidentiality and thus were not required to report illegal activities, and we were able to use the technology to search electronically for communication indicating child abuse, suicidal ideation, or intent to harm others. Despite our monitoring, examination of usage data and the linguistic properties of a two-day sample of the text messaging indicated that participants were communicating frequently and openly using the BlackBerry devices (Underwood et al., 2012). On a 5-point scale, participants reported using the BlackBerries

almost all of the time (*M* = 4.64, *SD* = .70, between “Most of the time” and “Always”). The average daily number of messages sent was 55, which corresponds to self-reports of frequency of texting (Lenhart et al., 2010). Examination of the two-day sample using Linguistic Inquiry and Word Count (LIWC, Pennebaker, Francis, & Booth, 2001) showed that 6.65% of utterances contained sexual themes and 7% contained profane language, which were rates comparable to those found in a previous study of adolescent conversations in an unmonitored online chat room (Subrahmanyam, Smahel, & Greenfield, 2006).

Measures

Coding of text messages—Each utterance of text messaging was coded for time, sender, receiver, and content, according to a detailed microcoding system. An utterance refers to a unit of communication that conveys a complete thought. Utterances ranged from full sentences (e.g., “Are you going to the football game on Friday with Susie”) to monosyllabic responses (e.g., “No”). Consistent with the overarching goals of our longitudinal study, we coded the content of text messaging communication for positive talk, neutral talk, utterances related to social aggression (negative talk, social exclusion, friendship manipulation), antisocial behavior, substance use, and sex. Content codes, kappa coefficients, and examples are presented in the Appendix. Although participants commonly developed unique and creative ways of manipulating the language and spelling used in text messages, these adaptations were often formulaic and could be easily interpreted (e.g., substituting “3” for “e”; replacing “cks” with “x”; “and g3t som3 snax”). When the content of a text message was not decipherable by a coder, it was discussed during ongoing coding meetings with the entire coding team. In the event that consensus could not be reached about what the content of the message was, the utterance was coded as neutral talk. The receiver of text messages was coded on the basis of the contact information entered by the participant and by obvious cues from the content of the text messages; when neither of these provided clear information as to the recipient, the recipient was coded as unknown.

Due to the massive volume of text messaging by our sample, we prepared two, 2-day transcripts for microcoding during participants’ 9th grade year: one 2-day period near the fall Homecoming events and one near Valentine's Day. We chose these two time periods to raise the odds that we would see peer communication about important social events. Teams of coders blind to the hypotheses of the study were trained over a period of 8 weeks to use the coding system (a total of 21 coders), then met weekly for ongoing training and to discuss coding challenges. Twenty percent of transcripts were also coded by the coding coordinator to examine reliability. The overall kappa coefficient for content codes was .66; kappa coefficients for specific codes are provided in the appendix. All but one of the kappa coefficients were in the substantial (.61 – 80) or almost perfect (.81 – 1.00) ranges as outlined by Landis and Koch (1977). The overall kappa coefficient for the receiver of the text messages was .60, and reliabilities for individual receivers were: peers (κ = .65), romantic partners (κ = .69), parents (κ = .74), siblings (κ = .78), other family members (κ = . 57), and teachers (κ = 1.0). When kappas were lower, it was due to ambiguity in the actual messages, which were often cryptic.

Because number of text messaging units was so highly variable and because frequency of content and receiver codes was naturally correlated with number of texting units, both count and proportion scores were computed for content and receiver codes, as one way of making sure that apparent differences were not due only to higher numbers of text messaging units. For each individual, frequency scores were created by summing the frequency for each code across the four days of microcoded data. Proportions were determined by dividing the sum of each content code by the sum of the total number of text messaging units for each individual for the four day period.

Given the exploratory nature of this investigation, analyses examining relations with internalizing problems focused on the content codes with the highest base rates: positive-neutral talk, negative talk, and sex talk. The positive-neutral category included all positive and neutral utterances that were not captured by any other of the content codes. The negative talk category included all negative utterances to or about other individuals or groups, but did not include social exclusion and friendship manipulation, because these had lower base rates in this age range and were only modestly correlated with the more frequent negative talk code ($r = .24$, $p < .01$ for social exclusion, and $r = .17$, $p < .05$ for friendship manipulation). This negative talk code did not include utterances about aggression, victimization, substance use, or sex, because these were captured by other content codes. Because text messages about hypothetical and actual sex were so highly correlated ($r = .63$, $p < .001$ controlling for total number of text units), frequencies and proportions of these two codes were summed. The kappa coefficient for this combined code was .70.

Youth's Inventory -4, Self-Report (YI-4)—Baseline levels of participants' internalizing symptoms were assessed in the summer prior to the 9th grade year by adolescents' self-reports on the YI-4 (Gadow & Sprafkin, 1999). The YI-4 is comprised of 128 four-point items (0 – Never; 1 – Sometimes; 2 – Often; 3 – Very Often) examining a wide range of behaviors and personality traits. Of interest for this study were the depression and somatization subscales. The depression subscale is made up of 11 items assessing depressed mood and somatic complaints, including "I feel unhappy or sad" and "I feel grouchy or cranky," and has been found to have strong reliability ($\alpha = .90$). For this sample, the reliability of the depression subscale was adequate ($\alpha = .74$). The somatization subscale includes two items: "I get aches and pains for no reason like headaches or upset stomach" and "I worry a lot about my health."

Child Behavior Checklist – Youth Self-Report (CBCL-YSR)—Participants' internalizing problems at the end of the 9th grade year were assessed by adolescents' reports on the CBCL-YSR (Achenbach & Rescorla, 2001). The CBCL-YSR includes 112 items describing specific behaviors; youth are asked to indicate whether each is "not true," "somewhat or sometimes true," or "very true or often true." The subscales relevant for this investigation are those of the empirically derived broad band internalizing dimension: anxious depression, withdrawn depression, and somatic complaints. The anxious depression subscale includes 13 items, such as "cries a lot," "fears," "nervous," and "feels worthless." The withdrawn depression subscale is made up of 8 items, including "rather be alone" and "shy, timid." The somatic complaints subscale is made up of 11 items, including "overtired"

and “headaches.” In previous research, the internalizing scales have all been shown to have strong reliability (Achenbach & Rescorla, 2001). For this sample, reliabilities were also strong: internalizing dimension (α = .90), anxious-depressed subscale (α = .85), withdrawn-depressed subscale (α = .76), and somatic complaints (α = .82).

Overview of analyses

To examine what adolescents say in text messaging and with whom they communicate, analyses began with descriptive statistics for recipients and content of text messaging. Next, *t*-tests were conducted to examine gender differences for content and recipients.

Analyses examining relations with internalizing symptoms focused on the content codes with the highest base rates: positive-neutral talk, negative talk, and sex talk. Text messaging about antisocial behavior is investigated in another paper (Ehrenreich, Underwood, & Ackerman, in press), which analyzes antisocial text messaging at the level of the dyad in keeping with peer coercion theory.

To examine how the content of text messages relates to internalizing symptoms, three types of analyses were conducted. First, correlations were examined between internalizing symptoms and text messaging codes. Second, hierarchical regression analyses were conducted to examine how frequencies of text messaging content predicted internalizing symptoms overall at the end of 9^{th} grade, as well as anxious depression, withdrawn depression, and somatic complaints (for a total of four regression models). Because the total number of text units was so highly correlated with all other content codes, especially positive or neutral talk, total text units was not included in the regression analyses because including them resulted in very high multicollinearity (variance inflation factors > 50; removing total texts resulted in all variance inflation factors falling to well below 10). Because all internalizing variables were highly positively skewed, square root transformations were performed on 8^{th} and 9^{th} grade internalizing variables prior to analyses. The scale scores all included 0 as a possible value, so a constant of 1 was added to all scores prior to transformation (Kline, 2010). Examination of Cook's distances for each regression model revealed no outliers according to the criterion proposed by Cohen, Cohen, West and Aiken (2003); no value of *d* exceeded the value of the *F* distribution at α = .5 with *df* = (k-1, n – k – 1), which was .89.

To control for prior levels of internalizing symptoms, all analyses were conducted with 8^{th} grade levels of internalizing (depression plus somatic symptoms) as one of the predictors, to determine whether text messaging frequency or content contributed to 9^{th} grade internalizing symptoms above and beyond prior symptoms. Participant sex was dummy coded so that 1 indicated male and 0 indicated female, and interactions with sex were included in all regression analyses.

Last, to examine whether extreme levels of text messaging relate to internalizing symptoms, extreme groups were created for those one standard deviation above the mean for frequency of text messaging (total text units > 466.52, *n* = 23, 14 girls), positive-neutral content (frequency > 342.19, *n* = 23, 15 girls), negative talk about others (frequency > 77.85, *n* = 24, 16 girls), and sex talk (frequency > 17.68, *n* = 16, 7 girls). A 2 (Group: High vs. Other) X 2

(Participant Sex) multiple analysis of variance (MANOVA) was conducted to examine the effects of extreme texting group and participant sex on anxious depression, withdrawn depression, and somatic complaints.

Results

With whom do adolescents communicate in text messaging?

Table 1 shows the mean proportions of text messages sent to different types of interaction partners, as best that could be determined from the contact information and the content of the utterances. The most common recipients of adolescents' text messages were peers, by far; 70% of total messages were sent to peers. The next most common recipients were romantic partners (21%). Only 3% of text messages were sent to parents and less than 1% to other adults.

What do adolescents say in text messages?

Table 2 presents the mean frequencies of total text messaging units, and frequencies and proportions of specific types of text messaging content. The average number of total text messaging units sent for this four day sample of communication was 241, with very high variability and a range of 3 to 1172. The most common type of text messaging was positive-neutral talk (77% of total text messaging utterances). The next most frequent types of content were negative talk (14%), directives (2%), and messages about hypothetical sex (1%). For all other types of content, mean frequencies and proportions were low, and variability was high.

Are there gender differences in adolescents' text messaging?

As shown in Tables 1 and 2, there were few gender differences in the proportions of messages sent to different interaction partners and frequencies proportions of text messaging content. For proportions of text messages sent to different types of recipients, a Multiple Analysis of Variance (MANOVA) showed no overall effect for gender, $F(9, 161) = 1.22$, *n.s.* Exploratory univariate ANOVAs showed just one significant difference; boys sent more messages to siblings than girls did.

There was a trend for girls to send more text message utterances than boys. Gender differences were examined in a MANOVA for the 14 specific types of content, and overall effects of Gender were significant for both frequencies, $F(14, 156) = 1.90$, $p < .05$, and proportions of specific types of content, $F(14, 156) = 1.90$, $p < .05$. Follow-up ANOVAs showed that for positive- neutral talk, there was a trend for girls to send these types of messages more frequently than boys did, but when examined as proportions of total text messaging units, there were no gender differences. Girls sent a significantly higher frequency and proportion of text messages about saying "no" to sex than boys did.

Of the possible gender differences examined, only three were significant at $p < .05$. This just barely exceeds the number expected by chance.

Does frequency and content of adolescents' text messaging relate to internalizing symptoms?

Table 3 presents the correlations between text message frequencies and internalizing symptoms. Both total text messaging units and positive-neutral talk correlated significantly and positively with somatic complaints. Negative talk text messages were positively, significantly correlated with overall internalizing symptoms, as well as with anxious depression and somatic complaints. Text messages about sex were correlated with overall internalizing symptoms, as well as all three subscales.

In step one of each hierarchical regression, three variables were entered: participant sex, 8th grade internalizing symptoms, and the frequency of positive-neutral talk (summed across the four coded days). In step two, two content frequencies were added: negative talk and sex talk. In step three, interactions of all texting variables with participant sex were added to the models.

The results of these hierarchical regression analyses are presented in Table 4. All models resulted in a significant total R^2. As expected, in all models, 8th grade internalizing symptoms were strong predictors of 9th grade internalizing symptoms.

For total internalizing symptoms, the only significant predictor at step one was 8th grade internalizing symptoms. In step two, the addition of content codes to the model resulted in a significant change in R^2, with negative talk significantly, positively predicting internalizing symptoms. In step three, the addition of the interactions with sex did not result in a significant change in R^2, though negative talk remained a positive predictor and there was a trend for a significant interaction between sex and sex talk. To explore this interaction, regressions were conducted separately by sex. For girls, sex talk was a significant, positive predictor of internalizing symptoms, $\beta = .37$, $p < .05$, whereas for boys, sex talk was not a significant predictor, $\beta = -.25$, $p = .14$.

For anxious depression, again the only significant predictor at step one was 8th grade internalizing symptoms. The addition of the texting content codes for step two resulted in a significant change in R^2, though there was only a trend for negative talk as a positive predictor of anxious depression. The addition of the interactions with sex on step three did not result in a significant change in R^2, though negative talk emerged as a significant, positive predictor.

For withdrawn depression, the only significant effect in the first two steps of the hierarchical regression was 8th grade internalizing symptoms. Although step three with the interactions did not result in a significant change in R^2, a significant interaction emerged for Male Sex X Sex Talk. To explore this interaction, regressions were conducted separately by sex. For girls, sex talk was not a predictor of anxious depression, $\beta = .17$, $p = .19$, whereas for boys, there was a trend for sex talk to be a negative predictor of anxious depression, $\beta = -.30$, $p = .07$.

For somatic symptoms, in step one, both 8th grade internalizing symptoms and frequency of positive or neutral text messages were positive predictors. The addition of the negative

content codes in step two resulted in a trend for a change in R^2, though no content code emerged as a significant predictor. The addition of the interaction between content codes and sex on step three did not result in a significant change in R^2, though trends emerged for both sex talk and the interaction of participant sex and sex talk. To explore this interaction, regressions were conducted separately by sex. For girls, there was a trend for sex talk to be a positive predictor of somatic complaints, $\beta = .21$, $p = .07$, whereas for boys, sex talk was not a significant predictor $\beta = -.17$, $p = .29$.

Do extreme levels of text messaging relate to internalizing symptoms?

For being in the extreme group on frequency of texting, the MANOVA showed an overall effect of group, $F(3, 142) = 3.45$, $p < .05$. Examination of the univariate ANOVAs indicated that high frequency texters reported more somatic complaints than other participants ($M = 4.32$, $SD = 3.46$ and $M = 3.45$, $SD = 3.28$, respectively, $F(1, 144) = 4.45$, $p < .05$).

For being in the group high on positive-neutral texting, the MANOVA showed an overall effect for group, $F(3, 142) = 3.04$, $p < .05$. The univariate ANOVAs again indicated that that those high on positive-neutral text messaging reported more somatic complaints than other participants ($M = 4.16$, $SD = 3.59$ and $M = 3.47$, $SD = 3.27$, respectively, $F(1, 144) = 4.01$, $p < .05$).

For being in the extreme group for negative talk text messages, the MANOVA yielded an overall effect for group, $F(3, 142) = 3.02$, $p < .05$. The univariate ANOVAs indicated that those high on negative talk texts reported more withdrawn depression than other participants ($M = 4.45$, $SD = 3.65$ and $M = 2.80$, $SD = 2.50$, respectively, $F(1, 144) = 4.69$, $p < .05$) and also more somatic complaints ($M = 5.30$, $SD = 3.67$ and $M = 3.28$, $SD = 3.17$, respectively, $F(1, 144) = 9.19$, $p < .01$).

For being in the extreme group for text messages discussing sex, the MANOVA showed an overall effect for group, $F(3, 142) = 3.22$, $p < .05$, a trend for a main effect for participant sex, $F(3, 142) = 2.28$, $p = .08$, both of which were qualified by a significant interaction for Group X Participant Sex, $F(3, 142) = 2.99$, $p < .05$. The univariate ANOVAs indicated that for anxious depression, there was a trend for an interaction between high rates of texting about sex and participant sex, $F(1, 144) = 3.82$, $p = .05$, and this same interaction was significant for withdrawn depression, $F(1, 144) = 5.34$, $p < .05$, and for somatic complaints, $F(1,144) = 8.80$, $p < .01$. Follow-up contrasts using the Bonferroni correction showed that as compared to other girls, girls in the high texting about sex group reported more withdrawn depression ($M = 2.95$, $SD = 2.56$ and $M = 5.42$, $SD = 3.31$, respectively, $F(1, 144) = 94.80$, $p < .001$) and more somatic complaints ($M = 3.67$, $SD = 3.30$ and $M = 5.42$, $SD = 3.23$, respectively, $F(1, 144) = 6.64$, $p < .05$). However, as compared to other boys, boys in the high texting about sex group reported less withdrawn depression ($M = 2.97$, $SD = 2.80$ and $M = 1.86$, $SD = 1.95$, respectively, $F(1, 144) = 18.08$, $p < .001$) and fewer somatic complaints ($M = 3.46$, $SD = 3.39$ and $M = 1.71$, $SD = 1.60$, respectively, $F(1, 144) = 6.58$, $p < .05$).

Discussion

This naturalistic study of adolescents' text messaging revealed that the majority of content is positive or neutral, but that texting negative talk to or about others predicts overall internalizing symptoms as well as anxious depression. Adolescents extremely high (one standard deviation above the mean) on text messaging frequency and positive-neutral content reported more somatic complaints. Those high on texting negative talk to or about other people reported more withdrawn depression and somatic complaints. Interesting interactions with gender emerged for being high on text messaging about sex; girls high on sexting tended to report higher levels of somatic complaints than other girls, whereas boys high on sexting reported lower levels of withdrawn depression than other boys.

Given strong fears by policy makers that adolescents may use text messaging with mobile phones for sexting and cyberbullying (Internet Safety Technical Task Force, 2008), it is important that careful coding of text messaging content confirmed our hypothesis that by far the highest proportion of text messaging would be positive or neutral talk. This finding is consistent with the results of survey studies of adolescents' text messages (Lenhart et al., 2010) and content analyses of diaries of young adults (Faulker & Culwin, 2005), but we believe that these results make even more clear that not all texting is negative because this study examined the actual content of text messaging.

Although base rates of most types of negative and antisocial content were low in adolescents' text messaging, variability was high. Though rare, these negative behaviors could relate to adolescents' maladjustment in important ways. For example, a careful analysis of peer deviant talk in adolescents' text messaging with this same sample found that despite fairly low base rates of talk about aggression, rule-breaking, and substance use, proportions of this type of content strongly predicted physical aggression and rule-breaking during the first year of high school (Ehrenreich, et al., in press).

These results also provided support for the hypothesis that the highest proportions of adolescent text messages would be sent to peers. The proportion of text messages sent to parents was low, 3% overall. These findings support theories that text messaging serves as a means of emancipating youth from parents (Ling, 2005) and appeals to adolescents because of their strong developmental needs for close, intimate conversations with peers (Gottman & Mettetal, 1986).

These findings provided minimal support for the hypothesis that girls would be more involved in text messaging than boys. The number of significant gender differences that emerged for text messaging content and recipients barely exceeded the number that would have been expected by chance. Though they should be interpreted with caution, some of the trends that did emerge were consistent with previous research. There was a trend for girls to send more text messaging utterances than boys, which is consistent with the findings of survey studies (Lenhart et al., 2010). There was also a trend for girls to send a greater number of text messages with positive or neutral content than boys. Girls sent more text messages saying "no" to sex than boys did (this was also true for text messaging content examined as proportions).

These findings provided some support for the hypothesis that text messaging content would predict internalizing symptoms at the end of the 9th grade year. Texting negative talk to or about others and text messaging about sex were related to internalizing symptoms in hierarchical regression analysis treating the texting variables as continuous predictors as well as in extreme groups analyses comparing extreme groups to all other participants, though the patterns of findings for texting about sex were different for girls and boys.

The results provided little evidence that texting frequency in and of itself was related to internalizing problems. Although total text units could not be included in the regression models due to extreme multicollinearity with positive texts, in the extreme groups analyses, total text messaging frequency was significantly associated only with somatic complaints. This may be due simply to the fact that sending texts relates to physiological arousal (Lin & Peper, 2009), to awkward neck and wrist positions (Gold et al., 2011) and may interfere with sleep (Van den Bulck, 2003).

These results provided little support for the hypothesis that being high on positive or neutral text messaging might relate to low levels of internalizing symptoms. There was only one trend for frequency of positive or neutral texts to negatively predict anxious depression. In fact, frequency of positive or neutral texts was positively related to somatic complaints, in both the regressions and the extreme groups analyses. Positive or neutral texting was likely related to somatic complains for the same reasons as texting frequency, because the two variables were so highly correlated and the majority of text messages sent were positive or neutral in content.

Texting negative talk to or about others predicted overall internalizing symptoms as well as withdrawn depression. Those high on texting negative talk about others reported more withdrawn depression as well as somatic complaints. Frequently sending text messages that are negative statements about others may relate to several social or behavioral deficits that likely contribute to adolescent depression: co-rumination, excessive reassurance seeking, negative feedback seeking, and negative self-disclosure (Rudolph, 2009).

Text messaging about sex tended to relate to internalizing symptoms, but in different ways for boys and girls, and more of the interactions were significant for the extreme groups analyses than for the hierarchical regressions. The overall pattern was that for girls, texting about sex related to higher levels of overall internalizing symptoms, withdrawn depression, and somatic complaints. These results for girls are consistent with the results of a large survey study that found that adolescent sexting was associated with self-reports of depression, suicidal ideation and attempts, substance use, and romantic partner violence (Dake, Price, Maziarz, & Ward, 2012).

Several interactions emerged between being high on sexting and participant gender, with girls higher on sexting reporting more withdrawn depression and more somatic complaints, but boys higher on sexting reporting significantly lower levels of withdrawn depression and somatic complaints than girls. Sending text messages about sex may be related to somatic complaints more for girls because talking about sex is less typical among girls than among boys (Thorne & Luria, 1986) and may be a source of greater interpersonal stress (Rudolph,

2009), given that youth report that one reason for sexting is the hope of becoming romantically involved (Lenhart, 2009). Sexting may also relate to maladjustment more for girls because they may be more embarrassed if their sexually explicit messages are forwarded: 25% of adolescents report having forwarded sexually explicit cell phone pictures (Strassberg, McKinnon, Sustaita, & Rullo, 2013). Boys in this study who here high on texting about sex actually reported fewer symptoms of withdrawn depression than other boys did. Perhaps for boys, sending explicit messages is associated with social connectedness or maybe even high social status. Given that 20% of adolescents report having sent sexually explicit text messages (Strassberg et al., 2013), more research is needed to understand why sexting may be associated with a greater risk for withdrawn depression and somatic complaints for girls, but decreased risk for boys. It could also be fruitful to examine whether sexting relates to symptoms of other syndromes to which girls and woman are more vulnerable, such as borderline personality disorder.

Limitations

All of the findings of this exploratory study of the content of adolescent text messaging must be considered in light of serious methodological limitations. Although previous research with this same longitudinal sample suggested that adolescent participants used these BlackBerries energetically and communicated openly (Underwood et al., 2012), the possibility remains that participants altered their text messaging communication because they knew it was being monitored. The microcoding system used here was designed as part of a study of origins and outcomes of aggression and antisocial behavior and so focused on finer grained coding of negative communication and thus did not capture nuances of different types of neutral or positive text messaging content. Although adolescents can use text messaging to transmit photographs, our archiving system did not allow us to see the content of those pictures. Clues were available about the participants' relationship to the recipients of text messaging, but the identity of recipients could not always be determined definitively. Some of the kappa coefficients were lower than would be desired. Another limitation was that our baseline measure of depression prior to 9th grade (the Youth's Inventory – 4, Self-Report) was different from the outcome measure collected after 9th grade (the Youth Self-Report from of the Child Behavior Checklist). Some of the models tested accounted for only small proportions of the variance. Some of the observations may have not been independent because a few of the participants attended the same schools and may have been in the same social networks. Last, technology continues to evolve rapidly, so though these results likely generalize to text messaging, they may or may not generalize to other forms of digital communication.

Most importantly, causation cannot be determined from these findings. The fact that particular types of text message content predicted internalizing symptoms does not necessarily mean that text messaging caused an increase in symptoms. Perhaps youth who sent high proportions of text messaging with negative talk about others and about sex were already on a developmental trajectory of increasing internalizing symptoms, and the content of their text messages was just a marker of their increasing symptoms. Future studies should examine whether those following different types of developmental trajectories differ in their use of text messages. Experimental studies could also be useful in determining whether

sending text messages with particular types of content has short term effects on participants' moods.

Still, this initial, exploratory attempt to reveal the hidden world of adolescents' text messages also had methodological strengths. This is the first naturalistic study of the actual content of adolescents' text messaging in their ongoing daily lives with partners of their choosing. Almost all previous studies have relied on adolescents' self-reports, and the few diary studies available required adolescents to record their own text messaging and resulted in small samples of content. This is one of the first studies to examine how content of digital communication relates to internalizing symptoms across an important developmental period, the transition to high school, when depressive symptoms are increasing for some youth (Twenge & Nolen-Hoeksema, 2002). This study included a baseline measure of depression and somatic complaints, to determine whether frequency and content of text messaging related to internalizing symptoms over and above prior symptoms.

Conclusions

This study extends our understanding of adolescents' texts messaging in important ways. Given the fervor with which adolescents use text messaging (Lenhart, 2012) and the fact that they like that it is discreet and outside the scope of parental monitoring (Ling & Yttri, 2002), it is important to know that the large majority of text messages sent by these participants were positive and neutral in content. However, these results also suggest that intense engagement in text messaging may relate to adjustment problems. The number of text messaging units sent by our participants was related to having more somatic complaints over the first year of high school, perhaps due to the physiological wear and tear that text messaging requires and the fact that many participants have their sleep interrupted by text messaging. Still, the content of text messaging matters, because text messaging negative talk about others or about sex predicted increases in internalizing symptoms, especially for girls. This initial, exploratory attempt to examine the hidden world of adolescent text messaging shows that what adolescents say in their text messaging matters for their psychological adjustment. Adolescents prefer text messaging because "When I text, I can say just what I want to say" (Lenhart et al, p.48) to close friends and romantic partners. Youth are so desperate to send and receive text messages that one in three has endangered his or her life by texting while driving (CDC, 2012). We who seek to understand adolescents' social relationships and developmental psychopathology ignore text messaging at our peril.

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Appendix

Content Codes, Reliabilities, and Examples

Code	Kappa	Definition and Example
Positive or neutral	.66	Positive or neutral talk about people, occurrences, or events, “Tina was telling all the girls how hot you looked.”, “My mom is going to pick me up at 7.”
Negative Talk	.70	Negative utterances about to or about people, “You're so lame”, “Tim's really stupid.”
Social Exclusion	.69	Utterances that exclude or plan to exclude specific people or groups, “I didn't invite Sarah.”
Friendship Manipulation	.75	Interfering with others’ relationships for personal gain or using relationships as leverage with which to gain control, “You need to stop hanging out with the Goths, or we're not gonna be friends anymore.”
Defend/Avoid Social Aggression	.67	Utterances that defend the target of social aggression or avoid social aggression, “You shouldn't talk about her like that.”
Antisocial	.88	Discussion of behaviors that involve lying to authority figures, intentional rule breaking, or breaking the law, “After my parents go to bed, I'll slip out.”
Negative Physical	.75	Utterances about engaging in physical violence or threats of violence, “Trish and I got into a brawl at lunch.”, “I kicked his ass.”
Property Crime	.93	Discussion of engaging in or planning harm to another's property, “Rick, Steve, and I egged Mr. Newcombe's house.”
Acquiring Substances	.93	Utterances about acquiring or helping someone else acquire drugs, “Can I get some weed from you?”, “What do I need if I want to make meth?”
Using Substances	.83	References to having used, currently using, or planning or wanting to use drugs, “I was sooo stoned Saturday”, “Wanna come over and smoke a bowl?”
Saying No to Substances	.83	Declining to engage in substance use, or negatively assessing substance use, “Smoking weed is only going to get in the way of your future.”, “Users are losers.”
Hypothetical Sex	.68	Discussing sexual behaviors that have not actually occurred, “You should come over after school so we can have sex.”, “When I get to college, I'm gonna hook up with girls every night.”
Actual Sex	.62	Utterances about sexual behaviors that they have engaged in or are currently engaging in, “After the party on Thursday, Jenny and I did it.”, “{In the context of a discussion of masturbation} “My hands are back in motion now.”
Saying No to Sex	.54	Refusing to engage in a sexual behavior or discussing the fact that they have not yet engaged in a particular behavior, “I'm a virgin.”, “I don't put weenies in my mouth.”

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Table 1

Mean Proportions of Text Messages Sent to Different Recipients

	Mean	Standard Deviation	Min.	Max.	Gender Differences
Peers	0.70	0.30	0	1.00	n.s.
Romantic Partners	0.21	0.29	0	1.00	n.s.
Parents	0.03	0.10	0	0.78	n.s.
Siblings	0.01	0.04	0	0.39	Boys (*M* = .017) > Girls (*M* = .005), p<.05
Other Family	0.003	0.02	0	0.17	n.s
Teachers	0.001	0.02	0	0.23	n.s
Other Adults	0.001	0.01	0	0.13	n.s
Strangers	0.00	0.004	0	0.05	n.s
Unknown	0.02	0.07	0	.67	n.s

Table 2

Mean Frequencies and Proportions of Text Messaging Content

	Mean	Standard Deviation	Min.	Max.	Gender Differences	Mean Proportion	Standard Deviation	Min.	Max.	Gender Differences
Total Text Message Units	241.40	225.12	3	1172	Girls (*M* = 271)>Boys (*M* = 215),p=. 10					
Positive/Neutral Talk	179.98	162.21	2	773	Girls (*M* = 202.73)>Boys (*M* = 160.1), p=.09	.77	.11	.38	1	n.s.
Negative Talk	35.01	42.84	0	238	n.s.	.14	.090	0	.41	n.s.
Social Exclusion	0.91	2.09	0	13	n.s.	.003	.007	0	.05	n.s.
Friendship Manipulation	0.51	1.83	0	15	n.s.	.002	.006	0	.05	n.s.
Defend/Avoid Social Aggression	0.25	0.66	0	4	n.s.	.001	.002	0	.02	n.s.
Antisocial	1.03	2.78	0	20	n.s.	.003	.008	0	.05	n.s.
Negative Physical	0.94	3.05	0	30	n.s.	.003	.008	0	.08	n.s.
Property Crime	0.12	0.64	0	6	n.s.	.001	.003	0	.04	n.s.
Acquiring Substances	0.77	5.57	0	70	n.s.	.002	.009	0	.08	n.s.
Using Substances	1.22	6.23	0	64	n.s.	.003	.013	0	.13	n.s.
Saying No to Substances	0.20	0.91	0	7	n.s.	.001	.003	0	.02	n.s.
Hypothetical Sex	3.82	8.76	0	70	n.s.	.010	.020	0	.11	n.s.
Actual Sex	1.60	4.27	0	28	n.s.	.005	.010	0	.10	n.s.
Saying No to Sex	1.04	8.76	0	70	Girls (*M* = 1.81) > Boys (*M* = 0.35), p<.05	.002	.006	0	.05	Girls (*M* = .004) > Boys (*M* = .001), p<. 01

Table 3

Correlations between Frequency of Text Messaging and 9th Grade Internalizing Symptoms

	Internalizing	Anxious Depression	Withdrawn Depression	Somatic Complaints	M (SD)
Total Text Units	.16^{t}	.10	.10	.26**	241.40 (225.12)
Positive/Neutral	.13	.07	.07	.22**	179.98 (162.21)
Negative Talk	.20	.16*	.13	.25**	35.01 (42.84)
Sex Talk	.18*	.18*	.14	.28**	5.42 (12.26)
M (SD)	3.15 (1.19)	2.09 (.82)	1.92 (.65)	5.69 (1.79)	

* $p \leq .05$

** $p < .01$

^{t} $p < .10$

Table 4

Text Message Frequencies of Content as Predictors of Youth-Reports of 9th Grade Internalizing Symptoms

	Internalizing Syndrome		Anxious Depression		Withdrawn Depression		Somatic Complaints	
	ΔR²	**β**	**ΔR²**	**β**	**ΔR²**	**β**	**ΔR²**	**β**
Step 1	.15**		.12**		.13**		.20**	
Male		−0.04		0.01		−0.04		0.05
8th Grade Internalizing		0.37**		0.34**		0.35**		0.41**
Positive/Neutral Talk		0.08		0.02		0.03		0.18*
Step 2	.04*		.04*		.02t		.04*	
Male		−0.05		0.00		−0.05		0.04
8th Grade Internalizing		0.37**		0.35**		0.36**		0.41**
Positive/Neutral Talk		−0.11		−0.17		−0.12		0.01
Negative Talk		0.28*		0.24t		0.20		0.16
Sex Talk		0.01		0.06		0.03		0.12
Step 3	.03		.01		.04		.02	
Male		−0.03		0.02		−0.11		0.07
8th Grade Internalizing		0.35**		0.33**		0.33**		0.39**
Positive/Neutral Talk		−0.20		−0.26t		−0.19		0.00
Negative Talk		0.39*		0.37*		0.14		0.15
Sex Talk		0.10		0.10		0.18		0.23t
Male X Positive/Neutral Talk		0.20		0.19		0.16		0.05
Male X Negative Talk		−0.12		−0.19		0.15		0.07
Male X Sex Talk		−0.24t		−0.12		−0.32*		−0.25t
Total R^2	.22**		17**		.19**		.31**	

Males were coded as 1 and females as 0.

* $p \leq .05$

** $p < .01$

† $p < .10$