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The Role of Compulsive Texting in Adolescents' Academic Functioning

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Text messaging has increased dramatically among adolescents over the past 10 years. Many researchers have cited potential consequences associated with a high frequency of texting and problematic texting behaviors. This study examines the relations among frequency of texting, a specific type of problematic texting (i.e., compulsive texting), and adolescents' academic achievement and attitudes about school. Adolescents in 8th ($n = 211$) and 11th ($n = 192$) grades participated in this study. Results indicated that, as hypothesized, teens' compulsive texting was significantly positively related to their frequency of texting and negatively related to their grades, school bonding, and perceived scholastic competence. It is noteworthy that the negative relation between compulsive texting and academic functioning held true only for females and not for males. Actively preventing or reducing compulsive texting may ameliorate the potential effects of texting on academic adjustment in adolescents.

Keywords: texting, text messaging, media effects, compulsive texting, academic functioning

Adolescents' texting far surpasses their use of any other modes of communication with others, including face-to-face interactions outside of school; they send and receive an average of 167 texts per day, with the median number of daily texts rising from 50 to 60 since 2009 (Lenhart, 2012). Given the importance of social connections during adolescence, it is no surprise that applications serving social functions are popular among adolescents. Indeed, text messaging has become a premier mode of communication

among teens in the past decade. Texting has evolved to be cheaper and easier to use over time, and in turn, its use has increased.

Despite its increase, texting among adolescents has not been a significant focus of research. Studies on texting have primarily focused on both the desirable and undesirable correlates of frequency of use (Harman & Sato, 2011; Junco & Cotten, 2012; Lepp, Barkley, & Karpinski, 2014; Rosen, Carrier, & Cheever, 2013). While important, considering frequency alone ignores many other significant components of texting. For example, potentially addictive qualities of texting, or compulsive texting, may be a better predictor of functioning deficits in adolescents. A specific deficit of interest is in academic functioning, as recent research largely has found a negative relation between frequency of media use and academic performance.

It is expected that the frequency and compulsion of texting will relate to one another and that, consistent with research on other media use, teens' compulsive texting will negatively relate to their academic adjustment. In this study, we examine the relations among adoles-

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cents' frequency of texting, compulsive texting, and three components of academic functioning (i.e., grades, school bonding, and perceived scholastic competence). We also describe the development of a measure of compulsive texting, the Compulsive Texting Scale.

Adolescents' Compulsive Behaviors

Compulsive behaviors among adolescents have long been a concern for parents and teachers. Teens have demonstrated behavioral addictions to multiple stimuli, including food (Meule, Hermann, & Kübler, 2015), gambling (Peters et al., 2015), gaming (Donati, Chiesi, Ammannato, & Primi, 2015), shopping (Martinotti et al., 2011), sex (Sussman, 2007), and Internet use (Beard, 2005; Caplan, 2007). Given that limited research has been conducted on teens' compulsive use of mobile phones, a brief review of teens' compulsive Internet use is warranted before shifting attention to texting specifically.

Caplan (2007) referred to the phenomenon of teens' compulsive Internet use as "problematic internet use" and described it as a multidimensional syndrome consisting of cognitive and behavioral symptoms that result in negative social, academic, and professional consequences. Approximately 4% of teens in the United States are considered problematic Internet users (Liu, Desai, Krishnan-Sarin, Cavallo, & Potenza, 2011). Young (1998, 2004) applied pathological gambling criteria to "internet addiction," including but not limited to preoccupation with the Internet, the need to use the Internet with increasing amounts of time to achieve satisfaction, an inability to cut back Internet use, depressed or irritable mood when attempting to cut back Internet use, longer use of the Internet than intended, and use of the Internet to escape from problems. It is a point of debate whether Internet addiction should be considered its own psychiatric disorder with specific diagnostic criteria. Although it is not currently included in the Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition (*DSM-5*; American Psychiatric Association, 2013), Internet gaming disorder is listed as a condition that is under consideration but requires further research before it will be included as a formal disorder. Beard (2005) noted that regardless of whether it is considered its own disorder, many people are

developing a harmful dependence on the Internet which relates to their social, educational, and occupational functioning. He proposed that the more time a person spends on the Internet and the greater the availability of the Internet, the more prone he or she is to developing an Internet addiction. This idea is particularly salient when applied to texting, as mobile phones are more easily accessible than computers. Beard (2005) also suggests that expectations and peer pressure from friends to participate in online activities may contribute to people's problematic Internet use, which may be particularly true for youth and their texting behaviors.

It is probable that teens' compulsive texting shares features with their compulsive Internet use given that both enable social interactions and have similar reasons for use, such as allowing for rapid text-based communication that promotes multitasking. It is possible that individuals are drawn to and thus become addicted to the same communicative properties present on the Internet and in texting.

Adolescents' Texting

Prevalence of Texting

In the last half decade, mobile phones have replaced landlines as people's first line of telephone communication, and the advent of unlimited voice and texting plans has contributed to increased texting across age-groups. Texting has become teens' preferred method of communication (Chóliz, 2012; Tulane & Beckert, 2013). In strengthening friendships and experimenting with romantic relationships, teens seek opportunities for private communication with their peers, and texting supports this desire. Teens now have a private, text-based world in which they can communicate, largely away from their parents' and teachers' supervision. According to the Pew Internet & American Life Project (Lenhart, 2012), three quarters of teens own mobile phones with approximately one quarter owning a smartphone. Sixty-three percent of teens report texting on a daily basis, as compared to the other highest rates of alternative daily communication including 39% engaging in voice calls on mobile phones, 35% socializing face-to-face outside of school, and 29% exchanging messages through social media sites (Lenhart, 2012). Additionally, female

texters endorse a median of 100 texts per day as compared to males' 50 texts per day (Lenhart, 2012). Recently, Murdock (2013) has shown that the combination of high frequency of texting and experiencing interpersonal stress is related to lower levels of emotional well-being. Similar research is needed on the association of compulsive texting and functioning.

Compulsive Texting

Like Internet addiction, compulsive texting has been referred to by several terms in previous literature, including "addiction" and "problematic use" (i.e., use that involves additional negative or risky components of texting, such as texting while driving, sexting, and bullying through texts). Recent studies of problematic texting have noted its relation to similar behavioral addictions and asserted that problematic mobile phone use may present a public health concern (Martinotti et al., 2011). Researchers in Spain (Chóliz, 2012), Korea (Kwon, Kim, Cho, & Yang, 2013), Great Britain (López-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014), and Italy (Martinotti et al., 2011) have attempted to measure problematic mobile phone use through various questionnaires. While several questions on these measures relate specifically to compulsive texting, many frequency of use questions and queries about other uses of mobile phones beyond texting are included as well.

For the purposes of this study, the term "compulsive texting" will be used to describe this construct, as it is one contributing factor to "problematic use." Compulsive texting is more complex than frequency of texting. Not only is the frequency, or amount, of time people spend texting related to their compulsive use, but their thoughts, feelings, and behaviors related to texting are involved as well. Compulsive behaviors involve, but are not limited to, themes of trying and failing to cut back on the frequency of the behavior, becoming defensive when challenged about the frequency of the behavior, and feeling frustrated when the behavior cannot occur. Compulsive texting can be defined as a behavioral dependence on maladaptive patterns of texting. Because research has shown that other compulsive behaviors impact teens' academic functioning, an examination of

the association between compulsive texting and academic adjustment is warranted.

Texting and Academic Functioning

Adolescence is a crucial developmental period for behavioral, cognitive, and emotional growth (Berk, 2012). Fredricks, Blumenfeld, and Paris (2004) reported that these areas of growth relate to the developmental needs of teens in regard to their academic performance, feelings of academic competence, and sense of "school relatedness" (i.e., the emotional quality of a caring and supportive teacher–student relationship). Thus, academic functioning is a vital topic of interest when considering its relation to adolescents' texting behaviors. Recently, researchers have called for further examination of the relation between texting and academic functioning, because school is a "major component of social life and development" for high school texters (Tulane & Beckert, 2013, p. 402). Academic functioning includes, but is not limited to, grades, school bonding, and perceived scholastic competence. Grades that students earn in the classroom are a direct indicator of their academic achievement. In addition, school bonding relates to the connections youth have with their school and academic lives (Maddox & Prinz, 2003). Perceived scholastic competence consists of teens' perceived cognitive competence as applied to schoolwork and their beliefs regarding their comparative level of intelligence (Harter, 1988). It is unknown whether compulsive texting is associated with grades, school bonding, and perceived academic competence.

Frequency of Texting and Academic Functioning

Texting has the potential to impact study skills and performance in the classroom. Middle school, high school, and college students spend <6 min on average attending to their studies before being distracted by social media and texting (Rosen et al., 2013). Adolescents in particular view texting in school and during other social interactions (e.g., while spending time with friends) as more appropriate and acceptable than do college students (Tulane & Beckert, 2013).

Recent research largely has found a negative relation between frequency of media use and academic performance. More specifically, in one study of adolescent Hispanic and African American regular Facebook users, the authors reported a significant negative relation between time spent on Facebook and their math scores (Lee, 2014). Similarly, research has demonstrated a negative relation between texting and overall GPA (Harman & Sato, 2011; Lepp et al., 2014) and a negative relation between frequency of texting while doing schoolwork and GPA in college students (Junco & Cotten, 2012). Results from similar media studies highlight the potential interference associated with multitasking while using media; for example, there is evidence that frequent Facebook users engage in high levels of multitasking and subsequently study fewer hours per week and earn lower grades than do nonregular Facebook users (Kuss & Griffiths, 2011).

Texting while multitasking has the potential to similarly impact the grades of regular texters. As in-class texting increases, the level of detail in students' notes and their ability to recall specific details from the lecture decreases (Kuznekoff & Titsworth, 2013). In an experimental study of college students, those who did not text during a lecture significantly outscored the group who texted during the lecture on a quiz of retention and comprehension of the lecture content (Gingerich & Lineweaver, 2014). Another potential contributing factor for the relation between frequency of texting and poorer academic performance is related to adolescents' sleep behaviors (Van den Bulck, 2003). Murdock (2013) found that a higher number of daily texts is significantly associated with an increase in sleep problems. It is plausible that frequent awakening due to receipts of incoming text messages or staying awake longer than intended in order to text may impair adolescents' functioning, including academic functioning, during the day.

Compulsive Texting and Academic Functioning

There is much research regarding the relation between compulsive behaviors and academic functioning. Skoric, Teo, and Neo (2009) reported that children's frequency of playing video games is not related to their scholastic

performance, but video game players' addiction tendencies are negatively related to their scholastic performance. Excessive Internet users delay their schoolwork and lose sleep to spend time online, thus impacting their academic functioning (Nalwa & Anand, 2003). Despite a clear focus on the relation of compulsive substance use and other compulsive behaviors with academic functioning in previous research, little research has focused on the relation between compulsive texting and academic functioning.

Nathan and Zeitzer (2013) touched on this notion by highlighting teens' sleepiness and its relation with compulsive texting. They found that teens' frequency of texting is not associated with their level of sleepiness. However, sleepiness is associated with teens feeling a need to be accessible via their mobile phone at all times and past attempts at reducing their mobile phone use, both indicators of compulsive use. These students also stayed up later to use their phone for both texting and calling (Nathan & Zeitzer, 2013). While not indicated by the researchers, it is presumable that students' sleepiness during the day corresponds with a lower ability to pay attention and perform to their highest ability in the classroom. Beyond Nathan and Zeitzer's study, research regarding teens' compulsive texting and its relation with academic adjustment is limited, and attention to this area is warranted in the present study.

Present Study

The first objective of this study is to develop a measure to assess adolescents' compulsive texting. Young's Internet Addiction Test (IAT; Young, 1998), a 20-item scale that was originally adapted from a gambling addiction scale to assess Internet addiction, is modified in this study to assess adolescents' compulsive texting.

The second goal of this study is to describe characteristics of frequency of texting and compulsive texting, in addition to potential demographic differences. It is predicted that there will be a significant positive relation between texting frequency and compulsive texting. It also is hypothesized that, consistent with Lenhart's (2012) research, females will endorse greater frequency of texting compared to males. Gender differences in compulsive texting are not hypothesized but will be explored.

The third aim of this study is to examine the relation between compulsive texting and academic functioning. The academic variables of interest are grades, school bonding, and perceived academic competence. Given the previously identified negative correlations between compulsive behaviors and academic adjustment, it is hypothesized that higher levels of compulsive texting will correlate with poorer grades, lower school bonding, and lower perceived scholastic competence. Gender will be explored as a potential moderator of the relation between compulsive texting and academic achievement.

Method

Participants and Procedures

Given the increase in texting among junior high and high school populations, we surveyed students in Grades 8 and 11. Our sample came from schools in a semirural town in the Midwest (one junior high and one high school in the same school district). All procedures were approved by the authors' University's institutional review board. A letter describing the study was sent home to parents of all potential 8th ($n = 244$) and 11th ($n = 230$) grade participants, and a waiver of parental consent was utilized because of the innocuous nature of the survey and the anonymity of the participants. Students were asked to complete a survey that assessed aspects of texting and school adjustment (see below) and demographic questions. A total of 403 students (211 females, 192 males) participated in the study, with 211 participants ($M = 13.81$ years, $SD = 0.53$ year) from the 8th grade (99 males and 112 females) and 192 participants ($M = 16.82$ years, $SD = 0.48$ year) from the 11th grade (93 males, 99 females), representing an 85% response rate. Most students came from households with two parents ($n = 267$, 68%) and were primarily Caucasian ($n = 331$, 83%), which was representative of the demographic characteristics of the student population in the district.

Measures

Demographic questions. To characterize the sample and identify potential demographic differences in texting, demographic information

was requested, including gender, grade in school, race/ethnicity, and family structure (i.e., with whom did the child primarily reside).

Texting frequency. Text messaging frequency was assessed with the item, "About how many text messages do you send in a day," with 12 response options ranging from 1 = "zero" to 12 = "over 100." The number of days per week that participants texted also was assessed, in order to exclude participants who did not text at least one day per week.

Compulsive texting. Young's IAT (Young, 1998) was adapted to assess youth's compulsive texting. Young's IAT assessed the degree to which people's Internet use affects their daily routine, social life, productivity, sleeping pattern, feelings, and cognitions. The IAT was originally based on a compulsive gambling measure, and items were created by changing the words "gambling" or "substance" to "internet" (Ng & Wiemer-Hastings, 2005). Widyanto and McMurran (2004) examined the psychometric properties of the IAT and found six factors of Internet addiction: salience, excessive use, neglecting work, anticipation, lack of self-control, and neglecting social life. Scales derived from these factors were found to have adequate internal consistency (α 's ranging from .54 to .82; Widyanto & McMurran, 2004). Potential compulsive use items from the IAT were carefully considered in order to be differentiated from frequency of use and adjustment items, including academic adjustment. In order to avoid confounding variables that potentially could arise from using all of the original Internet addiction items in conjunction with the academic adjustment items, those that appeared to overlap (e.g., "How often do your grades or school work suffer because of the amount of time you spend online?") were eliminated from the compulsive use section.

After this elimination process, the resulting Compulsive Texting Scale contained 14 items (see Table 1 for items and associated means) adapted from the IAT. Each item began with the stem, "Please tell us how you feel about the following statements." Sample items included: "How often do you find that you text longer than you intended?" "How often do you check your texts before doing something else that you need to do?" "How often do you try to cut down the amount of time you spend texting and fail?" and "How often do you find yourself frustrated

Table 1
Factor Loadings in a Principal Components Analysis of the Compulsive Texting Scale

Compulsive Texting Scale items	Component			Mean (SD)
	1 Interference	2 Cognitive preoccupation	3 Concealment	
1. Not do your chores to spend more time texting	.63	.50	.24	1.92 (1.01)
2. Text longer than you intended	.70	.40	.26	2.83 (1.17)
3. Others complain to you about the amount of time you spend texting	.73	.38	.51	2.23 (1.18)
4. Check your texts before doing something else that you need to do	.77	.44	.17	3.45 (1.22)
5. Become defensive or secretive when anyone asks you about your texting	.70	.28	.44	2.21 (1.11)
6. Find yourself frustrated because you want to text but you have to wait	.57	.70	.31	2.09 (1.16)
7. Fear that life without texting would be boring and unhappy	.40	.76	.20	1.89 (1.17)
8. Snap, yell, or act annoyed if someone bothers you while you are texting	.36	.58	.52	1.57 (.86)
9. Lose sleep due to texting	.60	.43	.25	1.92 (1.09)
10. Feel preoccupied with texting or fantasize about texting	.38	.73	.23	1.58 (.90)
11. Find yourself saying "just a few more minutes" when texting	.47	.76	.34	1.90 (1.06)
12. Try to cut down the amount of time you spend texting and fail	.26	.45	.56	1.68 (.99)
13. Try to hide how much you have been texting	.40	.21	.80	1.53 (.97)
14. Lied to others to cover up the amount of time you have been texting	.29	.28	.83	1.31 (.71)
% of Variance	36.50%	9.34%	7.84%	
Eigenvalue	5.11	1.31	1.10	

Note. Promax with Kaiser Normalization rotation method used requesting Eigenvalues > 1.0. Highest factor loadings (correlations between the item and the factors) per item are bolded. Question stem is "How often do you . . ." Scale: 1 = *Never*, 2 = *Hardly ever*, 3 = *Sometimes*, 4 = *Most of the time*, and 5 = *Always*.

because you want to text but you have to wait?" The response options were on a 5-point scale ranging from 1 = *never* to 5 = *always*.

Academic adjustment. Academic adjustment was assessed in three areas: grades, school bonding, and perceived scholastic competence. Adolescents self-reported their grades in school. They were asked what grades they usually earned, and the response options ranged from 1 = "mostly F's" to 9 = "mostly A's." Higher scores indicate higher grades.

School bonding items assessed youths' attitudes toward school. The three items (i.e., "At school, I try as hard as I can to do my best work," "I care how I do in school," "I feel bored at school") were derived from Jenkins (1997) and displayed satisfactory internal consistency ($\alpha = .68$). Response options ranged on a 5-point scale from 1 = *always* to 5 = *never*. The coefficient alpha for the school bonding items in the present study was .66. Two of the items were reverse-coded as necessary, and a mean score was obtained, with higher scores indicating higher levels of school bonding.

Scholastic competence was assessed by administering an adapted version of the scholastic competence subscale of the *Harter Self-Perception Profile for Adolescents* (Harter, 1988), which assessed adolescents' perceived competence in several areas of functioning. The scholastic competence subscale consisted of five items that involved pairs of opposing statements describing a particular belief (e.g., "Some teenagers feel that they are just as smart as others their age BUT other teenagers aren't so sure and wonder if they are as smart"). On the original measure, students chose which teenager was more like them and to what extent, ranging from "really true for me" or "sort of true for me," for a total of four response options. For the purposes of this study, the questions were adapted to offer a 5-point response option scale ranging from 1 = *always* to 5 = *never*. For example, the original item described above was reworded as "Some teenagers feel that they are just as smart as others their age but other teenagers aren't so sure and wonder if they are as smart. Do you feel that you are just as smart as others your age?" The five items assessed whether a student felt competent in meeting the demands of school. The internal consistency reliabilities of this subscale ranged from $\alpha = .62$ to $.79$ across the sample (Harter, 1988). In

the present study, after reverse-coding necessary items so that higher scores reflected higher perceptions of academic competence, the coefficient alpha was .81.

Results

Descriptive Statistics

Participants consisted of 403 adolescents, including 47 who indicated that they did not text at least one day a week (i.e., "non-texters") and were thus excluded from all analyses. The 47 nontexters were almost equally split between males and females and were predominantly eighth graders ($n = 33$), Caucasian ($n = 41$), and from households with two parents ($n = 36$). The remaining 356 students' responses were used for the subsequent analyses.

Demographic differences in frequency of texting and compulsive texting also were explored (see Table 2 for ranges, group means, and standard deviations of frequency of texting and compulsive texting). Consistent with Lenhart's (2012) research, it was hypothesized that females would endorse greater frequency of texting compared to males. Contrary to the hypothesis, there was no significant difference between males' ($M = 7.99$, $SD = 3.64$) and females' ($M = 8.60$, $SD = 3.53$) frequency of texting as measured by the number of texts sent, $t(354) = -1.62$, $p = .11$. Although there was not a hypothesis regarding gender differences in compulsive texting, potential differences were explored. There was a significant difference between males' ($M = 1.81$, $SD = 0.54$) and females' ($M = 2.18$, $SD = 0.67$) levels of compulsive texting, such that females endorsed significantly higher levels of compulsive texting than did males $t(354) = -5.73$, $p < .01$, indicating that gender should be considered in further analyses regarding compulsive texting. There were no significant differences found by grade, race, or family structure (p 's $> .05$).

Relations Among the Major Study Variables

Preliminary analyses. A principal components analysis was computed for the 14 Compulsive Texting Scale items (see Table 1). Three components (i.e., interference with tasks, cognitive preoccupation, concealment) had eigen-

Table 2
Means and Standard Deviations of Frequency of Texting and Compulsive Texting Across Demographic Groups

Texting variables	Potential range of scores	Actual range of scores	Overall		Males		Females		8th graders		11th graders		Caucasian		Not Caucasian		Intact family		Not intact family		
			<i>M</i>	<i>(SD)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>	<i>(n)</i>
Texts sent per day ^{a,b}	1-12	1-12	8.31 (3.59)	7.99 (3.64)	8.60 (3.53)	8.25 (3.62)	8.37 (3.57)	8.43 (3.50)	7.76 (4.04)	8.10 (3.59)	8.74 (3.54)	8.10 (3.59)	8.74 (3.54)	8.10 (3.59)	8.74 (3.54)	8.10 (3.59)	8.74 (3.54)	8.10 (3.59)	8.74 (3.54)	8.10 (3.59)	8.74 (3.54)
Compulsive texting ^c	1-5	1-4.29	2.01 (.64)	1.81 (.54)	2.18 (.67)	2.04 (.69)	1.97 (.57)	2.00 (.62)	2.05 (.71)	1.93 (.56)	2.14 (.73)	2.05 (.71)	2.05 (.71)	2.05 (.71)	2.05 (.71)	1.93 (.56)	2.14 (.73)	1.93 (.56)	2.14 (.73)	1.93 (.56)	2.14 (.73)

^a Response options: 1 = none, 2 = 1-5, 3 = 6-10, 4 = 11-15, 5 = 16-20, 6 = 21-30, 7 = 31-40, 8 = 41-50, 9 = 51-65, 10 = 66-80, 11 = 81-100, 12 = over 100. ^b Number of texts received also were assessed and correlated strongly with number of texts sent ($r = .97, p < .01$); therefore, only number of texts sent were used in these analyses. ^c Response options: 1 = *Never*, 2 = *Hardly ever*, 3 = *Sometimes*, 4 = *Most of the time*, 5 = *Always*.

values greater than 1, but all of the items loaded between .26 and .77 on the first factor, which accounted for 36.5% of variance, with an eigenvalue of 5.11. There were moderate significant intercorrelations among the three components (see Table 3): interference with tasks and cognitive preoccupation, $r(356) = .63, p < .01$; interference with tasks and concealment, $r(356) = .46, p < .01$; cognitive preoccupation and concealment, $r(356) = .44, p < .01$. Therefore, the 14 Compulsive Texting Scale items were considered together as one factor, compulsive texting. A mean compulsive texting score was calculated, with higher scores indicating greater endorsement of compulsive texting. High internal consistency was found on the Compulsive Texting Scale ($\alpha = .86$).

Regarding the academic functioning measures, there were moderate significant correlations among reported grades, school bonding, and scholastic competence (see Table 3): grades and school bonding, $r(399) = .45, p < .01$; grades and scholastic competence, $r(400) = .54, p < .01$; school bonding and scholastic competence, $r(401) = .33, p < .01$. Analyses were conducted separately for each academic adjustment variable, and the results did not substantially change (see below). The items were standardized and combined into one overall academic adjustment variable, with higher scores indicating better academic adjustment.

The relation of texting frequency with compulsive texting and academic functioning. It was predicted that there would be a significant positive relation between texting frequency and compulsive texting. As expected (see Table 3), frequency of texting was positively related to compulsive texting, $r = .54, p < .01$. Frequency of texting was negatively related to academic functioning, $r = -.19, p < .01$.

Compulsive texting and academic functioning. It was predicted that greater compulsive texting would correlate with poorer academic functioning. As expected (see Table 3), compulsive texting was negatively related to academic adjustment (overall academic adjustment: $r = -.18, p < .01$; GPA: $r = -.11, p < .05$; bonding: $r = -.12, p < .05$; competence: $r = -.21, p < .01$).

Next, we examined whether gender moderated any effects for compulsive texting on academic functioning. A hierarchical linear multi-

Table 3
Correlations Among Frequency of Texting, Compulsive Texting, and Academic Adjustment Variables

Texting and academic variables	1	2	3	4	5	6	7	8	9
1. Texting frequency	—								
2. Compulsive texting	.54**	—							
3. Interference	.60**	.91**	—						
4. Preoccupation	.38**	.86**	.63**	—					
5. Concealment	.23**	.66**	.46**	.44**	—				
6. Academic adjustment	-.19**	-.18**	-.16**	-.21**	-.04	—			
7. GPA	-.15**	-.11*	-.07	-.16**	-.00	.84**	—		
8. Bonding	-.14**	-.12*	-.16**	-.11*	.04	.75**	.45**	—	
9. Competence	-.10	-.21**	-.15**	-.23**	-.14**	.79**	.54**	.33**	—

* $p < .05$. ** $p < .01$.

ple regression was computed with overall academic adjustment as the dependent variable (see Table 4). At Step 1, gender, texting frequency, and overall compulsive texting were entered simultaneously and accounted for a significant 7% of the variance in predicting academic adjustment. Within that step, gender ($\beta = .18, p < .01$) and compulsive texting ($\beta = -.20, p < .01$) each significantly predicted academic adjustment, while texting frequency did not. Females had higher levels of academic adjustment than males, and students with higher levels of compulsive texting exhibited lower levels of academic adjustment. At Step 2, the interaction of gender and compulsive texting contributed a significant additional 2% of the variance above and beyond the contribution of the variables in Step 1; within that step, the interaction of gender and compulsive texting significantly predicted academic adjustment ($\beta = -.13, p < .05$). The significant interaction in Step 2 indicates that the interaction of gender and compulsive texting accounts for unique variance over and above what was accounted for at Step 1 and that the relation between compulsive texting and academic functioning was significantly different for males and females.

To test the nature of the significant interaction, post hoc probing was conducted, following Holmbeck (2002). Simple regressions were computed at different levels of the moderator (i.e., separately for males and females), with the resulting regression coefficients indicating the simple slopes of the regression lines predicting academic functioning for males and females, respectively. As depicted in Figure 1, the resulting slopes (i.e., stan-

dardized regression coefficients) are listed beside each line displaying the relation between compulsive texting and academic functioning for males and females. Post hoc probing of the interaction effect indicated that compulsive texting was significantly negatively correlated with academic adjustment for females, but not for males (see Figure 1).

As noted, analyses were computed separately for each of the three academic adjustment variables. The interaction of gender and compulsive texting was associated with grades and school competence in the same way as just reported for overall academic functioning. While this interaction was not significantly associated with school bonding, it was in the same direction of effect.

We also computed the regression analyses using the individual subscales of the compulsive texting measure (i.e., interference, cognitive preoccupation, concealment); these results are included in Table 4. In general, the results did not substantially change, lending support for combining the subscales into one composite score. Both the interactions of gender and interference with tasks and gender and concealment were associated with overall academic adjustment. While the interaction of gender and cognitive preoccupation was not significantly related to academic functioning, it was in the same direction of effect.

Discussion

This study examined the relation between compulsive texting and academic adjustment in a sample of adolescents. As expected, the majority of teens reported engaging in text mes-

Table 4
Hierarchical Regressions Predicting Academic Adjustment

Predictors	Overall compulsive texting		Interference		Cognitive preoccupation		Concealment	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.07		.06		.09		.05	
Gender		.18**		.17**		.19**		.14*
Texting frequency		-.08		-.09		-.10		-.17**
Compulsive texting factor ^a		-.20**		-.15*		-.23**		-.02
		$F(3, 352) = 8.87**$		$F(3, 352) = 7.25**$		$F(3, 352) = 10.98**$		$F(3, 352) = 5.60**$
Step 2	.02		.01		.01		.02	
Gender × Compulsive texting factor		-.13*		-.10*		-.07		-.15**
		$F(4, 351) = 8.16**$		$F(4, 351) = 6.47**$		$F(4, 351) = 8.69**$		$F(4, 351) = 6.41**$

Note. *F* values and betas are those obtained in the individual step in each analysis. Coding for gender: 1 = males, 2 = females.

^a Compulsive texting factor = overall compulsive texting, interference, cognitive preoccupation, or concealment.

* $p < .05$. ** $p < .01$.

saging regularly. This study is the first to identify compulsive texting as a significant correlate of poor academic adjustment; compulsive texting was negatively related to academic adjustment, but only for females.

Compulsive Texting Scale

There was a need for a measure of compulsive texting similar to measures that have been developed for compulsive Internet use. The Compulsive Texting Scale was modeled based on the Internet Addiction Test (Young, 1998). A principal components analysis of the 14 Compulsive Texting Scale items revealed three components, which we labeled “interference with tasks” (e.g., “Not do your chores to spend more time texting”), “cognitive preoccupation” (e.g., “Find yourself frustrated because you want to text but you have to wait”), and “concealment” (e.g., “Try to hide how much you have been texting”). While some of these factors overlapped somewhat with the IAT factors (e.g., three cognitive preoccupation items were represented in the five IAT “salience” items, three interference with tasks items were represented in the five IAT “excessive use” items; Widyanto & McMurrin, 2004), there was not perfect overlap. Interestingly, the three “lack of control” items from the IAT loaded separately on each of the three factors of the Compulsive Texting Scale, indicating that replacing the IAT factors with new factor names in the Compulsive Texting Scale was necessary.

As previously stated, high internal consistency was found on the Compulsive Texting Scale, and the subscale reliabilities were adequate. The overall compulsive texting score correlated with other variables (e.g., texting frequency) with which one would expect it to correlate, supporting construct validity.

Frequency of Texting, Compulsive Texting, Academic Adjustment, and Gender Differences

In this study, while there was no significant difference between males’ and females’ frequency of texting, females endorsed compulsive texting at a significantly higher level than did males. One aspect of teens’ social development centers on gender differences in communication. Females generally experience a stronger

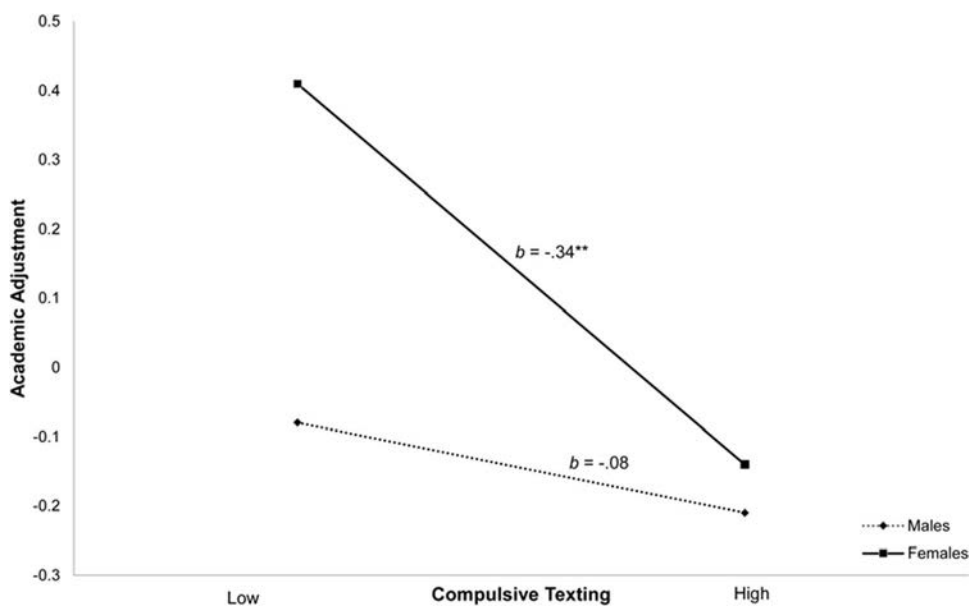


Figure 1. Relation of compulsive texting and academic adjustment by gender. ** $p < .01$.

need to remain in contact with peers (Maccoby, 1998; Rose & Rudolph, 2006), which translates to electronic communication and may contribute to their compulsive checking of and intrusive thoughts about their phones. Texting may thus involve more anxiety and social distress for females than for males, which is highlighted by the compulsivity measure. Females, across childhood and adolescence, focus on relationships more than do their male counterparts, and their interactions are more likely to be characterized by themes of friendships and family relationships (Maccoby, 2002). Further, females initiate verbal interactions more often than males do, from the preschool years through adolescence, and they are more responsive to verbal communication from others (Maccoby, 1998; Ruble & Martin, 1998). While males text as frequently as females, they may be texting for different purposes. For example, Baron (2004) reported gender differences in Internet use: females used the Internet as a tool for social interaction and to establish and nurture relationships, while males used messaging via the Internet primarily to convey information.

Results of zero-order correlations showed that both frequency and compulsivity of texting were related to poorer academic adjustment. But when considered as joint predictors, only

compulsivity of texting predicted poorer academic adjustment. Thus, it appears it is the compulsive nature of texting—not the sheer frequency—that is problematic. Further, this appears to be the case for females but not for males. Before discussing potential reasons for this gender difference, it is important to note that females' academic functioning is higher than males' academic functioning in both the low and high compulsive texting groups (see Figure 1). Indeed, previous research has shown that adolescent females have higher academic achievement than do adolescent males (Buchmann & DiPrete, 2006). Though we are unable to examine whether female students who increase in their compulsive texting over time will continue to have higher academic adjustment compared to male students, this is an important question to be addressed by future research.

In terms of the potentially higher vulnerability regarding academic functioning of compulsive texting for female adolescents, there are two main reasons that may explain females' susceptibility. First, females are more likely than males to engage in rumination or obsessive, preoccupied thinking (Johnson & Whisman, 2013; Nolen-Hoeksema & Jackson, 2001), and as noted, are more likely in this developmental stage to focus on their intimacy in inter-

personal relationships than males. Perhaps engaging in compulsive texting reflects females' preoccupation with intimacy in relationships that interferes with academic tasks (e.g., homework, studying) to the extent of impairing academic adjustment. Indeed, recent research has documented that corumination, or communicating with others about problems or negative feelings, via mobile phones is more common among young women than men (Murdock, Gorman, & Robbins, 2015). Further, Murdock et al. (2015) found that higher levels of perceived interpersonal stress were associated with lower levels of well-being in college students who were more likely to coruminate via their mobile phones. Greater perceived interpersonal stress thus also may interfere with academic performance and drive the increased interference with academic tasks. Though corumination and perceived interpersonal stress were not examined in the present study, these variables may underlie the gender differences found herein.

A second and connected reason the relation between compulsive texting and poorer academic functioning exists only for females, and not for males, is that the content of the texts females receive may be more distracting or interfering than the texts that males receive. As described earlier, females may be more likely to use texting as a means to establish and nurture relationships, given similar gender differences in Internet use (Baron, 2004). Although we did not examine the content of text messages in the present study, it seems likely that the differences in the nature of text messages received by females, compared to males, may also account for the gender differences in the relation between compulsive texting and academic functioning.

Limitations and Directions for Future Research

Readers should keep in mind several limitations of this study. First, the sample is primarily Caucasian in a small town in the Midwest, so future research with more diverse sample is needed to test the generalizability of the results. Second, the sample is focused on adolescents, so future studies could examine the construct of compulsive texting in preadolescents and emerging adults, and conduct confirmatory factor analyses of the Compulsive Texting Scale.

Third, given that this study is cross-sectional in design, the directionality of the findings cannot be determined and causality cannot be inferred. Future research should examine whether changes that occur in adolescents' texting affect academic adjustment over time. Additionally, it is important to note that the assessment of texting was based on self-report with response options posed categorically. With the increase in texting among adolescents, we recommend that future studies assess frequency of texting in a continuous way. Also, non-self-report methods of assessing texting behaviors (e.g., observations of texting, texting data based on monthly bills, parent-report) could be pursued in future research.

This study did not address a related area of growing research—multitasking (see Rosen et al., 2013). Teens are required to multitask more regularly than ever before, and their mobile phones are a key part of their multitasking. Rosen et al. (2013) noted that teens spend an average of only 6 min on other tasks before being distracted by their phones. While dividing one's attention is considered a necessary skill to some extent, divided attention also has been associated with negative outcomes (Beede & Kass, 2006; Iqbal, Ju, & Horvitz, 2010), including negatively impacting driving performance and academic performance, and impairing memory. Clearly, texting offers numerous opportunities for teens to divide their attention throughout the day, and while this study did not focus on divided attention specifically, the role of texting in adolescents' divided attention should be a focus of future research.

This study also did not address adolescents' motivations for texting (e.g., to feel connected to others, convey information, share feelings, engage in conflict resolution, avoid "missing out"). Media research has centered on the uses and gratifications theory (Dubow, Huesmann, & Greenwood, 2008; Katz, Blumler, & Gurevitch, 1974; Rubin, 1986) to explain motivations for media consumption, including passing time, entertaining, escaping, aiding in social utility (e.g., fitting in with a peer group), seeking information, and arousing/affecting (Comstock & Scharrer, 2001; Roberts & Christenson, 2001; Valkenburg & Cantor, 2000). The limited studies on texting that have considered motivations for use have focused on social utility and arousal/affect, namely, by way of attachment and the "fear

of missing out” (FoMo), or the desire to stay connected at all times to know what others are doing. In a study of attachment and texting, college students in romantic relationships were more likely to text their partner if they had a secure attachment and were more likely to engage in problematic or risky mobile phone behavior (e.g., sexting) if they were not securely attached (Drouin & Landgraff, 2012). Research has connected FoMo with problematic media use in young adults (Przybylski, Murayama, DeHaan, & Gladwell, 2013), and it is likely that teens who compulsively check their texts feel compelled to do so to avoid missing out on the latest news among their peers. Dubow et al. (2008) note that motivations may vary across contexts and likely evolve over the course of development. For example, an adolescent may engage in compulsive texting to seek information on some occasions and to fit in with peers on other occasions; further, younger adolescents may compulsively text for different reasons than do older adolescents. Little research has examined adolescents’ motivations for texting in the context of compulsive texting, warranting further research.

In conclusion, several concerns about teens’ texting were highlighted in this study, particularly regarding the relation between compulsive texting and academic adjustment. It is important that adults also recognize the potential benefits of texting for teens and communicate with their children about the attractive qualities of texting. While compulsive texting has the potential to predict poorer academic adjustment, it is plausible that normative texting may enhance academic performance when used in a goal-oriented way to facilitate understanding of material and assignments. Prospective studies that illuminate the relations among frequency/compulsivity of texting, texters’ motivations, and behavioral, emotional, academic, and social adjustment are needed to identify whether, and under what circumstances, texting exerts negative and positive effects on adolescent development.

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