Texting as a distraction to learning in college students

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ABSTRACT

Texting has been shown to be cognitively distracting for students in lecture settings, but few have done empirical work, or looked at moderating effects between texting and academic outcomes. This experimental study compared the proportion of correct answers on a lecture quiz between students who were randomly assigned to text message during a pre-recorded lecture and those who were not, while investigating possible moderators. The participants who text messaged throughout the lecture scored significantly lower in percent of correct responses ($t(95) = -4.6$, $p < .001$, $d = .93$). No moderating effects were found, including: perceived distraction, perceived texting ability, number of text messages sent and received during the lecture, age, and gender.

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1. Introduction

1.1. Text messaging

Text messaging, or texting, is a mode of conversation in which the sender types in a message typically of less than 160 characters on a mobile phone or other unit and sends it to a mobile receiver, regardless of the location or provider of the recipient. Texting has become ubiquitous through the adolescent and young adult generations (Faulkner & Culwin, 2005), with cell phone users between the ages of 18-34 sending upwards of 2000 text messages a month (Nielsen, 2011). Texting is often cited as the preferred method of conversation for college students, over phones or e-mail (Bryant, Sanders-Jackson, & Smallwood, 2006; Skierkowski & Wood, 2012; Van Cleemput, 2012). They use texting to update plans in real time, and to discuss private activities for which an audible conversation may not be appropriate (Grinter, Palen, & Eldridge, 2006), saving phone conversations for longer discussions about recent life events (Madell & Muncer, 2007). According to Harrison and Gilmore (2012), college students also self-report texting during work hours, while taking a shower, during religious services, and even while having sex.

1.2. Texting as a distraction

One additional inopportune area for texting is the classroom setting. Wei and Wang (2010) recently found that students who

are habitual texters in general are more likely to text in class. Some studies suggest technology usage during academic settings may be inhibitory to learning. For example, instant messaging on a computer, which has similar qualities to texting, has been shown to be correlated with academic distractibility (Levine, Waite, & Bowman, 2007), increased reports of academic impairment, and decreased homework completion (Junco & Cotten, 2010). Researchers have also found that using social technology such as texting or instant messaging during a simulated classroom environment can lead to lower recall (Wood et al., 2012). In addition, GPA and texting while studying are negatively correlated (Windham & B., 2008). Students who used instant messaging while reading a passage took longer to finish the passage than those who did not use instant messaging, even after removing the time taken to read and send the messages. However, there were no statistical differences on a following exam over the read passage. The researchers attributed this to the fact that the entire article was read by both groups, even though the instant messaging group took longer to do so (Bowman, Levine, Waite, & Gendron, 2010).

In a lecture environment, the student does not have the option to 'pause' the instructor while he or she texts, indicating that the students must multi-task. Research has found that multitasking leads to less productive, lower quality, less efficient work (Junco & Cotten, 2010; Mayer & Moreno, 2003; Meyer & Kieras, 1997). Students on computers will often multitask (Judd & Kennedy, 2011), using their laptops for things other than note taking, which can lead to distractions and lower test scores (Fried, 2008), especially when the devices are used for social interactions during class (Junco, 2012). Other studies have also shown that laptop usage can decrease student satisfaction, and does not statistically increase GPAs (Wurst, Smarkola, & Gaffney, 2008). Students in

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online classroom environments also report multitasking on the computer to be both distracting and challenging (Winter, Cotton, Gavin, & Yorke, 2010).

Texting acts as a distracter to attention in non-academic settings, such as driving, and divided attention in a classroom environment will limit learning (Horrey, Wickens, & Consalus, 2006; Kass, Cole, & Stanny, 2007; Strayer & Johnston, 2001). Therefore, texting should act as a distraction to limit learning in a lecture setting. In a recent survey, Wei, Wang, and Klausner (2012) found that students who reported texting during a lecture had lower levels of sustained attention, and therefore lower academic performance than those who did not text. However, this study used self-reported measures. Perhaps students who chose to text during a lecture already have lower sustained attention, and this is what is driving the lower academic performance.

Previous studies have found that students believe that texting is distracting in general, but yet they still choose to text during lectures (Harrison & Gilmore, 2012; Skierkowski & Wood, 2012; Wood et al., 2012). One reason for this may be linked to an attribution bias in which students believe that their texting abilities can overcome the distraction within a lecture. Many cultural myths circulate concerning multitasking, including the idea that multitasking can make an individual more productive (Ophir, Nass, & Wagner, 2009). Other studies have found that experienced drivers are less distracted by cell phones and other secondary tasks than novice drivers (Nabatilan, Aghazadeh, Nimbarte, Harvey, & Chowdhury, 2012; Patten, Kircher, Östlund, Nilsson, & Svenson, 2006). Therefore, looking at possible moderators to texting and distraction should also be a focus of research.

The main purpose of this study is to examine whether texting distracts students in a lecture setting, using a quasi-experimental design. This study has two main hypotheses, as follows:

1. Participants assigned to the texting group will have a lower percentage of correct answers on a recall quiz, compared to those assigned to the control group.
2. For the texting group, perceived distraction and texting ability will moderate the effect of texting on quiz performance.

2. Method

2.1. Participants

Participants ($N = 99$) were selected from an online sign up process as a part of an introduction psychology undergraduate class. The ages ranged from 18 to 56 years, with a mean age of 20.33 years ($SD = 5.17$). One participant's data from the initial 100 was deleted because the participant was under the age of 18. The sample was ethnically diverse, with the following breakdown: African American (35.7%), White, non Hispanic (34.7%), Asian, all groups (15.3%), and Hispanic/Latino (6.1%), and Other (8.2%). Eighty percent of the sample was female, and most were either in their freshman (49%) or sophomore (21.4%) year. The participants had a mean self-reported grade point average of 3.30 ($SD = 0.45$), and all participants reported previously taking three or fewer psychology college courses. Eighty percent of participants reported texting before the age of 18, although one participant had never sent a text message prior to the study.

2.2. Measures

A pre-recorded psychology lecture was used to simulate a lecture setting. The information presented in the lecture was not information that would be presented in the introduction to psychology class, but was intended for lower-division college students. A pre-recorded lecture was chosen because the participants attended the study sessions 25 at a time, and the lecture needed to be the same for all four study timeslots.

A multiple choice quiz was constructed based on the pre-recorded lecture used during the study. This quiz had seventeen overall questions, each with one correct answer that had been presented in the lecture. The percentage of correct answers was used to gauge the participants' performance on the quiz.

A survey was also created to test texting actions, ability, and attitudes. These self-reported items were used to measure potential moderators of the effect of texting on performance, such as

Table 1
Survey results: descriptive statistics.

Question	n	Mean	SD
1. I text message while in class	99	2.47	0.82
2. I use secret methods, such as hiding my phone under my desk, to hide my text messaging	99	2.53	0.91
3. I find myself distracted by my text messages while in class	98	1.99	0.70
4. I follow classroom text messaging policies	99	2.08	0.91
5. I am distracted, annoyed, or bothered by other's text messaging in the classroom	98	1.41	0.63
6. I miss lecture points or notes because of my text messages	98	1.67	0.65
7. The instructor notices my text messaging	99	1.41	0.54
8. I get frustrated when trying to send text messages because of my lack of skill.	98	1.23	0.57
9. Other classmates are bothered, annoyed or distracted by my text messaging	99	1.19	0.39
10. The instructor feels disrespected, frustrated, or annoyed because of my text messaging	99	1.51	0.78
11. I am often bored in class if I do not text message	98	2.09	0.90
12. I can send an accurate text message without looking at the keys of my mobile device	99	2.55	0.98
1. Text messaging in the classroom is distracting to the user	99	3.66	1.05
2. Administration should be concerned about text messaging	99	2.70	1.23
3. Students should be allowed to text message in class	99	3.32	1.26
4. Text messaging does not bother anyone else in the classroom except the user.	99	3.20	1.35
5. Administration places unfair emphasis on text messaging in class	98	2.70	1.10
6. Text messaging in the classroom is disrespectful to the instructor	97	3.81	1.01
7. I am good at text messaging	98	4.28	1.00
8. University policies about text messaging are useful and effective	99	2.81	1.09

Age started text messaging	Frequency	Percentage
Younger than 13 years	3	3.1
Between 13-15	31	31.6
Between 16-18	45	45.9
Above 18	14	14.3

perceived distraction and texting ability. General demographics were also gathered from this survey. The survey was two-part. The first was based on a 4 point scale ranging from "never" to "always", and included self-specific questions such as "I text message in class" and "I am distracted by text messaging". The second part was based on a 5 point scale ranging from "highly disagree" to "highly agree". It included general questions such as "Text messaging is distracting to the user" and "Academic policies are effective and useful". All questions and responses can be seen in Table 1.

Questions were combined from this survey to create a texting ability score, as well as a perceived distraction score. Z-scores from "I get frustrated when trying to send a text message because of my lack of skill" (question 8) and "I can send an accurate text message without looking at the keys of my mobile device" (question 12), as well as the item "I am good at text messaging" (question 7) from section two were all combined to form the texting ability score. Cronbach's alpha for the ability score was 0.71.

A perceived distraction score was also created using two questions. "I find myself distracted by my text messages while in class." (question 3) and "I miss lecture points or notes because of my text messages" (question 6) were combined from section one. These questions were positively correlated with one another, allowing for combination ($r = .332$, $p < .001$).

2.3. Procedure

Before the start of the study, both the survey and the quiz were piloted on a separate sample of $N = 30$. Pilot participants did not report any issues with the testing material. Scores for the quiz from the pilot study ranged from 70.5% correct to 100% correct. The scores were also slightly positively skewed. All Chronbach's alphas for the survey scales were also above 0.70 in the pilot.

Participants were invited to the study as a part of a requirement for Psychology 1101: Introduction to Psychology. When signing up for a timeslot using the online system, they were told to bring their own mobile phone, and to be prepared to send and receive text messages for about 20 min at their own cost, with a partner or partners not involved in the study. Before the beginning of the study, the participants were also given an informed consent form detailing the entire procedure.

A general classroom was used as the testing area, and was set up before the participants were allowed entry. Two different colored folders were used to determine the groupings. Each folder was assigned a number, and the folders were placed around the room according to a random number generator. Upon entry, the students were told to sit in front of a folder, but were not told which color was which group. This design, in which each study session included both texters and non-texters, was chosen for ecological validity reasons, in an attempt to create conditions similar to an actual class lecture environment in which some students would text and others would not.

Once all of the participants had been seated, the control group ($n = 50$) was asked to turn off their cell phones and place them underneath their desks. The texting group ($n = 49$) was instructed to send and receive text messages on a consistent basis, until asked to stop. All of the participants were asked to watch and attend to the video lecture, and were informed that a quiz was going to be given after the lecture. This quiz did not count towards any academic course, and was only used for this study.

A 20 min pre-recorded lecture on symbol acquisition in infants was then presented to the entire group. Most participants had not been exposed to the information in the lecture before, although previous exposure ($n = 2$) was not correlated with the quiz grade.

After the lecture, the texting group was asked to turn off their phones. All participants were then given a texting survey (Table 1). Once the entire group was finished with the survey, they were given a quiz over the material presented in the lecture. The participants in the texting group were also asked to report how many texts were sent and received during the lecture (Table 2 and Graph 1).

3. Results

3.1. Quiz results

To test the primary hypothesis that texting is distracting to students in a lecture setting, an independent measures t-test was conducted comparing the proportion of correct answers on the quiz between the control group (non-texting) and the texting group. The results revealed a strong effect of texting on the grade outcome. Participants in the texting group ($M = 0.58$ or 58% correct, $SD = 0.17$, $N = 50$) scored significantly lower on the overall recall test than the participants in the control group ($M = 0.71$ or 71% correct, $SD = 0.12$, $N = 49$), $t(98 = -4.6$, $p < .001$, $d = .93$).

In order to illuminate any possible covariates for the primary result, a linear regression was run for all the participants. Self-reported distraction levels, self-reported texting ability, GPA, gender, and age were not significant predictors of the percent correct on the performance test (Table 3). Additionally, the interaction effects of these variables with the group (texters or non-texters) were also non-significant predictors. Additionally, a linear regression for only the texting group was run for total number of texts sent and received. The number of texts did not predict the percent correct within this group ($\beta = -0.002$, $SE_\beta = 0.002$, $p = 0.27$, $N = 50$).

3.2. Survey results

The general survey was also analyzed, in order to look at student's attitudes and beliefs about texting in the classroom, to help

Table 2
Number of text messages sent and received during 20 min lecture.

	Mean	SD	Median	Range
Texts sent	14.10	7.36	11	4–40
Texts received	12.69	7.16	11	1–36
Total texts	26.79	14.02	24	6–76
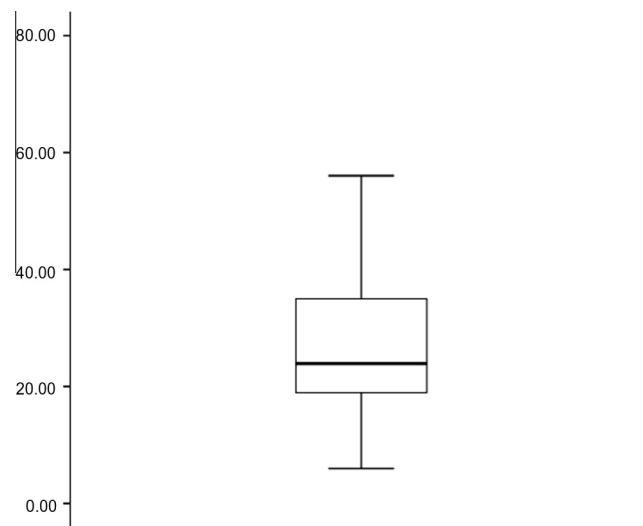
Graph 1. Boxplot: total number of text messages sent and received during 20 min lecture.

Table 3
Linear regression of covariates on percent correct ($N = 99$).

Covariate	β	SE_β	P-value
Perceived distraction	−0.02	0.05	0.58
Perceived ability	0.06	0.06	0.28
GPA	−0.01	0.06	0.89
Gender (female)	0.02	0.05	0.74
Age	0.001	0.01	0.85
Group × Perceived distraction	0.001	0.08	0.99
Group × Perceived ability	0.04	0.09	0.65
Group × GPA	0.16	0.10	0.11
Group × Gender (Female)	0.02	0.11	0.85
Group × Age	−0.01	0.01	0.57

further inform classroom policy. To test the attitudes of students regarding texting, descriptive statistics were run on each of the measures of the survey given to the participants. On the survey results (Table 2), participants generally agreed that texting is distracting to the user in general ($M = 3.68$, $SD = .56$), but disagreed that they themselves were distracted by texting ($M = 1.84$, $SD = 0.56$). The participants also reported that they only sometimes follow texting procedures ($M = 2.00$, $SD = 0.9$), mostly disagree that University policies are effective in the classroom ($M = 2.82$, $SD = 1.09$), and think that University students should be allowed to text message in class ($M = 3.33$, $SD = 1.25$). Descriptive statistics for each of the questions can be found in Table 1.

4. Discussion

The first hypothesis questioned whether texting is distracting to the user in a randomly assigned experimental design. In comparing proportion of recall questions correct between the text messenger group and the control group, the results suggest that texting is in fact highly distracting to the user in a lecture setting. This finding corresponds with previous research that has shown that any combination of stimuli is distracting to learning and memory (Fernandes, 2002; Fernandes & Moscovitch, 2000). It also expands the literature on instant messaging, suggesting that texting during a lecture leads to lower recall.

The second research question looked into general texting attitudes. With texting and distraction, neither perceived distraction nor perceived texting ability moderated the effect of texting on quiz performance. All text messengers had lower scores than non text messengers. The idea "If I do not have to look at the screen/keys, I will not be distracted" was not supported by this data. One could draw an analogy between texting in class and daydreaming. In both situations, the student is not cognitively present in class, even though he or she is physically there. This outcome also corresponds with the aforementioned idea that ability does not overcome distraction.

To further investigate the attitudes of individual students, a survey was given to the participants. According to the survey administered in this study, students feel that they can text message and not be distracted, but agree that texting is distracting to all other users. Many students do not follow the polices in class and believe they should be allowed to text message in class, even though they are in fact being distracted by texting, which may be linked to the idea that they do not believe that they are personally distracted by their own texting.

Future research may find more of a difference between the two groups if only one group is tested at a time. Other studies should also attempt to measure if students are missing the information presented at the exact moment they send or receive a text message, or if they are generally distracted from all of the information.

Previous research suggests that a ringing telephone distracts people from the information presented at the time of the ringing (Shelton, Elliott, Eaves, & Exner, 2009), but texting presents a slightly different situation. It is possible that the students are continuously distracted, as they anticipate incoming messages, think about their responses, and attempt to focus on the lecture. In addition, future research should consider the content of the text message, as some text messages may be more distracting than others. For example, finding out that a loved one was angry about something may be more distracting than a general "hey, how are you?" type message.

Finally, the social context of this experiment could have also had an impact on the findings. In a natural classroom setting, texting is usually a prohibited behavior. Because the students were asked to text message, there was no element of unlawful behavior. However, the distracting effect of texting when prohibited should only increase because of the added effect of the student being concerned about being caught texting. Additionally, due to the design, the amount the non-texters were distracted by the texters is unknown. According to the survey, the participants did not report any distraction from others texting (Table 1), but, given the findings for perceived distraction of the self when texting in class, this is most likely an inaccurate measure.

4.1. Conclusion

This experiment supports the idea of banning texting in classrooms, but students may continue to believe that they are not negatively affected by texting in class. However, analysis suggests that there are no moderators to the effect of texting on learning. Experience, ability, or even frequency of texting leads to declines in recall. The problem arises, however, when students have other responsibilities they need to be available for, such as a sick child or work related issues. Nevertheless, this should be the exception, and not the rule, and handled on a case by case basis. The students should be educated for the reasons behind this policy, and for the majority, texting should not be allowed in a lecture setting.

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