



Everyday deception or a few prolific liars? The prevalence of lies in text messaging



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ABSTRACT

With the recent and dramatic changes to communication patterns introduced by new information technologies it is increasingly important to understand how deception is produced in new media. In the present study we investigate deception production in text messaging, focusing on how often people lie, about what and to whom. This study uses a novel data collection method that allows for the examination of individuals' communication records at the message level, which may provide a more accurate account of deception behavior than diary or survey methods. We find that the majority of our participants practiced deception in text messaging. Although lying was a relatively infrequent occurrence for the majority of our participants, there were a small number of prolific liars who told a disproportionately large number of lies using this medium. Additionally, we found some support for the argument that deception occurs less frequently in closer relationships, and we observed how the micro-coordination goals of text messaging change the properties of deceptive text messages relative to face-to-face lies.

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1. Introduction

Research on deception has examined both the production and detection of lies in a variety of contexts. To date, far more work has focused on detection of deception relative to production. A recent meta-analysis of detection research included 206 studies and over 24,483 judges (Bond & DePaulo, 2006). In contrast, the number of studies focusing on production questions, such as how often people lie, about what, and to whom, is much smaller and numbers in the dozens of studies rather than hundreds. This asymmetry between detection and production work is problematic given the importance of deception in communication, with some scholars arguing that deception is one of the most significant human phenomenon in communication (Miller & Stiff, 1993).

Addressing questions around deception production, including how often people lie, about what, and to whom, has become even more important with the recent and dramatic changes to communication patterns introduced by new information technologies. As these new forms of communication increase in popularity we must

advance our understanding of how deception takes place in these new media. In the present study we examine deception production in text messaging, which is becoming one of the dominant forms of interpersonal communication, with 72% of American adult cell-phone users sending and receiving text messages (Purcell, Entner, & Henderson, 2010), producing over 184 billion text messages per month in the US (CTIA, 2012).

In the context of text messaging we tackle three research questions that have emerged in the limited deception production literature. The first question is concerned with how often individuals lie, including how different media may affect the prevalence of deception (e.g., George & Robb, 2008; Hancock, Thom-Santelli, & Ritchie, 2004; Whitty, Buchanan, Joinson, & Meredith, 2012). A debate has recently developed over the regularity with which individuals produce lies in everyday communication. Early diary studies suggested that deception is a regular occurrence, with most people lying at a rate of once or twice a day on average (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). More recent findings, however, have cast some doubt on how to interpret results from these diary studies. A key concern is that averaging the frequency of lies across participants obscures a skewed distribution of deception rates. Rather than everyone lying on a daily basis, this view argues that a small number of people account for a disproportionate share of the observed deception, with the majority of people telling relatively few lies

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(Halevy, Shalvi, & Verschuere, 2014; Serota, Levine, & Boster, 2010). In the present study we examine how often people lie in text messaging, and we seek to also address this larger debate about deception prevalence.

A second question in the deception production literature is the content of lies. Very limited work has examined the characteristics of lies in everyday communication. In their seminal work on lie production, DePaulo and colleagues content analyzed hundreds of lies to produce a taxonomy about the content (e.g., about a fact, feeling, accomplishment, explanation or action), orientation (e.g., self- or other-oriented) and the form of lies (e.g., outright, exaggerated or subtle), and while some work has explored these characteristics in lies told across different media, it remains unclear how communication technology might influence the content of lies. How do socio-technical factors, such as the frequent coordinating of social interactions in text messaging or the fact that it leaves a record (Birnholtz, Guillory, Hancock, & Bazarova, 2010; Ling & Yttri, 2002), affect the content of lies?

The third question is concerned with to whom people lie most. For example, a common research question has been whether people lie more or less to close relational contacts compared with distant contacts. The research to date is surprisingly mixed, with some empirical results suggesting that people lie less to close communication partners, perhaps due to the importance of trust in such relationships (DePaulo & Kashy, 1998), while other studies suggesting the opposite pattern, perhaps due to increased concerns with the feelings and opinions of close partners (Metts, 1989). Given that text messaging tends to involve mostly people with whom one has shared contact information, such as friends, romantic partners and family, does deception frequency vary across relational closeness in text messaging?

While understanding these questions regarding deception production in text messaging is important given the incredibly widespread use of text messaging in human communication, text messaging may also offer some important advantages over other media for capturing deceptive behavior. An important, and acknowledged, limitation of both diary and survey studies for examining the frequency of deception prevalence is that they require accurate recall of lies told during conversations over a given time period. This is problematic given that people tend to have surprisingly poor memory for their own conversations. In one study (Stafford & Daly, 1984), participants were asked to converse with a partner for seven minutes and then recall their conversation after a short distractor task. On average, individuals were able to remember only a small fraction, about ten percent, of the content of their conversations. In fact, individuals were more likely to remember their partners' conversation contributions than their own. As such, diary studies, and especially surveys that ask participants to recall their conversations over the last 24 h, are subject to serious recall errors and biases.

In the present study we leverage the digital record left by text messaging to reduce the dependency on participant memory (see also Birnholtz et al., 2010; Hancock et al., 2009). Text messaging systems allow users to review their previous texts to a communication partner. We use these communication histories to remind participants of their actual conversational contributions. While memory is still involved in recalling whether one lied or not, we believe that this method of reviewing communication histories will yield more accurate results than diary studies or surveys. Analyses reported here build on a partial analysis of this data set, described in Reynolds et al. (2013).

1.1. How often are deceptive text messages produced?

The first area we explore in the production of deceptive text messages is the rate at which these types of messages are pro-

duced. Surprisingly, Serota et al. (2010) note that there have been relatively few studies that directly address the rate of production of deceptive communication. From these few studies, moreover, two very different understandings of deceptive behavior have emerged. On the one hand, some have argued that lying is an integral component of communication and social interaction, and as such, people tell lies on a regular and everyday basis (DePaulo et al., 1996; George & Robb, 2008; Hancock et al., 2004). This view is based on theories of self-presentation, which argue that people seek to present themselves in the best possible way to others (e.g., Goffman, 1959). When it is not possible to present oneself in a positive light truthfully, deception is a strategy that people often employ in order to cultivate a more positive impression and possibly cast a more positive light on others or one's relationship with them as well (DePaulo et al., 2003). Given that this is such a fundamental goal for people when interacting with others, deception should be an ordinary, everyday occurrence for most people.

To test this hypothesis, DePaulo et al. (1996) conducted diary studies examining patterns of deception among both students and non-students in face-to-face, telephone, and written interactions. Both groups of participants were asked to keep a record of their social interactions (that lasted for at least ten minutes or included a lie told by the participant) for seven days, and to record any lies told during those interactions. To aid with memory concerns, participants were encouraged to take notes following their interactions, and their interaction and deception records were to be updated at least once per day. In the student sample, 76 of 77 participants reported telling at least one lie over the seven-day period, with an average of 1.96 lies per day. In the non-student sample, 64 of 70 participants reported telling at least one lie over the seven-day period, with an average of 0.97 lies per day. As such, they concluded that lying is a common and everyday event for individuals.

Several other studies have followed this initial research with diary studies that also include multiple media, including telephone, messaging and email (George & Robb, 2008; Hancock et al., 2004; Whitty et al., 2012). Hancock et al. (2004) examined the frequency with which deceptive messages were produced during face-to-face, telephone, instant messaging, and email interactions. They also found that deception was a commonplace event, with participants reporting an average of 1.6 lies per day and deception occurring in 26% of interactions. George and Robb (2008) explored deception during face-to-face, telephone, instant messaging, email, or text messaging communication and used PDAs (rather than paper forms) to record interactions. In their two samples, they found that participants lied between 1.11 and 1.96 times per day, on average. The findings from both of these studies support DePaulo et al.'s (1996) assertions about the commonplace nature of deception in everyday interactions.

Recent work, however, has questioned the interpretation of these results, drawing on the principle of veracity, which notes that people may try to avoid situations involving deception because, unlike telling the truth, engaging in deception requires justification (Bok, 1999). Therefore, they argue that most people should lie infrequently. Serota et al. (2010) speculated, however, that some individuals may have especially honest demeanor that makes it easier for them to get away with lying and who therefore lie more than average. They referred to this small group of people as "prolific liars" who skew the average values reported by prior diary studies (Serota et al., 2010).

To examine this prediction, Serota et al. (2010) asked individuals (student and non-student samples) to recall the number of lies they had told in the last 24 h, and they also re-analyzed data from the DePaulo et al. (1996) and George and Robb (2008) studies. Like prior work, these survey studies found that, on average, people lie

between 1.65 and 2.34 times per day, but they found that the data were highly skewed. In the non-student sample 60% of participants reported telling no lies when asked if they could recall telling any lies in the last 24-h period, while the top 5% of participants told nearly half of the lies reported. In the student sample, 29% of participants reported telling no lies in the previous 24 h, and the top 5% of participants told nearly a quarter of the lies reported.

They found a similar pattern in their re-analysis of the data from previous studies. In the case of the DePaulo et al. (1996) study, two-thirds of the participants told two lies or fewer per day, while a small subset (9.2%) of the participants told approximately one quarter of all the lies reported. Similarly, the re-analysis of the George and Robb (2008) study revealed that half of the subjects told just a quarter of the lies, while a small subset (12%) reported about three quarters of all lies reported. The pattern across both the diary studies and the national sample suggest positively skewed distributions of deception frequency, with a small number of participants telling a disproportionately large number of lies, and the majority telling a disproportionately small number of lies.

We developed competing hypotheses that flow from these two perspectives to predict the prevalence of deception in text messaging. The first is the everyday lies perspective, in which most people are expected to lie a little (e.g., DePaulo et al., 1996; Hancock et al., 2004), and the second is the prolific liars perspective, in which a few people tell the majority of lies (Serota et al., 2010):

H1A. According to the everyday deception perspective, the distribution of deceptive text messages will be relatively normal with most participants telling at least one lie, and most participants telling only a small number of lies.

H1B. According to the prolific liar perspective, the distribution of deceptive text messages across participants will be highly positively skewed with most participants telling zero lies, and a small number of participants telling many lies.

1.2. What are the characteristics of deceptive text messages?

As noted above, DePaulo et al. (1996) also asked participants to explain what about their lies was deceptive, and why they told the lies. Using this method, they were able to explore the frequency of lie characteristics. Their results suggested that in terms of the content of lies, people lie most frequently about their feelings, followed by their actions, plans or whereabouts, their achievements, their explanations for their behavior, and lastly about facts or possessions. Regarding the reasons for lies, people told lies more often to protect themselves than to protect the target of the lie. In terms of the type of lies told, people most often told outright lies, followed by exaggerations and lastly subtle lies.

The communication landscape has changed dramatically since DePaulo et al.'s original study was conducted, which only included the phone and letter-writing in addition to face-to-face. This set of media stands in stark contrast to current communication media, with people using a wide variety of tools (Pew Research Center, 2012). There is substantial evidence that various characteristics of communication media can affect the nature of deception. For example, the Feature Based Model of deception suggests that deception rates are affected by properties of the media, including a medium's synchronicity, provision of a record and physical co-presence. According to several studies (Hancock et al., 2004; Whitty et al., 2012), for example, there are more spontaneous lies when an interaction is supported by a synchronous medium, such as the telephone or face-to-face interaction. The recordability of a

medium, on the other hand, changes deception as liars seek to avoid leaving behind evidence of a lie. For instance, one study (Hancock et al., 2004) found that people tend to tell more explanation lies in recordable media, such as email, than in evanescent media, such as face-to-face.

The medium of text messaging also appears to be distinct than other forms of communication. A recent large-scale content analysis of over 60,000 text messages revealed that the most common types of content in text messaging concerned social coordination, such as planning meetings or arranging other interactions (Battestini, Setlur, & Sohn, 2010). The fact that text messaging so often involves this kind of social coordination suggests that content of lies should be more often related to a person's actions, whereabouts and plans. Indeed, prior research has identified the "butler lie" (Hancock et al., 2009), a form of deception used to coordinate and negotiate social interactions. For instance, butler lies often involve providing an account for why one person does not want to interact with another person (e.g., "sorry can't talk now, gotta work" when in fact they do not need to work). According to Birnholtz et al. (2010), butler lies occur during the kinds of micro-coordination that text messaging supports (Ling & Yttri, 2002), such as arranging meeting times and social activities. Butler lies are made possible by the ambiguities associated with mediated communication, such as ambiguity about locations (e.g., "I'm in the library" when actually at the bar) or activities (e.g., "I'm hanging out with PERSON X" when in fact one is with PERSON Y). As such, this kind of lie should be more common in text messaging than in the face-to-face interactions captured by previous diary studies.

Taken together, these results suggest that the recordability and genre of text messaging may both affect the characteristics of lies relative to the face-to-face lies observed by DePaulo et al. (1996). First, the fact that text messaging involves more content related to social coordination suggests that deceptions in text messaging should more often involve lies about actions, plans and whereabouts than in the original study. This prediction is also borne out by the frequency of butler lies already identified in text messaging (Birnholtz et al., 2010; Hancock et al., 2009; Reynolds et al., 2011).

H2. Relative to DePaulo et al.'s (1996) study, lies in text messaging will most often be about actions, plans and whereabouts.

The nature of butler lies may also have an effect on the self- vs. other-oriented reason for the lie. Butler lies tend to involve the sender providing an excuse about why the sender cannot meet in the future or account for why they failed to communicate in the past (e.g., "sorry my battery was dead") (Hancock et al., 2009). Because excuses tend to be about the self and accounting for one's behavior, we should see more self-oriented lies relative to prior work on face-to-face lies.

H3. Relative to DePaulo et al.'s (1996) study, lies in text messaging will more often be self-oriented.

Lastly, the recordable nature of text messages should also affect the type of lies told. Because text messages leave a record that can be reviewed later, telling outright lies in text messaging is inherently risky as they can be checked later in light of new knowledge about the sender's actual whereabouts or activities (e.g., "I'm not at the bar" can be exposed as a lie if the receiver of the message later sees the sender at the bar). Instead, lies in text messaging should be more indirect, such as exaggerations (e.g., "I'm running five minutes late" when in fact the person is ten minutes late) or subtle lies (i.e., lying by omission or telling literal truths designed to mislead.)

H4. Relative to DePaulo et al.'s (1996) study, there will be fewer outright lies but more exaggerations and subtle lies in text messaging.

1.3. Relationship closeness and deception

The third research question concerns the nature of the relationship with people to whom deceptive messages are addressed. Researchers have argued that the degree of relationship closeness between two individuals should affect the amount of deception occurring between them. As Miller, Mongeau, and Sleight (1986) argue, when two individuals have an impersonal relationship, they have very little reason to be deeply concerned for each others' feelings, but the same is not true with a closer or more personal relationship. Thus, they argue that relational concerns should affect the frequency of deception within a relationship.

However, there is currently no consensus on how relationship closeness affects the frequency of deception. DePaulo and Kashy (1998), drawing on past research highlighting the importance of openness and disclosure in close relationships, argue that deception should occur less frequently in close relationships. Using the data from their diary samples, they evaluated how relationship closeness across a variety of relationship types impacted rates of deception. Their participants reported telling fewer lies to closer relations or in intimate situations, and more lies in less close relationships or in non-intimate situations. This pattern supported the authors' argument that people avoid lying to those with whom they are close because deception would violate the openness and authenticity that characterizes close relationships. In contrast, Metts (1989) found in a survey study of deception in friendships and romantic relationships that a key motivator for deception is a desire to avoid hurting others' feelings, and it thus occurs more frequently in closer relationships.

We tested these contrasting predictions in our sample of text messages:

H5A. Given the importance of openness in close relationships, deception will occur less frequently in closer relationships.

H5B. Given the importance of avoiding hurting a partner's feelings in close relationships, deception will occur more frequently in closer relationships.

2. Method

2.1. Participants

There were 164 participants in this study, all students at a large U.S. university. Of the 126 participants who provided demographic data, 91 (72%) were female, their age ranged from 18 to 34 years old, and all had used some form of text-based messaging for an average of 5.9 years. Students were recruited via an on-campus web-based recruitment system and received either course credit or \$10 for their participation.

2.2. Procedure

Upon arriving at the lab, participants first filled out an online consent form, and then read a short tutorial, which provided definitions and examples for deceptive content. Next, they completed a short questionnaire, which included demographics (e.g., age, gender) as well as questions about their text messaging behavior (e.g., how long they have used text messaging, and the people with whom they most often exchange text messages).

Participants were then instructed to refer to their phones, and to enter into the web survey the verbatim text of the last 15 text messages that they had sent to two individuals of their choosing, for a total of 30 messages (some participants reported fewer than 30 messages, however). For each text message entered, participants were asked to indicate whether the message was deceptive (measured using a 6 point scale, anchored by (0) "not deceptive" and (5) "extremely deceptive.") If a message was marked as deceptive, they were also asked to explain briefly why the message was deceptive. Although participants in this demographic send an average of one hundred text messages per day (Pew Research Center, 2012), and therefore thirty messages is likely not representative of a full day's messages, this number of messages was chosen as it was manageable for participants to provide both the verbatim text of their messages as well as explanations for deceptive messages.

Participants were also asked about their relationships with the two people with whom they exchanged messages, both in terms of their relationship category (e.g., "family member," "acquaintance," "close friend") and closeness (measured using a 5-point scale anchored by (1) "not close at all" and (5) "very close.").

2.3. Message coding

Overall, participants provided and rated 4920 messages ($M = 28.51$ messages per participant, $SD = 3.81$), of which 533 were marked as deceptive. Messages were coded for jocularity following Hancock et al. (2009) and the categories presented by DePaulo et al. (1996). Two independent coders performed the coding task, rating all messages independently, with discrepancies between the coders resolved by the authors.

Jocularity: Messages were coded as jocular if they were clearly not intended to create a false belief in the recipient (e.g., the message "lol" is not technically true if the participant was not actually laughing out loud, but this was not likely intended to mislead the recipient). Inter-rater reliability for jocularity was acceptable (Cohen's Kappa = .84). There were 65 messages coded as jocular, which were excluded from subsequent analyses.

Deception categories: Messages rated as deceptive were coded for the categories presented in DePaulo et al. (1996), including: *content* (the lie was about feelings, achievements, facts, action, etc.), *reason* (was the lie told for self-oriented or other-oriented reasons), *type* (the scale of the lie, such as exaggerations or outright falsehoods), and *referent* (described who or what a lie was about, such as the person telling the lie, the target of the lie, or a third party or event). Messages were coded based on the explanations participants provided about why a message was deceptive; messages with insufficient or no explanation were not coded (10, 19, 11, and 7 messages, respectively.) Inter-rater reliabilities for these categories (Cohen's Kappas = .65, .54, .58, and .49, respectively) ranged from good to fair (Cicchetti & Sparrow, 1981) and are similar to the rates obtained by DePaulo et al. (1996).

3. Results

3.1. How frequently are deceptive messages produced?

Our first pair of hypotheses contrasts the distribution of the number of deceptive text messages expected by the everyday liars (e.g., DePaulo et al., 1996) and the prolific liars perspectives (Serota et al., 2010) across three characteristics of the data: the relative normality of the distribution, the number of individuals telling no lies, and the number of individuals that frequently produce deceptive messages. The everyday liars perspective anticipates a relatively normal distribution, with few people telling no lies,

and most people telling only a few lies. In contrast, the prolific liars view anticipates a severely skewed distribution, with a majority of participants telling no lies, and a few participants that are frequently deceptive.

Before exploring the hypotheses regarding the distribution of the number of deceptive text messages produced, we first examined the overall rate of deceptive messages relative to total messages sent. Overall, 468 of the 4676 messages were deceptive ($M = 10.8\%$ of messages, $SD = 11.79\%$). These data suggest that about one in ten text messages for our sample involved a lie, which provides some context when exploring the distribution of deceptive messages produced by a person.

Following Serota et al.'s (2010) analysis, we created a histogram showing the distribution of deceptive message production rate across participants (see Fig. 1). The first characteristic of interest is the distribution's skew, which is positive. The skew statistic (2.02) is more than ten times the standard error of the skew (.19), suggesting that the data are highly skewed. Further, the mean (10.8%) is larger than the median (6.7%). Taken together, these descriptive statistics suggest that the distribution is highly positively skewed, consistent with the prolific liar perspective.

The next characteristic is the number of individuals that did not tell any lies. As can be seen on the left side of Fig. 1, only 23% of participants ($n = 38$) reported sending no deceptive messages, indicating that the majority sent at least one deceptive message, providing support for the everyday liar perspective. A look at the distribution of participants reporting at least one deceptive message provides some additional support to this perspective. The majority of people that lied at least once ($n = 95$) told relatively few lies, with an average of deception rate of 14.1% ($SD = 11.7\%$). Further, of those participants who reported sending at least one deceptive message, the median and mode percentage of deceptive messages was 10.0%, suggesting that the frequency of lies for those that did lie was more normal than the overall distribution that included participants with no lies, although the skew statistics ($skewness = 2.13$, $SE\ skewness = .27$) continue to indicate a non-normal, positive skew. The observations of a small proportion of participants telling no lies and the fact that most of those who did lie tended to lie at a relatively low rate (fewer than 3 lies out of the 30 reported) are consistent with the everyday lies perspective.

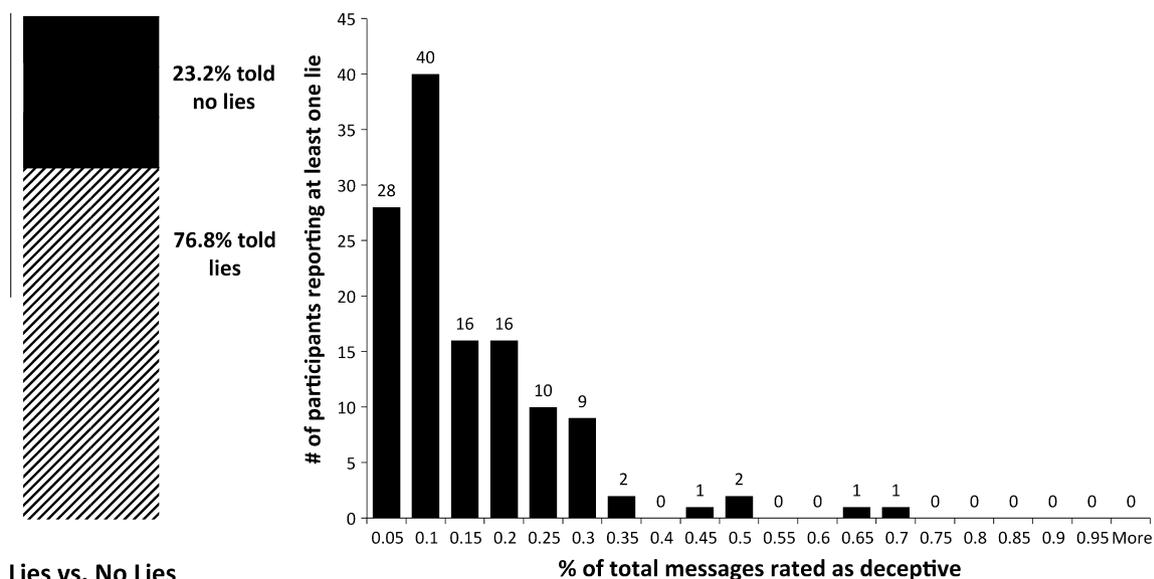


Fig. 1. The distribution of deceptive message production rates among participants as a function of total messages sent and the proportion of participants that did or did not tell a lie.

The third characteristic was the presence or absence of highly deceptive participants that lied significantly more than the rest of the sample. Serota et al. (2010) did not operationally define prolific liars, but a common rule for detecting outliers is three standard deviations above the mean. According to this criterion for identifying prolific liars, five participants in the current sample are three standard deviations beyond the mean. These five participants reported that more than 45% of their messages were lies. And, consistent with the prolific liar perspective, these five participants (4% of the sample) accounted for a disproportionate number of all the lies in the sample, producing 15% (72) of all the lies.

In summary, the distribution of deceptive messages produced via text messaging reported with our method of message-level data analysis suggests that aspects of both perspectives are correct for understanding the production of deception in text messaging, although neither the everyday liars nor the prolific liars perspectives fully explain our data. The distribution of the rate of deceptive message production is skewed, which supports Serota et al.'s (2010) contention that prior work has relied on problematic averages of deception. The presence of a small number of prolific liars also supports this perspective. Our data also provide support, however, for DePaulo et al.'s (1996) claims about the commonplace nature of lying in everyday life. First, a large majority of our participants (77%) reported at least one instance of deception, which indicates that telling lies in text messages is more common than not lying at all. Furthermore, among participants that did report deception, lying was often relatively infrequent, with over half of these participants reporting three or fewer lies out of their thirty messages. These results indicate that the majority of individuals engage in some moderate amounts of deception in text messaging, but that there are a small number of prolific liars who frequently lie in text messaging.

3.2. Deception properties in text messages

A second goal of this paper was to examine the properties of deceptive text messages and compare them to DePaulo et al.'s (1996) findings about the properties of deceptive messages. One sample *t*-tests compared the messages from the present sample with the DePaulo sample, using the total number of messages, averages, and standard deviations presented in DePaulo et al. (1996) Table 1 describes the occurrence of lies by category across

Table 1

The content, reasons, and types of lies reported in the current sample and DePaulo et al. (1996) student sample.

Category	Current sample (%)	DePaulo et al. (1996) (%)	t^a	p
<i>Content</i>				
Feelings	38.2	37.4	0.50	n.s.
Achievements	6.6	15.8	-3.31	$p < 0.01^{**}$
Actions, Plans, Whereabouts	31.7	27.5	2.02	$p < 0.05^+$
Explanations	11.0	10.3	0.31	n.s.
Facts, Possessions	10.4	9.0	0.90	n.s.
Not Coded	2.0			
<i>Reason</i>				
Self-Centered	62.2	45.5	3.20	$p < 0.01^{**}$
Other-Oriented	28.5	25.8	2.87	$p < 0.05^+$
Not Coded	3.8			
<i>Type</i>				
Outright	45.0	67.7	-3.46	$p < 0.01^{**}$
Exaggeration	26.3	14.8	1.98	$p < 0.05^+$
Subtle	26.5	8.6	4.52	$p < 0.01^{**}$
Not Coded	2.2			

Note: Each subcategory in the present sample total to 100%, each message was coded for each category, and the "neither" property of the "reason" category was excluded from analysis because it was not reported by DePaulo et al. (1996).

⁺ $p < .05$.

^{**} $p < .01$.

^a Given that the distribution of these data was not normal we also ran non-parametric one-sample binomial tests. The pattern of results did not change.

the two samples. There were several significant differences in content between the samples. In the text-messaging sample, the percentage of deceptive messages pertaining to ones' actions, plans, or whereabouts was significantly higher than in the DePaulo sample. This result is consistent with H2, which predicted that the use of text messages for micro-coordination and the frequency of butler lies observed in text messaging (Birnholtz et al., 2010) would increase this type of lie. Text messages also included fewer achievement lies than the DePaulo sample. This finding was unanticipated, and is discussed in more detail below.

As expected, deceptive messages in the present sample contained more exaggerations and subtle deceptions and fewer outright deceptions than in the DePaulo sample, providing support for H3. Because text messages are persistent and can be reviewed at a later date lies told in recordable media may be more likely to be discovered later (Hancock et al., 2004). Exaggerations and subtle lies are more difficult to detect in this way, and also easier to justify or defend if they are detected.

Lastly, the ratio of self vs. other oriented deceptive messages was different across the samples. The present sample contained more of both of those types of messages. This unusual result may be an artifact of the coding process. For instance, fully 29% of the messages in the DePaulo sample were not included in their reporting for this category, where almost all lies were coded in the present sample. Therefore, rather than compare the percentage of deceptive messages told for self or other oriented reasons, we compare the ratio of self-to other oriented messages in the two samples. In the present sample, the ratio of self to other oriented lies is 62:28, or 2.21. In contrast, the ratio of self to other oriented lies in the DePaulo sample is 46:26, or 1.77, indicating that there were proportionally more self-oriented lies in the present sample compared to the DePaulo sample. This difference between ratios across the samples supports H4, which predicted that because butler lies are usually explanations or accounts of one's behavior, these lies are frequently self-oriented and designed to avoid social interactions.

3.3. Relationship closeness and deception in text messaging

The final purpose of this paper was to explore the impact of relationship closeness on the production of deceptive text messages. In terms of the relationship types represented in the sample, 49.8% of messages were sent to friends, 34.4% of messages were sent to best

friends, 5.9% were sent to family members, 1.4% to classmates or colleagues, and 7.8% to others. To test H5A and H5B we constructed a linear mixed model, in which messages were nested within participants, participants were a random variable nested within recipients, and recipients were set as a random variable. Relationship closeness was included as a fixed variable, and the average rate of deception was set as the predictor variable. Note that the denominator degrees of freedom in linear mixed models are estimated using a Satterthwaite's approximation, which can yield non-integer degrees of freedom (SPSS Technical Report).

H5A and H5B are competing hypotheses about the direction of the association between relationship closeness and rate of deception. H5A was partially supported, as the data revealed a marginally negative association between lie frequency and relational closeness, $F[1, 289.56] = 3.71, p = .054$. For each single unit increase in relational closeness, there was 1.57% fewer lies in text messaging reported. This observation partially replicates DePaulo and Kashy's (1998) finding that deception occurs less often in closer relationships, and it extends this finding to a new communication medium, text messaging.

4. Discussion

The goal of this study was to advance our understanding of the production of deceptive text messages, using a novel method that involved participants reviewing and reporting on their previously sent text messages. The study makes several key contributions regarding how frequently deceptive text messages are produced, the properties of deceptive text messages, and the impact of relationship closeness on deception in this context.

The first contribution of this study was the identification of the rate at which individuals produce deceptive text messages. We compared the distributions predicted by the everyday liars perspective (e.g., DePaulo et al., 1996) and the prolific liars perspective (Serota et al., 2010) in the context of text messaging. The two perspectives differ in how they describe three key aspects of the distribution of lies across participants: the normality of the distribution, whether or not most participants told lies, and the presence of a small number of participants telling a high number of lies.

Using these three dimensions as a guide, we conclude that deception in text messaging is consistent with certain aspects of both of these perspectives, suggesting that they both have impor-

tant insights into how lying takes place in this medium. First, we found that the rate of production of deceptive text messages is not normally distributed, supporting an important critique of prior diary studies (Halevy et al., 2014; Serota et al., 2010). Second, in terms of whether the majority of participants told lies or not, 76% of participants in the present study reported telling at least one lie in the 30 text messages they submitted. In this respect, our findings are supportive of the everyday liar perspective. These findings are particularly consistent with the DePaulo et al. (1996) study regarding the frequency of deception in a variety of media, which also found that 76% of participants told at least one lie over the course of their week long study. Lastly, in support of the prolific liars perspective's central contention, we identified five prolific liars, supporting the existence of individuals who lie at rates substantially higher than the average. We operationally defined a prolific liar as participants who reported telling lies at a rate of three standard deviations or more above the mean. This definition may be useful for future work examining deception prevalence across a variety of communication media as it can be useful for identifying these individuals for future areas of study (e.g., is the content of lies that prolific liars tell different from the lies that others tell?).

It is important to note that Serota et al. (2010) also conducted a student survey study, in which they found that nearly 70% of participants told zero, one, or two lies in the 24 h before the survey, and that top 5% of liars told 22.4% of all lies collected. In contrast, only 52% of our student sample told zero, one, or two lies out of their last 30 text messages, and the top 5% of liars told just over 15% of all lies collected. Considering each aspect of the results together, we argue that the pattern of the production of deception in text messaging lies somewhere between the perspectives put forth by DePaulo et al. (1996) and Serota et al. (2010). In sum, there are indeed a few prolific liars, but most people appear to tell at least some lies via text messaging.

There are several possible reasons why we discovered this hybrid pattern in our data. First and foremost is the novel method of drawing on the advantages afforded by the stored records of text messages. Rather than relying solely on participants' recollections of their interactions, which have been shown to be surprisingly problematic (Stafford & Daly, 1984). This method allows individuals to review a record of all of their communication over a period of time. This advantage allowed us to look at deception in text messaging at a more granular level than the deceptions in other media reported in conversations reported in diary studies or the reviewing of the last 24 h for survey studies. Indeed, the record of communication produced by text messaging may be one reason that the majority of our participants reported telling a lie. The text messaging record reminded them of their specific verbal messages rather than more general recollections of whether they had lied over some period of time.

Another important issue is that text messaging is different from other forms of communication in several important ways, from the cues available to the length of the messages (Birnholz et al., 2010). Text messaging also tends to involve many messages concerned with coordinating other social activities (Ling & Yttri, 2002). As such, generalizing our results beyond text messaging to other forms of communication is difficult. For instance, a number of studies (e.g., Birnholz et al., 2010; Hancock et al., 2009) suggest that a common form of lying in text messaging is the butler lie, which involves lies associated with avoiding or delaying social interaction. Given that these kinds of lies feature prominently in text messaging, it could be that the reason a majority of our participants reported telling at least one lie is due to this pattern of deception in text messaging. If this is the case, then the present study's support for the everyday liar perspective is limited to text messaging.

Several other factors should also be considered when comparing our findings to previous deception production studies, which

typically examine deception over a day or week-long time frame and explored deception in face-to-face or a variety of communication media (e.g., DePaulo et al., 1996; Halevy et al., 2014; Hancock et al., 2004; Serota et al., 2010). First, unlike other studies that asked participants to indicate whether they lied over some period of time, regardless of the medium, this study examined their deception in text messaging only. Therefore, it is likely that these participants told other lies during the time frame represented by the text messages we collected, suggesting that the deception rates observed here represent an underestimation. Second, we collected 30 text messages from participants, rather than asking them to provide all the text messages they sent over a specific period of time. This limits our ability to compare these findings to previous work with respect to the number of deceptions told per day or week.

A second objective for this study was to explore the properties of deceptive text messages, using the characteristics detailed in DePaulo et al. (1996) as a guide. In many instances, we found that the properties of lies in our sample of text messages were overall quite similar to DePaulo et al.'s (1996) sample of deceptions across a variety of media, with a few important differences. In terms of content, people told more lies about their plans, actions, or whereabouts and fewer lies about their achievements when communicating using text messaging. In terms of the type of lies and the reasons for lying, people told more small lies (subtle lies and exaggerations) and more self-serving lies using text messaging. The pattern of lies told using text messaging is perhaps indicative of butler lies (Hancock et al., 2009) and their involvement in text messaging for coordinating social activity. Butler lies are often minor, such as providing an excuse for why a message was not responded to or why a meeting is not possible, rely on ambiguities inherent to communication media regarding one's actions and location. Butler lies are also frequently in the interest of the sender of the message, as these lies allow people to account for their behavior, such as why they failed to respond to a message. It appears that lies such as this comprise a large enough portion of text-messaging deception to substantially alter the patterns observed in DePaulo et al. (1996).

Our final objective for understanding the production of deceptive text messages was to explore how relationship closeness impacts the rate of deception in text messaging, extending previous work done in this area into a different communication medium. We found some evidence for the argument that people tell fewer lies via text messaging to those with whom they have more close relationships. This lends some support to findings by DePaulo et al. (1996), which argue that people lie less frequently when they are in a closer relationship because to tell lies in those situations violates the trust and foundations of those relationships. Other possible interpretations for these findings include participants feeling less social pressure to lie to those with whom they have closer relationships, or that these relationships are characterized by a degree of openness that reduces deception.

However, these findings should be considered in light of the medium in which they occurred. As people typically do not exchange text messages with individuals with whom they do not have close relationships (as opposed to other forms of communication, such as face-to-face conversations), we did not see as much relationship variance among relationships as we might have seen if we had included a broader range of media. Thus, this observation must be limited to deception in relationships that are supported by text-messaging.

4.1. Limitations and future work

In addition to the inherent limitations mentioned previously for generalizing findings from one medium, such as text messaging, to

other forms of communication, there are several issues that urge caution in the interpretation of the findings presented above. In terms of the data collection used for this study, one limitation is that we asked university students to choose two people and share the text messages that they sent to those individuals. As a result, we examined a limited and self-selected sample of student communication, and it is possible that participants may have selected individuals with whom they have a particularly honest relationship, which would affect the overall frequency and distribution of the production of deceptive messages. However, there is no reason to believe this would be systematically biased toward unusually honest or deceptive behavior. Further, students tend to use text messaging in different ways than non-students, which limits the degree that we can generalize these findings beyond the student population and requires further examination in broader populations.

Relatedly, in terms of understanding vary degrees of relationship closeness, few participants reported low levels of relationship closeness with either of the people to whom they sent messages. Specifically, only five message recipients were rated as a one or a two on a five-point scale of relationship closeness. This lack of a range of relationship closeness limits our ability to generalize our findings to a broad range of interpersonal relationships. Techniques, such as using custom smartphone applications to capture messages sent to all message recipients, could allow for assessing behavior with a wider range of relationship types.

Future work in this area could further explore these questions using methods that address each of these limitations, such as by collecting participants' text messages and assessments of deception as messages are sent (which would allow for the capture of deception in the moment), as well as all of participants' communication over a period of time (which would allow for an observation of whether deceptive messages occur in bursts). The proliferation of smartphones and the viability of writing applications for these phones make such data collection techniques possible and we are working to incorporate them into our future work.

5. Conclusion

The results from this study advance our understanding of the production of deceptive messages via text messaging. The production of deceptive messages is currently under-represented in the literature on deception (Serota et al., 2010), and the present research explores this area using a highly popular form of communication, text messaging (Purcell et al., 2010.) Not only is text messaging popular, it also provides a record all messages that an individual sends, which is particularly advantageous to the study of deception. By examining actual messages, we were able to more carefully and systematically examine the production of deception without the challenges of relying entirely on participants to accurately recall past interactions. In doing so, we found that lying behavior, at least in text messaging, involves characteristics predicted by both the everyday liar and prolific liar perspectives, with most participants telling a small number of lies, but a few people lying at a very high rate. Deception in text-messaging also seems to support prior assumptions that we lie more to those we are closer to, but those deceptions tend to be more self-centered and be concerned with messages about coordinating social activities, leading people to lie more about activities and plans.

As deception research begins to more carefully analyze how people produce messages, rather than just focus on how deception can be detected, the present work suggests that current theories

and concerns about deception have application in the relatively new medium of text messaging. Lies are produced in text messaging in a predictable and systematic way, which is perhaps no surprise, but the degree to which these lies hue to patterns observed in face-to-face lying is remarkable. Nonetheless, these media have features that shape the kinds of lies we tell (Hancock et al., 2004), and to some degree, to whom we tell them, and continued research on deception production in new media is required.

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References

- Battestini, A., Setlur, V., & Sohn, T. (2010). A large scale study of text messaging use. *Proceedings of MobileHCI*, 229–238.
- Birnholtz, J., Guillory, J., Hancock, J., & Bazarova, N. (2010). On my way: Deceptive texting and interpersonal awareness narratives. *Proceedings of CSCW*, 1–4.
- Bok, S. (1999). *Lying: Moral choice in public and private life*. New York: Vintage Books.
- Bond, C. F., & DePaulo, B. M. (2006). Accuracy of deception judgments. *Personality and social psychology review*, 10(3), 214–234.
- Cicchetti, D. V., & Sparrow, S. A. (1981). Developing criteria for establishing interrater reliability of specific items: Applications to assessment of adaptive behavior. *American Journal of Mental Deficiency*.
- CTIA (2012). *U.S. Wireless Quick Facts*. <http://www.ctia.org/consumer_info/service/index.cfm/AID/10323>.
- DePaulo, B. M., & Kashy, D. A. (1998). Everyday lies in close and casual relationships. *Journal of Personality and Social Psychology*, 74(1), 63–79.
- DePaulo, B. M., Kashy, D. A., Kirkendol, S. E., Wyer, M. M., & Epstein, J. A. (1996). Lying in everyday life. *Journal of Personality and Social Psychology*, 70(5), 979–995.
- DePaulo, B. M., Lindsay, J. J., Malone, B. E., Muhlenbruck, L., Charlton, K., & Cooper, H. (2003). Cues to deception. *Psychological Bulletin*, 129, 74–118.
- George, J. F., & Robb, A. (2008). Deception and computer-mediated communication in daily life. *Communication Reports*, 21(2), 92–103.
- Goffman, E. (1959). *The presentation of self in everyday life*. Garden City, NY.
- Halevy, R., Shalvi, S., & Verschuere, B. (2014). Being honest about dishonesty: Correlating self-reports and actual lying. *Human Communication Research*, 40, 54–72.
- Hancock, J., Birnholtz, J., Bazarova, N., Guillory, J., Perlin, J., & Amos, B. (2009). Butler lies: Awareness, deception and design. *Proceedings of CHI*, 517–526.
- Hancock, J., Thom-Santelli, J., & Ritchie, T. (2004). Deception and design: The impact of communication technology on lying behavior. *Proceedings of CHI*, 129–134.
- Ling, R., & Yttri, B. (2002). 10 Hyper-coordination via mobile phones in Norway. *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*, 139.
- Metts, S. (1989). An exploratory investigation of deception in close relationships. *Journal of Social and Personal Relationships*, 6(2), 159–179.
- Miller, G. R., Mongeau, P. A., & Sleight, C. (1986). Fudging with friends and lying to lovers: Deceptive communication in personal relationships. *Journal of Social and Personal Relationships*, 3(4), 495–512.
- Miller, G. R., & Stiff, J. (1993). *Deceptive communication*. Newbury Park, CA: Sage.
- Pew Research Center (2012). *Teens, smartphones, and texting*. <http://pewinternet.org/~media/Files/Reports/2012/PIP_Teens_Smartphones_and_Texting.pdf>.
- Purcell, K., Entner, R., & Henderson, N. (2010). *The rise of apps culture*. <http://pewinternet.org/~media/Files/Reports/2010/PIP_Nielsen%20Apps%20Report.pdf>.
- Reynolds, L., Gillette, S., Marder, J., Miles, Z., Vodenski, P., Weintraub, A., et al. (2011). Contact stratification and deception: Blackberry messenger versus SMS use among students. *Proceedings of CSCW*, 221–224.
- Reynolds, L., Smith, M. E., Birnholtz, J. P., & Hancock, J. T. (2013). Butler lies from both sides: actions and perceptions of unavailability management in texting. In: *Proceedings of CSCW* (pp. 769–778).
- Serota, K. B., Levine, T. R., & Boster, F. J. (2010). The prevalence of lying in America: Three studies of self-reported lies. *Human Communication Research*, 36(1), 2–25.
- SPSS Technical Report-Linear Effects Mixed Modeling. <http://www.spss.ch/upload/1107355943_LinearMixedEffectsModelling.pdf>.
- Stafford, L., & Daly, J. A. (1984). Conversational memory. *Human Communication Research*, 10(3), 379–402.
- Whitty, M. T., Buchanan, T., Joinson, A. N., & Meredith, A. (2012). Not all lies are spontaneous: An examination of deception across different modes of communication. *Journal of the American Society for Information Science and Technology*, 63, 208–216.