Time Before Negative Emotions Occur While Waiting for a Reply in Text Messaging with Read Receipt Functionality

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Abstract—**In text messaging via smartphone, many users feel pressure to rapidly exchange messages. This study investigates reply speeds in smartphone messaging, focusing on messaging with read receipt functionality. This function allows the sender to see when a recipient has read a sent message. Using a questionnaire completed by 213 female college students in Japan, we investigate the time before negative emotions are felt while waiting for a reply. Results showed negative emotions arise in significantly less time when waiting for a reply to a read message than an unread one.**

Keywords—reply speed; read receipt function; emotion; text messaging.

I. INTRODUCTION

People looking at their phones while walking are now a common sight on the street and in train stations [1]. Although they do so for a variety of reasons, it seems that many are texting while walking in order to quickly reply to received messages [2]. In text messaging with mobile phones and smartphones, many users feel pressure to rapidly reply [3]. However, there are few studies examining response speed in text-based communication. To clarify demands for rapid responses in text messaging, this study investigates reply speeds in messaging via smartphones and assesses the time before negative emotions arise while waiting for a reply.

In text-based communication such as conventional email, there is no interaction while a message sender waits for a reply. However, messaging apps such as Facebook Messenger and LINE have read receipt functions, which notify senders when recipients have read a sent message, allowing senders to know that recipients have read the message before any reply arrives [4]. In such exchanges, many senders are concerned not only about the time spent waiting for a reply, but also about the time until the read receipt appears [4]. For example, the sender may suspect that the recipient is ignoring the message if the read receipt is not displayed after an extended time ("ignored unread"), or if no reply is received long after the read receipt has been displayed ("ignored read"). Conversely, recipients may worry about being misunderstood for leaving messages in an "ignored unread" state when they cannot read messages immediately, or in an "ignored read" state when unable to immediately reply to read messages. We hypothesize that

read receipt functions are strongly associated with interaction speed. Therefore, this study focuses on relations between this display function (which does not exist in conventional mobile phone messaging or email) and requirements for response speed.

The study used a questionnaire survey to investigate the time before negative emotions occur while waiting for a reply in text messaging on smartphones. This covered messaging with read receipt functionality, such as Facebook Messenger and LINE, and wait times were categorized as *read* status or *unread* status. The questionnaire focused on four representative negative emotions often mentioned in interpersonal communication research: sadness, anxiety, anger, and guilt. We recognized that a variety of additional factors are likely involved, such as message content and context, but as it is difficult to conduct a survey that covers all possible factors, we focused on two kinds of message recipients: friendships [5] and family relationships [6].

The rest of the paper is structured as follows. In Section 2, we present method of this study. In Section 3, we present results of this study. Finally, we conclude in Section 4.

II. METHOD

Survey participants were 213 Japanese female students (mean age = 18.67; SD = 0.94; age range, 18–22 years) at universities in the Tokyo area. The participants in this survey were limited to young women, because young women are more inclined to maintain human relationships through text messaging, and prefer and use messaging more than do men (e.g., [7]). All participants possessed their own smartphone and regularly used text messaging applications with read receipt functionality. Participation in this survey was voluntary. This survey was conducted in July of 2017. Participants were asked to answer a paper-based questionnaire.

The questionnaire asked "At noon, you send a text message to two recipients (*family and relatives* and *friends*), from whom you expect a response. Once sent, the message is immediately displayed as read. While waiting for a response, how long will it take for each of the four negative emotions to arise in you? How long would it take for each of the four negative emotions to arise if the message remained unread?" Each questionnaire item was answered using ten times of day: 1 = Until 13:00, 2 = Until 15:00, 3 = Until 17:00, 4 =

Until 19:00, 5 = Until 21:00, 6 = Until 23:00, 7 = Until 01:00, 8 = Until the next morning, 9 = Until noon the next day, 10 = Later than noon the next day. Each of the four negative emotions and each of the two recipient types were measured. Because answers are provided on an ordinal scale, the resulting data are subject to nonparametric analyses.

III. RESULTS

To compare time before each emotion occurs while waiting for a reply from recipients in *read* and *unread* statuses, we conducted the Wilcoxon signed-rank test using time-zone option responses for each of the two recipients and for each of the four negative emotions. Results indicated significant differences between *read* and *unread* status for each recipient and for each negative emotion. Table 1 shows the times before each of the four emotions occur while waiting for a reply from each of two recipients in *read* and *unread* status. We regarded the period from option 1 to 7 as "the same day as the message was sent" by considering option 7 (until 01:00) to mean the same thing as "by bedtime." The main results were the following three points: 1) For both recipient types, negative emotions arise in significantly less time when waiting for a reply to a *read* status message than one with an *unread* status. (Though only a marginal difference in occurrence of guilt when waiting for a reply from *family and relatives*). 2) When messages are in *read* status, anxiety occurs when no reply arrives from *family and relatives* on the same day. 3) When a message is in *unread* status, anxiety occurs when no reply arrives from *family and relatives* on the same day.

To find differences between sadness, anxiety, anger, and guilt with respect to the time before these four negative emotions occur while waiting for a reply from each of the recipients in each of the statuses, we conducted multiple comparisons among these emotions for each condition of the two recipients × the two statuses. The main results were the following four points: 1) Anxiety arises in significantly less time than does sadness ($p < 0.001$), anger ($p < 0.001$), or guilt ($p < 0.001$) when waiting for a reply from *family and relatives* for both *read* and *unread* statuses. 2) Anger arises in significantly less time than does guilt ($p < 0.001$) when waiting for a reply from only *family and relatives* for both *read* and *unread* status. 3) There is no significant difference between sadness and anger in the time before these emotions occur while waiting for a reply from only *family and relatives* for both *read* and *unread* statuses. 4) There is no significant difference between anxiety and sadness in the time before these two emotions occur while waiting for a reply from only *friends* for *read* status.

IV. CONCLUSION

The study clarified that sadness, anxiety, anger, and guilt arise in significantly less time when waiting for a reply to a read status than an unread status from all recipients. That is, senders experience negative emotions when they do not receive replies from recipients who were able to read the sender's message. Among the four emotions, anxiety and sadness tend to occur early, while anger and guilt tend to take longer. We observed that when waiting for a reply from

family and relatives, anxiety occurred in a shorter time in both read and unread status. Relationships with family are more intimate than friends, so senders may be more prone to worry about accidents or illness when messages remain unread for a long period, resulting in faster experience of anxiety. There is also likely a strong emotional dependence of young people on their families. Late replies may therefore more easily lead to anger and subsequently to anxiety. We also found that when waiting for a reply from friends, sadness occurred more quickly in the read status. While family relationships are strong, friendships may be relatively fragile [8], and the ending or erosion of such relationships results in sadness. Senders may interpret a lack of reply as indication of a decline in recipients' interest in them, resulting in a faster experience of sadness.

In future work we will gather scenes in which users intentionally manipulate reply speeds and analyze them in detail. In addition, this study solely surveyed young Japanese women. To generalize the results obtained in this study, we should examine the influence of differences in gender, culture, and generation.

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TABLE I.   TIMES BEFORE EACH OF THE FOUR EMOTIONS OCCURS WHILE WAITING FOR A REPLY IN READ AND UNREAD STATUSES.

Recipient Type	Status	Sadness			Anxiety			Anger			Guilt		
		Median (IQR)	z	p	Median (IQR)	z	p	Median (IQR)	z	p	Median (IQR)	z	p
Family and Relatives	Read	10 (4.5 – 10)	-4.73	<0.001	6 (3 – 10)	-3.02	<0.01	10 (5 – 10)	-4.13	<0.001	10 (9 – 10)	-1.88	<0.10
	Unread	10 (6 – 10)			7 (4 – 10)			10 (7 – 10)			10 (9 – 10)		
Friends	Read	9 (4 – 10)	-6.27	<0.001	8 (4 – 10)	-5.41	<0.001	10 (6 – 10)	-4.75	<0.001	10 (7 – 10)	-3.08	<0.01
	Unread	10 (7 – 10)			9 (6 – 10)			10 (9 – 10)			10 (8 – 10)		

Note. IQR = interquartile range; z = z-value of Wilcoxon signed-rank test; p = significance probability of Wilcoxon signed-rank test.