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Linguistic Devices, Emotionality, and Memorability of Computer Mediated Communication

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Angela M. Mion

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Abstract

I examined whether college students use shortcuts, pragmatics, and errors in text messages differently depending on their gender and the emotionality of the message. Results indicate that the prevalence of particular shortcuts differed across happy, sad, and angry messages, but gender did not influence use of linguistic devices. In a second study, I examined the emotionality and memorability of text messages versus voicemails. Results indicate that texts may be remembered better than voicemails, and happy, sad, and angry messages may be remembered differently by men and women.

Keywords: computer mediated communication, emotion, memory, linguistics

Linguistic Devices, Emotionality, and Memorability of Computer Mediated Communication

Computer Mediated Communication (CMC) is communication through the use of some electronic device. Examples include email, text messaging, picture/video messaging, voicemail, instant messaging (IM) or internet chat (Facebook Chat, AIM). CMC can be synchronous (as in IM) or asynchronous (as in email). CMC is popular among college students, particularly white, female students from families within the income bracket of \$100-149 thousand (Junco, Merson, & Salter, 2010).

Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong (2010) classify CMC as interactive and much like a real conversation, though the “speakers” are separated by time and space. At an age where technology is becoming more prevalent, CMC usage is increasing (Drouin, 2011). There are many reasons to choose CMC over face to face communication (FTF), including the ability to shield oneself from the message recipient and the permanency of CMC over FTF (Riordan & Kreuz, 2010).

Berger and Coch (2010) define the language used in CMC as texted English which “is a hybrid, technology-based language derived from standard English modified to facilitate ease of communication” (p. 135). One question that often arises when considering text messages is whether this use of texted English affects standard English. Varnhagen et al. (2010) found that spelling ability was not related to the use of new language in CMC. Similarly, Drouin and Davis (2009) found that text message language was not related to poor performance in standard literacy.

Varnhagen et al. (2010) found that people commonly use linguistic devices to abridge typed CMC messages. These devices can be classified into two major categories, with multiple subcategories in each. First, shortcuts are shortened versions

of words or phrases that facilitate speedier typing. Shortcuts include insider words (hottie, an attractive person), abbreviations (prolly, probably), word combinations (wanna, want to), acronyms (omg, oh my God), alphabet/letters (u, you; 2day, today), phonetics (wat, what), lower case (i, I), and contractions (thats, that's). The second major category is pragmatic devices, which are devices utilized to support and enhance the emotional impact of a message. Pragmatics include emotion words (hahaha, laughter), emotion acronyms (lol, laugh out loud), upper case (WHAT, what), and emotion punctuation (., pause). Varnhagen et al. (2010) also found that participants made errors when typing, including typographical errors (Frwnch, French) and misspellings (embarrasing, embarrassing).

Varnhagen et al. (2010) examined all of these linguistic devices in IM communications amongst adolescents. They found adolescent girls utilized more creative linguistic devices (both shortcuts and pragmatics) than boys did when sending instant messages. When examining gender differences in the context of formal spelling ability, boys who performed worse on a standard spelling test used more linguistic devices when sending instant messages than boys who performed better on a standard spelling test. Finally, girls who used more abbreviations tended to be better spellers than girls who used fewer abbreviations, while the opposite was true of boys.

Beyond linguistic devices that convey emotion, an emoticon is a pictorial or symbolic representation of emotion. It can be positive, negative, or neutral. Examples include a smile :) a frown :(an angry expression >:| and a neutral expression :| In CMC, emoticons may take the place of nonverbal cues, but they are used consciously and with more control than in FTF interactions (Derks Bos, & von Grumbkow, 2008). Emoticons are typically used to express emotion, strengthen the message, regulate the

message, gain perspective, and express humor; it is also possible to use them to express sarcasm (Derks Bos, & von Grumbkow, 2008). Emoticons have been found to influence CMC interpretation but do not have the strength to reverse the valence of the verbal message (Derks Bos, & von Grumbkow, 2008).

Although there are some similarities between emoticons and nonverbal behavior, emoticons are more voluntary and deliberate and therefore may have a different impact on the emotional interpretation of messages. Past research has demonstrated that the use of emoticons follow social norms that are common in CMC and are based on social norms typical in FTF communication (Derks, Bos, & von Grumbkow, 2007). In an FTF communication for example, individuals adjust emotional expressions to fit the context to some extent, and this also applies to emoticon usage in CMC. At the same time, there is an anonymity aspect of electronic communication devices that allows for more free expression of negative emotions than typical FTF communication (Derks, Bos, & von Grumbkow, 2007).

Varnhagen et al.'s (2010) study examined linguistic devices in the context of IM, but little research has focused on the use of linguistic devices in text messages, a newer and more popular form of CMC. Additionally, no research has examined whether the use of linguistic devices varies based on the type of emotion conveyed in a message, or whether gender differences persist in the use of these linguistic devices when texting. Study 1 was designed to answer these questions.

There has been extensive research on emotion, memory, and how the two interact. According to Fiedler, Nickel, Asbeck, & Pagel (2003), positive mood facilitates memory and enhances mood congruent recall, which is that people tend to remember positive events better when they are in a positive mood and negative events better when they are in a negative mood. Several researchers have documented that

we remember positive events better than negative events in general and remember them longer, despite the emotion of the event becoming less extreme over time (Levine & Bluck, 2004; Walker, Skowronski, Gibbons, Vogl, & Thompson, 2003; Walker, Vogl, & Thompson, 1997). Despite this being a fairly well established phenomenon in verbal and written communication, no studies have examined how emotion and memory interact in the context of computer mediated communication. Additionally, no previous studies have examined how emotion is interpreted in messages conveyed through different media like text messages and voicemails. Research is also lacking in how emotional messages in different formats are remembered across time. Study 2 was designed to address these issues.

Study 1

Method

This study addressed whether college students use shortcuts and pragmatic devices in text messages differently depending on the emotional content of the message they are conveying and whether this relationship depends on gender.

Participants. Participants were undergraduate students at Butler University, recruited from introductory psychology courses. They received extra credit as an incentive for participating. A total of 33 students completed the study. Twelve men (9 White, 1 Asian, 2 Hispanic) and 21 women (19 White, 1 Asian, 1 Hispanic) completed the study. The two gender groups were statistically equivalent in their ethnic distribution. The average age of the men ($M=20.25$, $SD=1.91$) was significantly higher than that of the women ($M=18.71$, $SD=1.15$), but the range (18-24) was typical of undergraduates, $F(1, 31)=8.39$, $p<.01$. Students were tested in two groups, one with both men and women and one with only men.

Materials and Procedure. After giving informed consent, each participant filled out a demographic form. Participants read three standard English messages (see Appendix A) one at a time from a PowerPoint presentation projected onto a screen. Each message related either a happy, sad, or angry scenario. Each participant used his or her own cell phone to text the message to the researcher's cell phone. Participants were asked to compose the message in the way they would normally send a text. In other words, they were asked to use their own style of texting while retaining all of the content of the messages.

Each text was uploaded into an Excel document. I analyzed the texts qualitatively using a modified version of Varnhagen et al.'s (2010) categories. I scored each message for inclusion of shortcuts (abbreviations, emotional acronyms, non-emotional acronyms, alphanumeric substitutions, combination words, contractions without punctuation, insider words, use of lowercase instead of uppercase, and phonetic spelling) and pragmatics (emoticons, emotional onomatopoeia, non-emotional onomatopoeia, punctuation for emphasis, and use of uppercase for emphasis). I also noted instances of content addition (emotional and non-emotional) and three types of errors (spelling typographical errors, punctuation typographical errors, and misspellings). Appendix B contains the scoring criteria and an example scoring sheet with examples of each category.

Two raters scored each text message. To secure interrater reliability, each rater privately scored each message for the linguistic devices. Then the raters traded score sheets, scored each other's messages, and discussed any discrepancies in the scores.

Results

Utilization of Linguistic Devices. To determine whether students use some linguistic devices more than others while text messaging regardless of the emotion of

the message, I ran a repeated measures analysis of variance with type of linguistic device as a within subjects factor and gender as a between subjects factor. I ran three separate analyses: one for the nine shortcuts, one for the five types of pragmatics, and one for the three error types. Table 1 contains specific linguistic devices by gender.

For shortcuts, I found a type main effect, $F(8, 24)=5.44, p<.001$. The use of lowercase was most common ($M=6.67, SD=7.84$), followed by inclusion of abbreviations ($M=3.45, SD=7.24$) and contractions ($M=3.33, SD=4.29$). Less commonly used were combinations ($M=1.03, SD=1.42$), emotional acronyms ($M=.58, SD=.61$), alphanumeric ($M=.45, SD=1.86$), phonetics ($M=.42, SD=.94$), insider words ($M=.33, SD=.99$), and non-emotional acronyms ($M=.12, SD=.33$). The pattern of use of shortcuts did not depend on gender ($F(8, 24)<1$), nor did men and women differ in the number of shortcuts they used overall, $F(1, 31)<1$.

For pragmatics, I again found a main effect of type, $F(4, 28)=4.06, p<.01$. Participants frequently used punctuation for emphasis ($M=2.21, SD=3.32$), with emoticons being the next most common, but fairly rare ($M=.70, SD=1.13$). Participants used uppercase ($M=.58, SD=1.00$), emotional onomatopoeia ($M=.30, SD=.68$), and non-emotional onomatopoeia ($M=.27, SD=.94$) less commonly. Again, gender did not exert a main effect ($F(1, 31)=1.78, n.s.$), nor did it interact with type of pragmatic device, $F(4, 28)<1$.

Finally, some error types were more common than others, $F(2, 30)=6.42, p<.005$. Punctuation typographical errors occurred most frequently ($M=2.82, SD=3.90$), followed by spelling typographical errors ($M=1.00, SD=1.09$), and misspellings ($M=.27, SD=.57$). Men and women were similar both in the overall frequency of their errors ($F(1, 31)<1$) and in the particular types of errors that they made, $F(2, 30)<1$.

differences from women in happy (men: $M=7.25$, $SD=6.38$; women: $M=7.33$, $SD=6.10$), sad (men: $M=6.00$, $SD=7.53$; women: $M=4.00$, $SD=4.06$), or angry messages (men: $M=5.17$, $SD=5.73$; women: $M=3.90$, $SD=4.00$). Additionally, I found no main effect of gender on usage of shortcuts ($F(1, 31) < 1$), suggesting that men and women were equally likely to use shortcuts in their texts overall.

In order to determine whether particular shortcuts varied based on the emotion of the message, I ran a 9 (shortcut: abbreviation, acronym emotional, acronym non-emotional, alphanumeric, combination, contraction, insider word, lowercase, phonetic) X 3 (emotion: happy, sad, angry) repeated measures analysis of variance. I found a significant Type by Emotion interaction, $F(16, 17)=4.86$, $p < .001$. I ran follow up analyses to see which devices were most common in each message type. Emotional acronyms were significantly more common in angry messages ($M=.55$, $SD=.62$) than in happy ($M=.03$, $SD=.17$) or sad ($M=0$); non-emotional acronyms were more commonly utilized in sad messages ($M=.12$, $SD=.33$) than in happy ($M=0$) or angry ($M=0$); and happy messages contained the more lowercase words ($M=3.88$, $SD=4.28$) than in sad ($M=1.64$, $SD=2.13$) or angry ($M=1.15$, $SD=2.09$). Results are summarized in Table 2.

Use of Emotional Techniques. My final set of analyses examined the utilization of four specific emotional techniques (emotional acronyms, emoticons, emotional onomatopoeia, and emotional content additions) by men and women across the three types of emotional messages. (See Figure 2.)

I found that some emotional techniques were more common than others ($F(3, 29)=4.63$, $p < .01$), but this difference depended on the emotionality of the message, $F(6, 26)=9.44$, $p < .001$. Acronyms were much more common in angry messages ($M=.55$, $SD=.62$) than in either happy ($M=.03$, $SD=.17$) or sad ($M=0$) messages.

Onomatopoeia emerged in both happy ($M=.18, SD=.53$) and angry ($M=.12, SD=.33$), but not in sad messages ($M=0$). Similarly, content additions appeared in angry ($M=.30, SD=.59$) and happy ($M=.27, SD=.63$) messages more frequently than sad messages ($M=.15, SD=.57$). Finally, emoticons were most prevalent in sad messages ($M=.42, SD=.66$); they occurred half as often in happy messages ($M=.21, SD=.60$), and were rare in angry communications ($M=.06, SD=.24$). No main effect of gender emerged ($F(1, 31)=1.79, n.s.$), nor did gender interact with any of the other variables, all $F_s < 2$.

Discussion

Due to the lack of previous literature about the use of linguistic devices in emotional messages, I did not have any specific hypotheses for Study 1. However, my study did offer several interesting results. I found that some linguistic devices are used more commonly than others. For example, abbreviations, contractions, and use of lowercase were the most common shortcuts, and the use of punctuation for emphasis far outstripped other pragmatic devices.

Men and women use similar linguistic devices and make similar errors when they send text messages. Although there were no statistically significant gender differences, when looking within a given category of linguistic devices, men and women sometimes varied. For instance, men used an average of six abbreviations whereas women used an average of two. In contrast, women used an average of eight lowercase words while men used only four. There was substantial variability from participant to participant, as evident by the large standard deviations summarized in Table 1, and this likely made significant gender differences difficult to detect.

Interestingly, pragmatics and errors did not differ based on the type of emotion being conveyed in text messages, whereas shortcuts did. Shortcuts occurred more

commonly in happy messages than in sad and angry messages, where they were fairly equally frequent. For example, the sentence “Im gonna go to spain next semester all by myself haha its gonna be awesome that well both be in europe bc well be having an awesome time” contains nine shortcuts, just a few more than the average utilized by participants to convey the happy message. This significant result suggests that young adults change texting styles to suit the emotional content of the message. For example, emotional acronyms, non-emotional acronyms, and lowercase were found to be more common in angry, sad, and happy messages, respectively. Finally, of the four linguistic devices specifically designed to convey emotion, some were more common than others, yet this was dependent on whether the message was happy, sad, or angry. For instance, acronyms tended to be used in angry messages, emoticons in sad messages, and onomatopoeia in happy messages. The addition of novel content to convey emotion was found in all three message types.

Based on the results of Study 1, I created three text messages that utilized common linguistic devices for Study 2. By using the devices documented in Study 1, I created three text messages that represented prototypes for each of the happy, sad, and angry messages. The prototypes were designed to convince college student participants that the messages were generated by their peers. The purpose of Study 2 was to examine the emotionality and memorability of two different forms of CMC: text messaging and voicemail.

Study 2

Method

Participants. Participants were undergraduate students at Butler University, recruited from introductory psychology courses. A total of 98 students completed the study. Twenty men (17 White, 1 African American, 2 Hispanic) and 78 women (72

White, 1 African American, 1 Asian, 2 Hispanic, 2 other) participated. The two gender groups were statistically equivalent in their ethnic distribution. The average age of the men ($M=19.65$, $SD=1.53$) was significantly higher than that of the women ($M=19.04$, $SD=.99$), but the range (18-22) was typical of undergraduates, $F(1, 96)=4.79$, $p<.05$. Participants received extra credit in a psychology course as an incentive.

Materials and Procedure. I randomly assigned participants to one of six conditions: happy text, sad text, angry text, happy voicemail, sad voicemail, angry voicemail. The text messages were created by evaluating the most commonly used linguistic devices from Study 1 and incorporating those devices into an “average” text message for each emotion. (See the “Translated Texted English Messages” in the second part of Appendix A.) Each translated texted message was similar in its number of characters. A senior theater major recorded each voicemail verbatim from the original standard English messages from Study 1 (Appendix A), each of which contained 63 words. The researchers used a prepaid cell phone as their own, with the text and voicemail messages already loaded.

Participants attended individual testing sessions. After giving informed consent, participants filled out a demographic questionnaire as well as pencil and paper tests and a computerized questionnaire for the cover story (a separate research project). The participant was interrupted while reading the informed consent by the researcher, who feigned receiving a text or voicemail. The message had been previously created and loaded onto the phone and was shared with the participant. The content of the emotional message was identical regardless of the medium (text or voicemail), but in the text condition, participants read the message, whereas in the voicemail condition, they listened to it.

After a 20-minute delay, during which time they completed the computerized questionnaire for the separate study, participants took an incidental memory test. They recalled all of the details of the message that they could remember. Then, they reviewed the text or voicemail message again through the same medium as their initial encounter with it, before rating its emotional impact on a 7-point Likert scale. Participants were also asked to identify the emotion that they believed the person in the message was feeling at the time that it was sent. This was an open-ended question in which participants freely reported a word of their choice to describe the emotion they attributed to the sender of the message. Appendix C contains the memory recall task and emotional impact rating scale that participants used to make these judgments.

Finally, the researcher asked participants whether or not they suspected the text or voicemail had been a part of the study. If they responded affirmatively, the researcher queried what the participant thought they would have to do with the message. Answers were then categorized into one of three categories: memory, unspecified, or no suspect. The memory category signified that the participant believed he or she would need to remember the message or details about it. Unspecified meant that the participant believed something was going on, but he or she did not think the message was meant to be remembered. For example, some participants thought the message was a mood manipulation or a distracter task. Finally, if the participants fully bought into the deception of the researcher, their answers were categorized as no suspect.

Results

Suspicion. I analyzed differences in degree of suspicion (memory, unspecified, no suspect) across message medium (text, voicemail) and across emotion (happy, sad, angry). (See Table 3.) I found no differences in suspicion across medium

($X^2(2, N=96)=2.16, n.s.$) or across emotion, $X^2(4, N=96)=3.12, n.s.$ Thus, regardless of medium or emotion, participants were equally likely to suspect that the message was for a memory task, to feel suspicious but not know what it was for, or to have no suspicions about the message.

Second, I analyzed whether differences existed in memory recall scores or emotion rating scores based on degree of suspicion. A between subjects analysis of variance with suspicion (memory, unspecified, no suspect) as the independent variable and memory as the dependent variable revealed no main effect of suspicion on memory, $F(2, 93)=1.41, n.s.$ This indicated that participants remembered a similar number of elements from the message, regardless of whether they suspected the message was part of the study or not. A second between subjects ANOVA similarly showed no main effect of suspicion on emotion rating, $F(2, 93)=1.43, n.s.$ Thus, suspicion did not affect how emotional the participants felt each message was.

Emotionality. A 3 (emotion: happy, sad, angry) X 2 (medium: text message, voicemail) X 2 (gender: male, female) between subjects ANOVA with emotion rating as the dependent variable revealed no main effects or interactions, all $F_s < 2$. Thus, whether the message was happy, sad, or angry, whether it was conveyed in text or voicemail, and whether the participant was male or female had no effect on how emotional the messages were perceived to be. Results are summarized in Table 4.

To examine overall valence effects of emotion on emotionality ratings, I collapsed sad and angry messages into a general negative emotion category. I then ran a 2 (medium: text, voicemail) X 2 (emotion: positive negative) X 2 (gender: male, female) between subjects analysis of variance. I found no significant main effects or interactions, all $F_s < 3$.

Memory. A 3 (emotion: happy, sad, angry) X 2 (medium: text message, voicemail) X 2 (gender: male, female) between subjects ANOVA examined the similar impact of these factors on how memorable the emotional messages were. (See Table 5.) I found a near significant trend associated with the message medium ($F(1, 86)=2.81, p=.097$) with voicemail messages ($M=3.94, SD=1.63$) being remembered somewhat better than text messages ($M=3.60, SD=1.75$). Figure 3 summarizes these results. Therefore, voicemail messages tended to be remembered better than text messages.

Although neither emotion nor gender exerted a significant main effect on how memorable texts and voicemails were (all $F_s < 2$), a trend emerged suggesting an emotion by gender interaction, $F(2, 86)=2.76, p=.069$. Men tended to remember happy messages ($M=4.29, SD=1.98$) better than women ($M=3.59, SD=1.31$), whereas women tended to remember sad ($M=3.96, SD=1.73$) and angry ($M=4.11, SD=1.91$) messages better than men (sad: $M=2.88, SD=1.36$; angry: $M=2.80, SD=1.92$). These results are displayed in Figure 4. Neither the emotion by memory interaction, the memory by gender interaction, nor the three way interaction (emotion by memory by gender) reached significance, all $F_s < 2$.

Again, I collapsed sad and angry messages into a general negative emotion category and ran a 2 (medium: text, voicemail) X 2 (emotion: positive, negative) X 2 (gender: male, female) between subjects analysis of variance. I found a significant Emotion by Gender interaction, $F(1, 90)=5.63, p<.05$. Women remembered negative messages ($M=4.04, SD=1.81$) better than men ($M=2.85, SD=1.52$), while men remembered positive messages ($M=4.29, SD=1.98$) better than women ($M=3.59, SD=1.31$). Results are displayed in Figure 5. No additional main effects or interactions were found, all $F_s < 3$.

Relationship Between Emotion and Memory. To examine the relationship between how emotional participants perceived the message to be and how well they remembered the message, regardless of medium, I ran a Pearson correlation analysis that included these two variables. There was not a significant correlation between emotionality and memory ($r=.03$, *n.s.*) indicating that there was not a strong relationship between the perceived emotionality of the message and message memorability.

Furthermore, there were no significant relationships present between emotionality and memory when each message type (happy, sad, angry) was examined separately, (all $r_s \leq .07$, *n.s.*). Thus regardless of the message was happy, sad, or angry, higher perceived emotionality was not associated with better memorability of the message.

Correct Identification of Emotion. My final set of analyses examined the accuracy with which participants identified the emotion conveyed by the message they saw or heard. (See Table 6.) A 3 (emotion: happy, sad, angry) X 2 (medium: text, voicemail) X 2 (gender: male, female) between subjects analysis of variance with accuracy of identified emotion as the dependent variable showed a trend whereby happy messages tended to be more correctly identified as happy ($M=.91$, $SD=.29$) than sad messages were identified as sad ($M=.75$, $SD=.44$) or angry messages were identified as angry ($M=.63$, $SD=.49$; $F(2, 86)=2.40$, $p=.097$). Figure 6 shows these results. This result remained consistent when collapsing sad and angry into an overall negative emotion, $F(1, 90)=2.88$, $p=.093$.

Although no additional main effects reached significance (all $F_s < 1$), I found a trend towards an interaction of medium and gender ($F(1, 86)=2.81$, $p=.098$) with women ($M=.82$, $SD=.39$) tending to correctly identify the emotion of text messages

more often than men ($M=.70$, $SD=.48$), and men ($M=.90$, $SD=.32$) tending to correctly identify the emotion of voicemails more often than women ($M=.70$, $SD=.46$). This interaction is displayed in Figure 7. No further interactions between emotion and medium, emotion and gender, or emotion by medium by gender were revealed, all $F_s < 1$. Finally, when I collapsed sad and angry messages into a general negative emotion category, I found no significant main effects or interactions, all $F_s < 3$.

Discussion

Before conducting the emotion rating and memory analyses for Study 2, I was interested in determining the effectiveness of the deception in my study and whether it impacted other variables. Interestingly, I found no differences in the degree of suspicion based on the type of medium or the emotion conveyed by the message. Participants were equally likely to suspect that they were being deceived regardless of the message coming by text or voicemail and regardless of whether the message was happy, sad, or angry. More importantly, whether or not the participant suspected deception did not have any effect on how well he or she remembered the message or how emotional he or she rated it. When examining the results of this study, it is useful to know that if participants suspected they were being misled, their answers to the memory and emotionality questions were not affected.

I found that the three messages were rated similarly on the emotion rating form and no gender differences emerged in perceived emotionality. Specifically, the study abroad acceptance (happy) scenario was just as emotional as losing the family dog (sad) and dealing with an uncooperative group for a class project (angry). As I created the messages for Study 2, I was careful to balance them for words in the voicemail condition and for characters in the text message condition. In addition, it is also clear that the three messages were balanced in their emotional impact.

In analyses of message memorability, voicemail messages were better remembered than text messages. Perhaps the most important finding, this result has practical applicability. When sending a friend a message that you wish the friend to remember, you should choose a voicemail because your friend will most likely remember the voicemail better than a text message. In addition, there was a near significant interaction between gender and emotion on how well the messages were remembered. Men tended to remember happy messages more accurately, and women tended to remember sad and angry messages more easily. Overall, men remembered positive messages better than women, while women remembered negative messages better than men. This was somewhat surprising, as past research has associated men with negative emotions like anger and women with more positive emotions like happiness (Kelly & Hutson-Comeaux, 1999; Saurer & Eisler, 1990). Also surprisingly, there was not a relationship between the perceived emotionality of the message and how well it was remembered. Perhaps this was due to a lack of variability in perceived emotionality limiting my ability to detect a significant correlation.

Finally, I found that in identifying the emotion of the message, participants identified happy messages more accurately than sad or angry messages. There can be ambiguity when describing the emotion of sad and angry messages, which may have led to happy messages being identified correctly more often. For example, sad and angry messages were often identified with more vague descriptions such as “frustrated” or “upset.” Interestingly, for emotional identification there was also a near significant interaction between gender and medium. Men tended to correctly identify the emotion of voicemails better than women, whereas women seemed to correctly identify the emotion of text messages better than men. Unlike for

memorability, the result did not depend on the particular emotion (happy, sad, or angry) being conveyed by the message.

General Discussion

Previous research had not examined the use of linguistic devices in text messages or how emotionality of the messages affects usage of these devices, nor have past studies inspected emotion or memory in the context of CMC. Studies 1 and 2 aimed to examine these issues. Like Varnhagen et al. (2010), I found a multitude of linguistic devices that typical college students use when they send text messages. Using a modified version of Varnhagen et al.'s (2010) categories, I expanded upon the study by using three different emotions in my messages and by examining text messages, rather than utilizing the less contemporary instant messaging program.

I found no gender differences in the usage of linguistic devices in texts, whereas Varnhagen et al. (2010) found that adolescent girls used more shortcuts than boys. This discrepancy may be due to the difference in the age of the samples of the two studies. Varnhagen et al.'s (2010) study included adolescents whereas the current study examined college age students. Because girls tend to have stronger verbal skills than boys, they may set the trend for using language creatively in CMC when they are young. Thus, the adolescent boys in Varnhagen et al.'s (2010) study may have had some "catching up" to do before they were more similar to their female classmates in their use of linguistic devices. This catching up may have occurred by college age where the gender differences were found to be nonexistent.

I also expanded upon Varnhagen et al.'s (2010) study by using emotional messages. Although pragmatic devices and errors did not differ based on emotionality, shortcuts were more common in happy messages. This difference was likely not due to the happy message being more emotional than the sad and angry

messages given that all three were rated equally for their emotional impact in Study 2. I cannot rule out the possibility that the happy message simply lent itself to the use of shortcuts, but future studies using different emotional messages could further explore this possibility.

Due to a lack of research on emotion and memory in CMC, I designed Study 2 to examine how well texts and voicemails are remembered and what their emotional impact is. Voicemails and texts were equally effective at relaying emotional information. Thus hearing someone's voice and reading a text that includes linguistic devices both adequately conveyed the emotion of the message sender. When examining message memorability, I found a trend such that voicemails tended to be remembered better than text messages. This was true despite the messages having a similar emotional impact. Memory was also affected by the gender of the message receiver and the emotion conveyed in the message. Men showed a trend towards remembering happy messages better while women showed a trend towards remembering sad and angry messages better. Men significantly remembered negative messages better than women, while women significantly remembered positive messages better than men. Perhaps men were more comfortable with the happy messages and women were more willing to sympathize with the sad and angry messages, and this led to gender differences in the extent to which certain messages were remembered better than others.

How men and women use text messages and voicemails could be valuable to wireless phone companies when creating and marketing new cell phone technology in the future. It may also help us understand gender differences in the interpretation and encoding of new information, particularly if that information comes in the form of

technology. Because of the focus on emotionality and memorability, Study 2 in particular paves the way for further CMC research.

Limitations and Future Directions

Both Studies 1 and 2 were limited by a small sample size, particularly in Study 1. Several of my results represented near-significant trends, and future studies with a larger sample size may better delineate which of these results are truly significant findings. Additionally, each sample had limited variability, particularly in gender, with women outnumbering men by almost two to one in Study 1, and nearly four to one in Study 2. This was particularly problematic in examining gender differences. Additionally, all participants were Butler University students, and it may be that text messaging styles develop in particular cultures, such as geographical locations (i.e. the Midwest). A more geographically diverse sample could show differential usage of linguistic devices.

Additionally, it may be that there are age group differences, for instance, between older adults or adolescents and college students. Differences may also be found between individuals with various levels of experience with texting and voicemail, such as between people who have less than a few months of experience versus several years. To expand upon both Studies 1 and 2, future research could examine different age groups and individuals with varying experience with CMC, such as middle school students with a few years of experience to older adults with little to no experience, to evaluate how these factors influence the use of linguistic devices.

In future studies, the inclusion of multiple happy, sad, and angry messages may be useful to counterbalance the exclusive use of any one linguistic device in any given message. For example, in the angry message of Study 1, nearly every

participant texted “OMG” or “omg” when prompted with “oh my gosh” in the message. Contractions may also have been primed in the sad message, and lowercase use in the happy message, which contained more sentences and capitalized words than the other two messages. Furthermore, future researchers should seek to control for grammatical structure in the messages, as this may have impacted choice of linguistic device as well. Researchers may also choose to examine differences in texting styles based on what type of phone an individual owns, for instance, between smart phones with full keyboards and the classic flip phone with an alphanumeric keypad.

Study 2 was also limited in the believability of the message conveyed. Specifically, 19% of participants suspected the message was meant to be remembered, 27% suspected it may have been part of the study, but not as a memory test, while only 54% did not suspect the message had anything to do with the study. Essentially, 46% of participants believed that something unusual was going on when the researcher shared a text message or voicemail with them. Future research in this area should focus on the believability of the message as more robust results may be obtained with greater believability. A more thorough deception is needed if future studies aim to replicate these findings. Perhaps if the participant were to complete a cover story task on a cell phone, the interrupting message could be programmed to automatically appear or play at some point during the study, or the message could open automatically on the screen of the computer that the participant takes a separate test on.

Alternatively, future researchers may choose to forgo deception altogether. This would allow for a more comfortable presentation of the message, and it would ensure that each participant fully read or listened to the message. With the current deception, some researchers reported that their participants expressed feeling

awkward or appeared to be uncomfortable when reading another person's text or listening to a private voicemail. This led some participants to ignore parts of the text or voicemail. In fact, overall memory recall scores were low. For instance, of the 10 points a participant could score on the memory recall question, only one participant scored a 9, with none achieving all 10 points, while the mean memory recall score was less than 4. As an alternative to full deception, participants could be informed that they need to remember the message they read or hear. Researchers may also choose to openly present the participants with the message, but not specify what it will be used for until after the delay. For instance, researchers could tell participants that the message is part of the study and to carefully read or listen to it because it will be revisited later on without specifically mentioning a memory test. These methods could lead to a higher average memory recall score if participants pay better attention to the information when presented.

Furthermore, difficulties arose in the evaluation of identifying the emotion conveyed in some of the text messages or voicemails from Study 2. Often, generic terms were used by participants to answer the identification question, and thus could not be categorized into one of the three emotion categories (i.e. "upset" could represent either angry or sad). Because of the nature of the question, which was open-ended, it is unclear whether those who gave generic terms did not understand the emotion of the message or simply chose to write a generic term instead of a specific one. It is possible that more participants could have gotten credit for identifying the emotion of the message, but due to semantics of the word they chose, their responses were vague and therefore counted as incorrect. In a future replication of this study, participants could be presented with a list of emotions and asked to select the emotion of the sender. This would ensure results would be free from ambiguous answers.

Finally, while this study maintained internal validity due to the carefully controlled experimental laboratory procedure that each researcher followed, it may be limited in external validity. While individuals who are regular cell phone users frequently receive text messages and voicemails throughout a typical day, this study may have limited generalization in that individuals normally do not share their personal messages with strangers. It may be that if the text or voicemail that was shared with the participants was from a friend of theirs, results would differ.

Appendix A

Original Standard English Messages, Studies 1 & 2

Happy I got in! I am going to Spain next semester! I can't believe it! I get to travel on my own! With you in Italy and me in Spain, we are going to have the best time! We'll be able to meet up right? I want to see France and England especially! Only a few more months until Europe! I am so excited!

Sad Do you remember when I was home last weekend and Max wasn't doing so well? My mom just called to tell me that he's being put down. I was just there, and now he's gone. I know he's just a dog, but he's been in my family for years. I am honestly going to miss him so much. I feel awful right now.

Angry Oh my gosh, I can't believe it, no one in this group will cooperate with me! I've emailed them so many times, I finally got a meeting set up, and none of them showed up. I'm going to end up doing the entire slideshow, again, all by myself! I tried talking to my professor and he was completely unhelpful. I hate this class!

Note: Each message contains 63 words.

Appendix A Continued

Translated Texted English Messages with Character Count, Study 2

Happy I GOT IN!! i am going to spain next sem! i cant believe it! i get to travel on
(276) my own! with u in italy & me in spain we are gonna have the best time!
well be able to meet up right?? i want to see france & england especially!
only a few more months til europe! im so excited :)

Sad do you remember when i was home last wknd & max wasnt doin so well ...
(279) my mom jsut called to tell me that hes being put down :(i was just there &
now hes gone. i know hes just a dog but hes been in my fam for years. i am
honestly gonna miss him sooo much i feel awful right now :(

Angry omg i cant believe it!! no one in this group will cooperate! ive emailed
(283) them so many times i fianlly set up a meeting & noneof them showed up.
im gonna end up doin the ENTIRE slideshow all by myself!! i tried talking
to my prof & he was completely unhelpful. ugh i HATE this class!!

Appendix B

Scoring Instructions for Study 1 and Description of Linguistic Devices

In each line of the three messages, circle words that contain a device. One word or phrase may count as more than one linguistic device. For example, *OMG* would count both as an Acronym and an Upper Case. Then, for each linguistic device found per message, write the number of instances of that device in the space provided.

Abbreviation

Words commonly shortened by removing one or more morphemes or phonemes

Acronym (Emotional)

A word formed from initial letters with emotional connotation

Acronym (Non-Emotional)

A word formed from initial letters without emotional connotation

Alphanumeric

Consists both numbers and letters in one word

Content Addition (Emotional)

Information not in the original message that carries emotional connotation

Content Addition (Non-Emotional)

Information not in the original message that does not carry emotional connotation

Contraction

Omission of an apostrophe in a contraction or possessive

Emoticon

Punctuation marks and/or letters that when combined allude to a facial expression or form of emotional imagery

Insider Word

Slang words not commonly found in a dictionary

Lower Case

The word should be in or begin with a capital letter

Misspelling

Incorrect spelling

Onomatopoeic (Emotional)

A word spelled according to its pronounced sounds for emotional emphasis

Onomatopoeic (Non-emotional)

A word spelled according to its pronounced sounds for non-emotional emphasis

Phonetic

A word spelled according to its sounds and not its grammatical spelling

Punctuation

Use of punctuation marks not grammatically correct but used for emphasis/emotion

Typographical Error (Punctuation)

Accidental switching/omitting/adding of punctuation marks

Typographical error (Spelling)

Accidental switching/omitting/adding of letters

Upper Case

The word should be in or begin with a minuscule letter

Combination

Blending of two or more words into a single word

Appendix B Continued

Study 1 Scoring Sheet

Linguistic Device	Message					
	1 (Happy)		2 (Sad)		3 (Angry)	
Abbreviation <i>feelin; prolly; u;</i>						
Acronym <i>bf; omg; lol</i>						
Alphanumeric <i>2day; 4ever</i>						
Combination <i>wanna; gonna</i>						
Content Addition <i>Wow!</i>						
Contraction <i>thats; Garys</i>						
Emoticon <i>:); =D :'(</i>						
Insider Word <i>hottie</i>						
Lower Case <i>i; elyssa</i>						
Misspelling <i>embarrasing; calender</i>						
Onomatopoeic <i>hahaha; sooooo</i>						
Phonetic <i>yer; wat; c</i>						
Punctuation <i>..... ; !!!!</i>						
Typographical Error <i>carzy; Frwnch</i>	Punctuation	Spelling	Punctuation	Spelling	Punctuation	Spelling
Upper Case <i>CRAZY; NEVER</i>						

Note: In cells that are spilt, the first column is for Emotional and the second is for Non-Emotional.

Appendix C

Memory Recall Form for Study 2

Please recall as much of the message as you can.
Be sure to provide as many details as you can remember.

Emotionality Form for Study 2

How emotional would you rate the message you saw?

1	2	3	4	5	6	7
Not at all						Extremely
Emotional						Emotional

How do you think the person who sent the message was feeling? _____

Note: Participants were first presented with the Memory Recall form, which was the same regardless of condition. Next they were presented with the Emotionality form, which contained both the Likert scale question and the open-ended question. This form varied between conditions, i.e. “saw” for the text condition and “heard” for the voicemail condition.

References

- Berger, N. I., & Coch, D. (2010). Do u txt? Event-related potentials to semantic anomalies in standard and texted English. *Brain and Language*, 113(3), 135-148. doi:10.1016/j.bandl.2010.02.002
- Derks, D., Bos, A. R., & von Grumbkow, J. (2007). Emoticons and social interaction on the Internet: The importance of social context. *Computers in Human Behavior*, 23(1), 842-849. doi:10.1016/j.chb.2004.11.013
- Derks, D., Bos, A. R., & von Grumbkow, J. (2008). Emoticons and online message interpretation. *Social Science Computer Review*, 26(3), 379-388. doi:10.1177/0894439307311611
- Drouin, M. A. (2011). College students' text messaging, use of textese and literacy skills. *Journal of Computer Assisted Learning*, 27(1), 67-75. doi:10.1111/j.1365-2729.2010.00399.x
- Drouin, M., & Davis, C. (2009). R u txtng? Is the use of text speak hurting your literacy?. *Journal of Literacy Research*, 41(1), 46-67. doi:10.1080/10862960802695131
- Fiedler, K., Nickel, S., Asbeck, J., & Pagel, U. (2003). Mood and the generation effect. *Cognition and Emotion*, 17(4), 585-608. doi:10.1080/02699930302301
- Junco, R., Merson, D., & Salter, D. W. (2010). The effect of gender, ethnicity, and income on college students' use of communication technologies. *Cyberpsychology, Behavior, and Social Networking*, 13(6), 619-627. doi:10.1089/cyber.2009.0357
- Kelly, J. R., & Hutson-Comeaux, S. L. (1999). Gender-emotion stereotypes are context specific. *Sex Roles*, 40(1-2), 107-120. doi:10.1023/A:1018834501996

- Levine, L. J., & Bluck, S. (2004). Painting with broad strokes: Happiness and the malleability of event memory. *Cognition and Emotion*, 18(4), 559-574. doi:10.1080/02699930341000446
- Riordan, M. A., & Kreuz, R. J. (2010). Emotion encoding and interpretation in computer-mediated communication: Reasons for use. *Computers in Human Behavior*, 26(6), 1667-1673. doi:10.1016/j.chb.2010.06.015
- Saurer, M., & Eisler, R. M. (1990). The role of masculine gender role stress in expressivity and social support network factors. *Sex Roles*, 23(5-6), 261-271. doi:10.1007/BF00290047
- Varnhagen, C. K., McFall, G., Pugh, N., Routledge, L., Sumida-MacDonald, H., & Kwong, T. E. (2010). Lol: New language and spelling in instant messaging. *Reading and Writing*, 23(6), 719-733. doi:10.1007/s11145-009-9181-y
- Walker, W., Skowronski, J. J., Gibbons, J. A., Vogl, R. J., & Thompson, C. P. (2003). On the emotions that accompany autobiographical memories: Dysphoria disrupts the fading affect bias. *Cognition and Emotion*, 17(5), 703-723. doi:10.1080/02699930302287
- Walker, W., Vogl, R. J., & Thompson, C. P. (1997). Autobiographical memory: Unpleasantness fades faster than pleasantness over time. *Applied Cognitive Psychology*, 11(5), 399-413. doi:10.1002/(SICI)1099-0720(199710)11:5<399::AID-ACP462>3.0.CO;2-E

Table 1

Specific Linguistic Devices by Gender in Study 1 ($n=33$)

	Men $n=12$	Women $n=21$
Shortcuts		
Abbreviation	6.08 (10.97)	1.95 (3.34)
Acronym (E)	.50 (.67)	.62 (.59)
Acronym (NE)	.33 (.49)	0
Alphanumeric	.92 (2.87)	.19 (.87)
Combination	1.17 (1.11)	.95 (1.60)
Contraction	4.08 (4.64)	2.90 (4.13)
Insider Word	.67 (1.50)	.14 (.48)
Lowercase	4.17 (3.66)	8.10 (9.22)
Phonetic	.50 (1.00)	.38 (.92)
Pragmatics		
Emoticon	.17 (.39)	1.00 (1.30)
Onomatopoeia (E)	.08 (.29)	.43 (.81)
Onomatopoeia (NE)	0	.43 (1.17)
Punctuation	2.25 (4.90)	2.19 (2.11)
Uppercase	.17 (.39)	.81 (1.17)
Errors		
Misspelling	.33 (.65)	.24 (.54)
Typographical Error, Punctuation	2.42 (2.50)	3.05 (4.54)
Typographical Error, Spelling	.92 (.67)	1.05 (1.28)

Note: E=emotional, NE=non-emotional

Table 2

Shortcut Usage in Happy, Sad, and Angry Messages in Study 1 ($n=33$)

	Happy	Sad	Angry
Abbreviation	1.27 (2.67)	1.21 (2.92)	.97 (2.05)
Acronym (E)**	.03 (.17)	0	.55 (.62)
Acronym (NE)*	0	.12 (.33)	0
Alphanumeric	.24 (1.00)	.15 (.57)	.06 (.35)
Combination	.48 (.80)	.24 (.44)	.30 (.53)
Contraction	1.12 (1.39)	1.24 (1.97)	.97 (1.42)
Insider Word	.06 (.24)	.03 (.17)	.24 (.94)
Lowercase**	3.88 (4.28)	1.64 (2.13)	1.15 (2.09)
Phonetic	.21 (.55)	.09 (.38)	.12 (.33)

Note: E=emotional, NE=non-emotional

* $p < .05$

** $p < .01$

Table 3

Participants' Suspicion by Medium and Emotion ($n=98$)

	Memory	Unspecified	No Suspect
Medium			
Text	7.3%	11.5%	30.2%
Voicemail	11.5%	15.6%	24.0%
Emotion			
Happy	4.2%	10.4%	20.8%
Sad	7.3%	10.4%	14.6%
Angry	7.3%	6.3%	18.8%

Table 4

Emotion Rating of Happy, Sad, and Angry Texts and Voicemails by Gender in Study 2 ($n=98$)

	Men $n=20$		Women $n=78$	
	Text $n=10$	Voicemail $n=10$	Text $n=38$	Voicemail $n=40$
Happy	6.25 (.50)	6.33 (.58)	6.00 (.60)	5.33 (1.05)
Sad	6.00 (0)	5.25 (1.26)	5.64 (.67)	5.38 (1.19)
Angry	5.50 (.71)	6.00 (0)	5.93 (.88)	6.00 (.74)

Note: Emotion ratings could range from 1 to 7 and were statistically equivalent across medium, emotion, and gender.

Table 5

Memory for Happy, Sad, and Angry Texts and Voicemails by Gender in Study 2
($n=98$)

	Men $n=20$		Women $n=78$	
	Text $n=10$	Voicemail $n=10$	Text $n=38$	Voicemail $n=40$
Happy	3.50 (2.38)	5.33 (.58)	3.25 (.75)	3.87 (1.60)
Sad	2.50 (.58)	3.25 (1.89)	4.09 (2.12)	3.85 (1.41)
Angry	2.00 (0)	3.33 (2.52)	4.07 (2.02)	4.17 (1.85)

Note: Voicemails were remembered better than texts overall. Additionally, men tended to remember happy messages better than women, whereas women tended to remember sad and angry messages better than men.

Table 6

Accuracy of Emotion Identification of Happy, Sad, and Angry Texts and Voicemails
by Gender in Study 2 ($n=98$)

	Men $n=20$		Women $n=78$	
	Text $n=10$	Voicemail $n=10$	Text $n=38$	Voicemail $n=40$
Happy	75%	100%	92%	93%
Sad	75%	100%	82%	62%
Angry	50%	67%	73%	50%

Figure 1

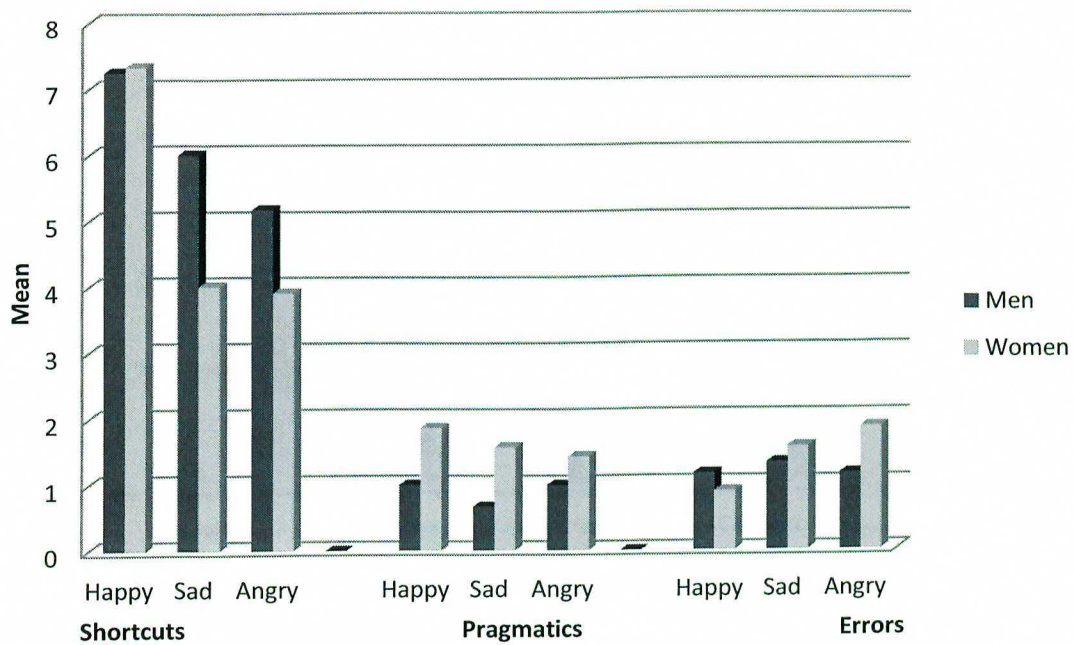
Linguistic Devices Utilized in Text Messages in Study 1 ($n=33$)

Figure 2

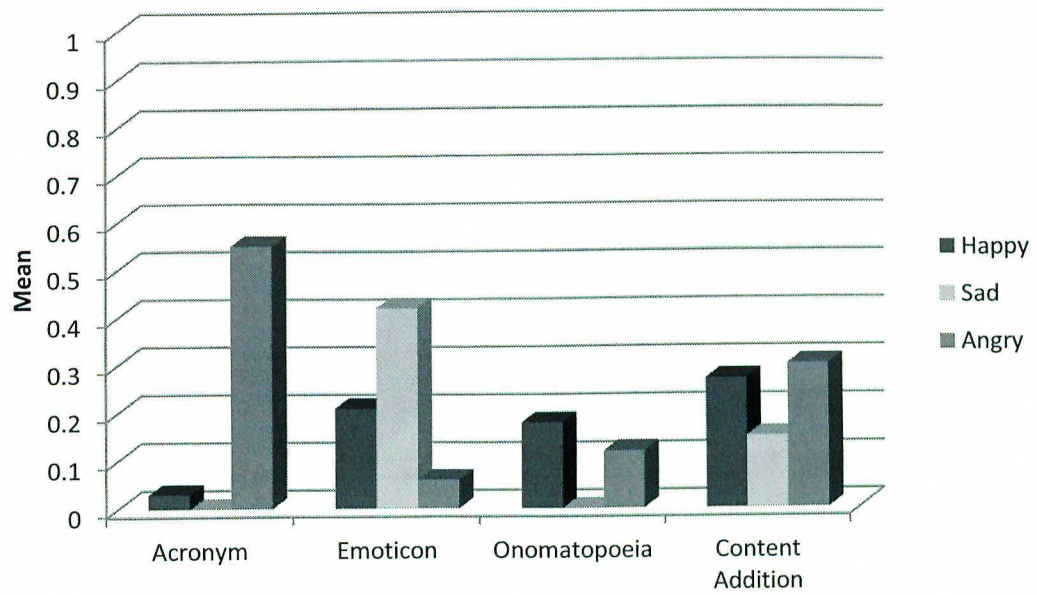
Use of Emotional Devices by Emotion in Study 1 ($n=33$)

Figure 3

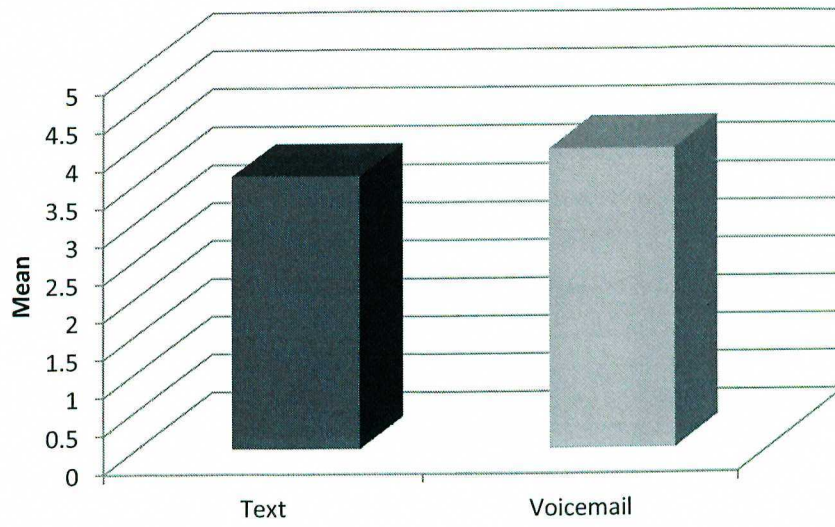
Memory Recall Score by Medium in Study 2 ($n=98$)

Figure 4

Memory Recall Score by Emotion (Happy, Sad, Angry) and Gender in Study 2 ($n=98$)

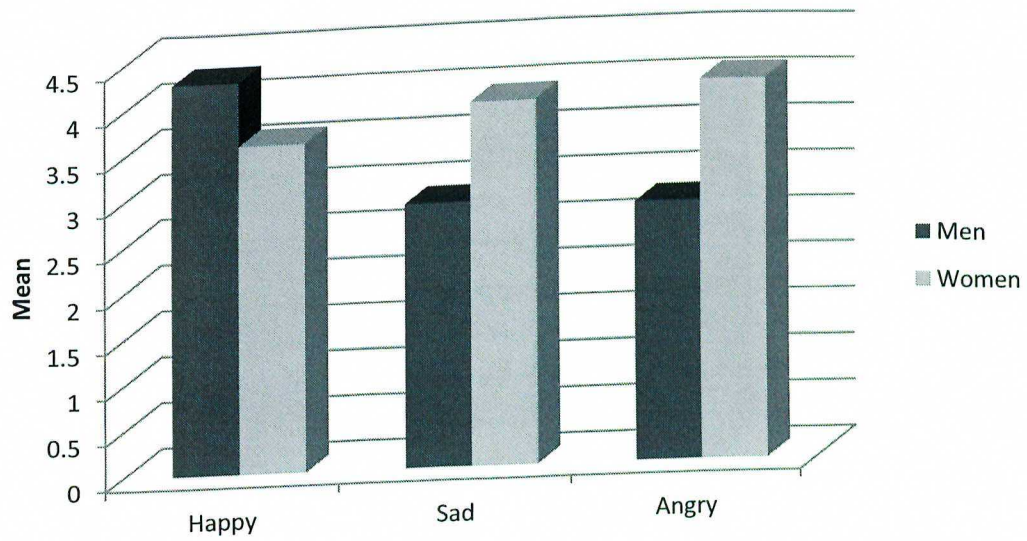


Figure 5

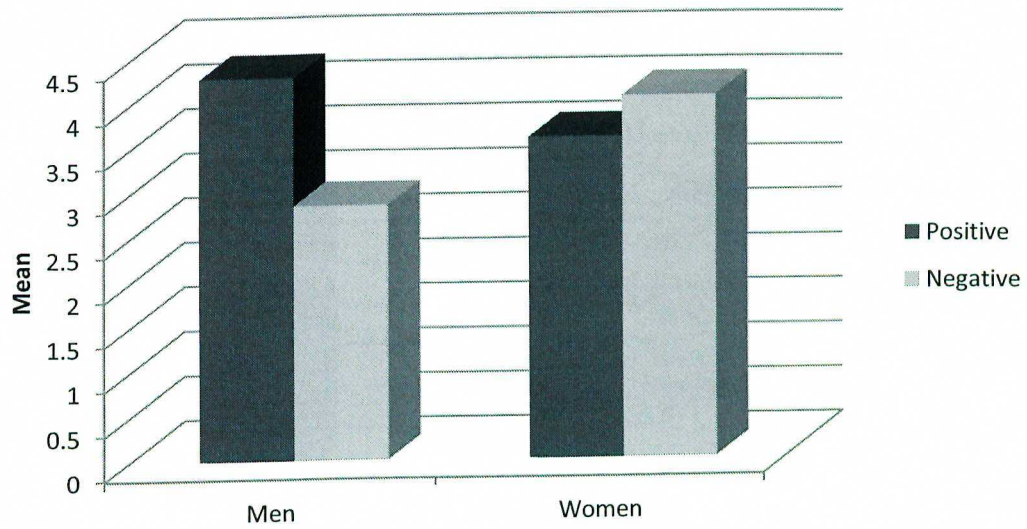
Memory Recall Score by Emotion (Positive, Negative) and Gender in Study 2 ($n=98$)

Figure 6

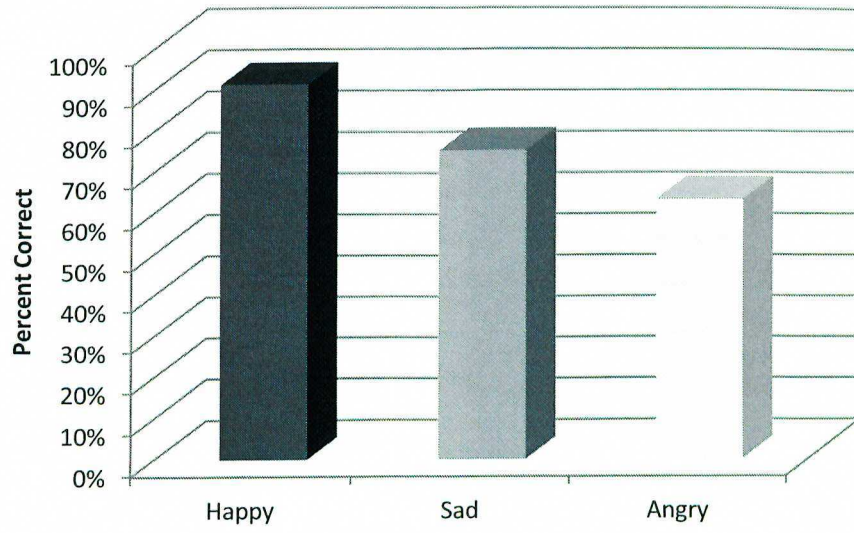
Accuracy of Emotion Identified in Study 2 ($n=98$)

Figure 7

Accuracy of Emotion Identified in Study 2 by Gender and Medium ($n=98$)

