How Non-Native English Speakers Perceive the Emotional Valence of Messages in Text-Based Computer Mediated Communication

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Abstract

We explore how native and non-native English speakers interpret cues of emotional expression in native English speakers text-only messages in two studies. In Study 1, 20 native English speakers and 20 Japanese non-native English speakers rated the emotional valence of 98 public Facebook status updates written by native English speaking authors. We found that non-native speakers were less accurate at detecting the emotional valence, and perceived messages more neutral or intensely negative than native speakers. In Study 2, we found that non-native speakers' cultural background and lack of confidence in second language ability may influence how they adjust their perceptions on a message based on subsequent replies. Our results contribute to theoretical development in multilingual socio-emotional communication in computer-mediated environments, and have implications for design of technologies to support socio-emotional text-based communication between native and non-native speakers.

Introduction

Accurately detecting conversational partners' emotional states is important in all human communication.

> "One's own and others' affective experiences are frequent topics of everyday conversations, and how well these emotions are expressed and understood is important to interpersonal relationships and individual well-being" (Fussell, 2002).

In general, people are able to distinguish between others' emotional states in face-to-face settings or on the phone based only on facial expressions or the tone of the speaker's voice (Buchanan et al., 2000; Ekman, 1982).

However, accurately detecting a message author's emotional state or the emotional tone of a message is more challenging in text-only computer mediated communication (CMC) mediums, such as instant messaging or email, due to the lack of non-verbal and vocal emotional cues (Dennis & Kinney, 1998; Short, Williams & Christie, 1976; Walther, 1992). Misunderstandings about the emotional tone of a message sometimes occur even when message authors and receivers share the same native language (Byron, 2008; Hancock, Gee, Ciaccio & Lin, 2008; Short et al., 1976; Walther, 1992; Walther, Loh & Granka, 2005). Message authors may overestimate their effectiveness in accurately conveying their message, while receivers may perceive the emotional tone of the message more or less intensely than intended by the author (Byron, 2008; Keysar & Henly, 2002).

Misunderstandings between authors and receivers regarding the emotional tone of a message may be more salient when the receivers are non-native speakers of the author's first language. Besides the scarcity of emotional cues in lean text-only CMC mediums (Short et al.,

1976; Walther, 1992), empirical and anecdotal evidence suggest that non-native speakers, particularly in Asia, often have only limited exposure to their second language outside a classroom (Benson, 1991; Hyland, 2004), they may not share the same communicative norms and display rules with native speaking authors (Meierkord, 2000; Seidlhofer, 2001), and thus may be more inclined to misperceive the emotional tone of a text-only message (Byron, 2008; Higa, Sheng, Shin & Figueredo, 2000; Morris & Feldman, 1997). Non-native speakers may also have particular difficulties in determining the connection between the syntactic structure of a message and the emotional nuances carried in words, symbols and emoticons used as emotional cues (Dewaele, 2004, 2008; Moore, Romney, Hsia & Rusch, 1999; Nishimura, 2006; Park, Barash, Fink & Cha, 2013; Russell, 1983; Romney, Moore & Rusch, 1997). On the other hand, some message properties, such as increase in message length (Gill, Gergle, French & Oberlander, 2008; Hancock, Landrigan & Silver, 2007), may help receivers comprehend the emotional content of a message more accurately. However, few studies to date have explored how non-native speakers perceive the emotional tone of real full-length text-only messages based on the available emotional cues, and how the different message properties and contextual cues affect their perceptions.

The goal of this article is to examine how non-native English speakers perceive the emotional tone of native English speakers' messages in text-only CMC. We conducted two studies, one focusing on the accuracy of non-native speakers' emotional valence and emotional cue detection, and the other on how viewing replies to a message affects emotional valence detection. In Study 1, native and non-native English speakers rated the emotional valence of real text-only messages written by native English speakers. We compared native and non-native

speakers' emotional valence detection accuracies, examined how message length affected their emotional valence detection, and compared the precision and recall of detecting the author-defined emotional cues in each message. In Study 2, we explored how the presence of replies as additional contextual cues influenced native and non-native speakers' perceptions regarding the emotional valence of the original message.

Theoretical Background

Media richness refers to the ability of a communication medium to allow rapid feedback, enable multiple types of cues simultaneously, use of natural language, and establishment of personal focus (Daft & Lengel, 1986; Lengel & Daft, 1988). Text-only CMC mediums, such as instant messaging or email, are considered lean communication mediums, with which resolving ambiguity in messages and facilitation of understanding is less effective than with richer mediums, such as video conferencing (Byron, 2008; Daft & Lengel, 1986). Social information processing model postulates that communicators actively develop social relationships in CMC environments if they expect further opportunities to interact over time despite the inherent purpose of their interaction (Walther, 1992, 1994). However, lack of non-verbal and vocal cues in text-only CMC limits the use of full range of interpersonal and emotional information (Short et al., 1976), and more messages have to be exchanged between interlocutors to achieve similar relational effects as in richer mediums or face-to-face communication (Walther, 1992).

Resolving discrepancies between how authors and receivers perceive the emotional tone of a message is challenging due to the limitations imposed by text-only CMC on emotional expression. Message authors "hear" their own vocal tone and contour when authoring emotionally arousing messages, but in text-only mediums these vocal cues are not communicated

to the receiver. The lack of these cues renders a text-only message less arousing to the receiver than to the author (Kock, 2005). Furthermore, authors may overestimate their effectiveness in accurately conveying their meaning to the receivers (Keysar & Henly, 2002). Byron (2008) described these discrepancies between authors and receivers as neutrality and negativity effects. Neutrality effect refers to message receivers' tendency to perceive positive messages as more neutral than intended by the message author. Negativity effect connotes a misinterpretation by the receivers to view a message as more intensely negative than intended by the author when the message includes any negative emotional cues (e.g., sarcasm) (Byron, 2008; Walther & D'Addario, 2001). These discrepancies may in turn have negative effects on both socio-emotional and task-oriented communication. People who communicate with text-only mediums, such as email, have an increased likelihood of conflict escalation (Barsade, 2002; Friedman & Currall, 2003), and misunderstandings regarding the emotional tone of a message may have detrimental effects on group cooperation and perceived performance (Barsade, 2002).

Message receivers who do not share the same native language with the message author may experience much greater difficulties in detecting the intended emotional tone of a text-only message. Besides evidence suggesting that non-native speakers have only limited exposure to their second language outside a classroom (Benson, 1991; Hyland, 2004), the communicative norms and display rules may be very different for native and non-native speakers (Meierkord, 2000; Seidlhofer, 2001). Lack of these shared norms and display rules may cause receivers to misperceive message author's emotional tone in text-only CMC (Byron, 2008; Higa et al., 2000; Morris & Feldman, 1997). Message properties and the communicative context may also influence how accurately non-native speakers are able to detect the author's emotional tone.

While the length of a text passage may not affect non-native speakers' comprehension of the written content (Mehrpour& Riazi, 2007), results reported in previous works with native speakers as participants suggest that receivers are more accurate at detecting the emotional tone in longer messages, which include more cues regarding the context and sentiment of a message (Gill, Gergle, et al., 2008; Hancock et al., 2007).

On a syntactic and semantic level, cotemporary scholars have taken different approaches on studying bilingualism and emotion. Dewaele (2004, 2008) examined the emotional weight of phrases, such as "I love you", in participants' first and second languages. His findings indicated that, in general, people report experiencing greater emotional weight on corresponding emotional phrases in their first language compared to their second language. Harris, Gleason and Aycicegi (2006) used single words and phrases as stimuli to measure bilingual participants' autonomic arousal to first and second language emotion terms. Their work, among others, also suggested that factors related to the social context of second language acquisition may mediate the emotionality (i.e., intensity of emotional response to words and phrases) of the language (Schumann, 1997). Besides emotional responses to words and phrases, previous studies have also examined the semantic structure of emotion terms in multiple languages. In a series of studies by Russell (1983), Romney, et al. (1997) and Moore, et al. (1999), the authors argued for the support of a shared semantic structure model of emotion terms across multiple languages, but also highlighted discrepancies in how native and non-native speakers perceive the same emotion words in their shared language. These previous studies suggest that first language background may influence how message receivers perceive the emotional nuances in words and phrases.

Besides emotion words and phrases, message receivers make use of symbols, such as

exclamation marks, and emoticons as emotional cues in text-only CMC (Aman & Szpakowicz, 2007; Hancock et al., 2007; Walther & D'Addario, 2001). Emoticons indicate pauses in emotional expression, such as laughter, that would occur in spoken dialogue in richer mediums or face-to-face communication (Provine, Spencer & Mandell, 2007). Emoticons strengthen the intensity of the verbal message, especially when the message is intended to carry a negative emotional tone (Derks, Bos & von Grumbkow, 2008; Walther & D'Addario, 2001). While symbols and emoticons are associated with higher level of emotional transmissions (Kato, Kato & Akahori, 2006), previous research has highlighted discrepancies on how interlocutors from different language and cultural backgrounds may perceive these emotional cues. For example, Asian interlocutors tend to rate the importance of emoticons as part of text-only communication higher than North Americans (Kayan, Fussell & Setlock, 2006). Further, the adoption rate of different types of emoticons varies greatly between languages (Nishimura, 2006; Park et al., 2013), and receivers may not be familiar with the emoticons commonly used in their non-native language (Park et al., 2013). Due to these discrepancies, non-native speakers may perceive the emotional nuances carried in symbols and emoticons differently from native speakers.

Altogether, previous research suggests that emotion detection in text-only CMC mediums may be more challenging in communicative situations, where message receivers are non-native speakers of the author's native language. While previous studies have examined how native and non-native speakers may differ in their perception of individual emotional cues, we focus on receivers' initial perceptions of the emotional valence in real full-length text-only messages. More precisely, we ask how non-native speakers perceive the emotional valence of native speaking authors' messages compared to other native speakers? How does message length affect

non-native speakers' emotional valence detection? Are non-native speakers able to detect emotional cues used by native speaking authors similarly to other native speakers? We address these questions in Study 1. Then, in Study 2 we examine how the presence of replies to the original message affects native and non-native speakers' emotional valence detection. These two studies examine the factors, which are likely to affect non-native receivers' perception of the emotional valence in text-based CMC, although the participants in these studies do not engage in interactive communication with the message authors.

Study 1: Detecting The Emotional Valence Of Text-Only Messages

Study 1 aims to answer how non-native English speakers perceive the emotional valence in native English speaking authors' text-only messages based on the available emotional cues used by the authors to express their emotional tone. Below, we introduce our hypotheses and research question based on previous works.

Previous studies by Gill, Gergle, et al. (2008), Gill, French, Gergle and Oberlander (2008) and Hancock, et al. (2007, 2008) suggest that, in general, native English speaking receivers are able to accurately detect the intended emotional valence of native speaking authors' messages. However, non-native English speaking receivers may have disparate perceptions on the emotional nuances expressed in words, symbols and emoticons (Dewaele, 2004, 2008; Miyake, 2007; Moore et al., 1999; Nishimura, 2006; Russell, 1983; Romney et al., 1997; Park et al., 2013; Yuasa, Saito & Mukawa, 2006), and only limited experience in using their second language outside a classroom (Benson, 1991; Hyland, 2004). Thus, we hypothesized the following:

H1: Non-native speakers will detect the emotional valence of text-only messages written by

native speaking authors less accurately than other native speakers.

Message receivers in text-only CMC tend to perceive positive messages as more neutral, and messages including any negative emotional cues as more intensely negative than intended by the author (Byron, 2008). Shared norms and display rules between authors and receivers regarding how to express or repress emotions in text-only CMC can moderate the intensity of these neutrality and negativity effects (Byron, 2008; Higa et al., 2000; Morris & Feldman, 1997). However, previous works suggest that non-native speakers often do not share the same communication norms and display rules with native speakers (Meierkord, 2000; Seidlhofer, 2001), which may be reflected in stronger neutrality and negativity effects for non-native receivers compared to native receivers (Byron, 2008). Thus, we hypothesize the following:

H2: Non-native speakers display stronger neutrality effects than native speakers when detecting the emotional valence of messages intended to carry positive emotional valence by native speaking authors.

H3: Non-native speakers display stronger negativity effects than native speakers when detecting the emotional valence of native speaking authors' messages which include negative emotional cues.

A study by Gill, Gergle, et al. (2008) reported findings where experiment participants were more accurate at detecting basic emotions, such as fear, anger and joy, from blog texts when the passages were longer. Based on this work, we expect that both native and non-native speakers would detect the emotional valence of text-only messages more accurately when the messages are longer. Thus, we hypothesize:

H4: Native and non-native speakers detect the emotional valence of text-only messages

written by native speaking authors more accurately when the messages are longer.

Emotional information is exchanged between message authors and receivers through emotional cues, including words, symbols and emoticons (Aman & Szpakowicz, 2007; Hancock et al., 2008; Murphy & Collins, 1997; Walther & D'Addario, 2001). However, previous research has not examined whether non-native receivers are able to detect these emotional cues from native speaking authors' messages similarly to native speaking receivers. Therefore, we ask the following research question.

RQ: Do non-native speakers detect the emotional cues in native speaking authors' messages similarly to other native speakers?

To answer these hypotheses and research question, we conducted an experimental study with native and Japanese non-native speakers of English, where they rated the emotional valence of text-only messages written by native English speaking authors, and annotated all emotional cues (words, symbols and emoticons) in each message.

Method

Design. Native English speaking participants and Japanese non-native English speaking participants rated the emotional valence of 98 text-only messages. The participants also annotated all emotional cues (i.e., words, symbols and emoticons) in each message. All messages in this study were public Facebook status updates written by native English speaking authors.

Participants. We hired 20 native English speakers (one female) and 20 non-native English speakers (two male) as experiment participants. All native speakers had received their primary education (from the age of 6 to 18, elementary school to high school) in English speaking countries, and reported English as their native language. Their mean age was 41.05

(SD=9.97). Four native speakers were from Australia, one from the Great Britain and the rest from North America (The USA, Canada).

All non-native participants spoke Japanese as their native language. Their average score in the TOEIC (Test of English for International Communication) English proficiency test was 829.00 (SD=91.32) out of 990 points, which represents the top 13.6 percentile of TOEIC test scores in Japan[1]. Their average self-evaluated English language proficiency was 4.60 (SD=0.74) on a 7-point scale (1=not proficient at all, 7=very proficient). We required that each non-native participant had spent less than two years in English speaking countries. These indicated that they spoke English as their second language, but not at a similar level of fluency to native speakers (Schumann, 1997). Their mean age was 37.70 (SD=14.76).

Materials. Our dataset consisted of public Facebook status updates written by native English speakers. We used snowball sampling as a method to get in touch with people who spoke English as their native language, had resided the majority of their life in an English speaking country, and had posted at least 10 public status updates on Facebook.

In our initial contact, we explained the aim of the study and asked each author's willingness to participate as message contributors. After receiving a positive reply, we sent the authors a formal consent form and a set of their own public status updates extracted from their Facebook page via email. The extracted messages did not include any photos, videos, hyperlinks or other additional content besides text. We asked each author to omit any of their status updates that they did not wish to be used as part of the dataset. Our final message pool consisted of 98 messages from eight male authors (M=12.25, SD=4.53) who completed the last step of our sampling procedure. One of the message authors was from the Great Britain, and the rest from

North America (The USA, Canada). Their mean age was 37.38 (SD=10.74).

Next, we categorized all messages as positive, negative or neutral. We refer to these message categories as the lexical sentiment of a message, which connotes the emotional valence of a message based on automatic detection of emotion words with positive or negative valence. The presence or absence of highly positive or negative emotion words may predict how receivers detect the emotional tone of a text-only message (Hancock et al., 2007, 2008).

We input all words in each message to a software called SentiWordNet to determine the sentiment score for each word. SentiWordNet uses human rated synset classifications to determine the emotional polarity of individual words in a positive-negative scale (Esuli & Sebastiani, 2006). The lexical sentiment of each message was calculated as the ratio of highly positive words to highly negative words (words rated over 0.5 in a 0-1.0 scale). In total, the lexical sentiment was positive for 33.67% of messages, negative for 32.65% of messages and neutral for 33.67% of messages. All messages were fully anonymized by excluding all person names, affiliations and other identifying information. We then combined all messages in to one dataset and randomized the message order.

Author rating and cue annotation. We asked all message authors to rate the emotional valence in each of their own messages in a 7-point Likert scale (1 = very negative, 4 = neutral, 7 = very positive). Secondly, we asked the authors to annotate all words, symbols and emoticons in their messages that they used as emotional cues. The author ratings and cue annotations were used to compare the accuracy of emotional valence detection and cue annotation between native and non-native participants.

Procedure. We presented the native and non-native participants a set of messages

(N=98), and asked them to read each message, and rate their perception on the emotional valence of the message in a 7-point Likert scale (1 = very negative, 4 = neutral, 7 = very positive). Secondly, we asked the participants to annotate all emotional cues in the message, after which they moved on to read, rate and annotate the next message in the set. The instructions for the non-native speakers were given in Japanese. There was no time limit set for the completion of this experiment. Depending on the participants' speed, the experiment took 1.5 to 2 hours including 15 minutes for instructions. In order to reduce fatigue during the experiment, each participant was asked to take a 10 to 15-minute break once they had rated and annotated half of the dataset. We allowed the non-native speakers to use bilingual English to Japanese dictionaries during the experiment to avoid non-native speakers' emotional valence rating and cue annotation to be heavily influenced by their second language abilities (e.g., grammar, vocabulary).

Table 1 includes a sampling message with lexical sentiment rating from SentiWordNet, author's emotional valence rating and author-defined cue annotation, and participants' average emotional valence ratings and cue annotations matching the author's annotations.

TABLE 1

Sampling message with emotional valence ratings and cue annotations

	Rater	*Sampling message and cue annotations*	*Rating scale and results*	*Emotional valence according to rating*
Lexical sentiment rating	SentiWord Net	Holy moly that flight was freakin' **scary** :O The WIND was nuts :O They almost diverted us to another Tokyo airport. Hats off to the pilots :) OMG :O	#Positive words = 0, #Negative words = 1	Negative

Author's emotional valence rating	Native author	Holy moly that flight was freakin' **scary** :O The WIND was **nuts** :O They almost **diverted** us to **another** Tokyo airport. **Hats off** to the pilots :) OMG :O	4 on a 7-point scale	Neutral
Participants' emotional valence rating	Native receivers	Holy moly that flight was freakin' **scary** :O The WIND was **nuts** :O They almost diverted us to another Tokyo airport. **Hats off** to the pilots :) OMG :O	5 on a 7-point scale	Slightly positive
	Non-native receivers	Holy moly that flight was freakin' **scary** :O The WIND was **nuts** :O They almost diverted us to another Tokyo airport. Hats off to the pilots :) OMG :O	2 on a 7-point scale	Negative

Measures. We collected two types of measurements: participants' emotional valence detection based on their ratings and participants' emotional cue annotation for each message.

Emotional valence detection. The participants rated the emotional valence of a message on a 7-point Likert scale. The rating score reflects the participants' emotional valence detection for each message. The consistency of emotional valence ratings given by native and non-native speakers was calculated as Krippendorff's alpha, which indicated that non-native speakers (α=.64) had a more diverse perception than native speakers (α=.68) regarding the emotional valence of the native authors' messages.

Cue annotation. We measured the participants' cue annotation for each message. Both native and non-native participants annotated three types of emotional cues from the messages (i.e., words, symbols and emoticons).

Results

To explore the challenges that conversational participants with disparate first language backgrounds face in socio-emotional communication over text-only CMC mediums, we

compared non-native speakers emotional valence detection and emotional cue annotation in native speaking authors' messages to other native speakers.

Emotional valence detection accuracy. H1 predicted that non-native English speakers detect the emotional valence of text-only messages written by native English speaking authors less accurately than native English speakers. To test our H1, we calculated the absolute distance of participants' emotional valence rating from the author ratings. We compared the average distance of native and non-native speakers.

Results from a mixed ANOVA 2 × 3 (language background: native vs. non-native × lexical sentiment: positive vs. negative vs. neutral) test showed that the main effect of language background was significant ($F[1, 38]=54.18$, $p<.05$, partial $\eta^2=.59$), which indicated that the absolute distance of native speakers' emotional valence ratings from author ratings was significantly lower than that of non-native speakers' (Table 2). The main effect for lexical sentiment was significant ($F[2, 37]=171.12$, $p<.05$, partial $\eta^2=.90$). A post hoc Tukey test showed a significant difference between all three levels of lexical sentiment ($p<.05$). The interaction effect between language background and lexical sentiment was not significant ($F[2, 37]=3.10$, $p=n.s.$, partial $\eta^2=.14$). H1 was supported.

TABLE 2

Descriptive statistics for participants' absolute emotional valence rating distance from author ratings

	Native speakers			Non-native speakers		
	M	SD	N	M	SD	N
Lexical sentiment						
Positive	1.25	0.15	33	1.44	0.20	33

Negative	1.80	0.14	32	2.12	0.20	32
Neutral	1.58	0.24	33	1.90	0.19	33
All messages	1.54	0.11	98	1.81	0.12	98

Neutrality effect. H2 predicted that non-native speakers display stronger neutrality effects than native speakers when detecting the emotional valence of native speaking authors' text-only messages. As proposed by Byron (2008), we analyzed the neutrality effect as the average distance of participants' ratings from the author ratings towards a more neutral rating score in messages, which the authors rated as positive (5 = slightly positive, 6 = positive, 7 = very positive: N=57).

Results from an independent-samples t-test indicated that the average distance of non-native speakers' ratings from author ratings towards a more neutral rating score (M=1.96, SD=0.23) was significantly greater than that of native speakers' (M=1.51, SD=0.28): $t[38]= 5.55$, $p<.05$. H2 was supported.

Negativity effect. H3 predicted that non-native speakers display stronger negativity effects compared to native speakers when detecting the emotional valence of native speaking authors' text-only messages. We analyzed the negativity effect as the average distance of participants' ratings from the author ratings towards a more negative rating score in messages with negative lexical sentiment (N=32).

Results from an independent-samples t-test indicated that the average distance of non-native speakers' ratings from author ratings towards a more negative rating score (M=1.42, SD=0.23) was significantly greater than that of native speakers' (M=0.97, SD=0.34): $t[38]= 4.87$, $p<.05$. H3 was supported.

Effect of message length.

H4 predicted that both native and non-native speakers are more accurate in their emotional valence detection when text-only messages are longer. Spearman's correlation coefficient showed a negative correlation with the distance of native speakers' ratings from the author ratings and the length of messages ($r[96]=-0.20$, $p<.05$), but no significant correlation for non-native speakers ($r[96]=-0.14$, $p=n.s.$). This indicated that native speakers were more accurate in their emotional valence detection when the length of a message increased, but message length did not correspond to non-native speakers' emotional valence detection accuracy. H4 was supported for native speakers, but not for non-native speakers.

Emotional cue annotation precision and recall. In our research question, we asked whether non-native speakers detect the emotional cues in native speaking authors' messages similarly to other native speakers. To explore this research question, we calculated the precision and recall of the participants' emotional cue annotations using author annotations as the gold standard.

Regarding the precision of emotional cue annotation, results from a mixed ANOVA 2 × 3 (language background: native vs. non-native × lexical sentiment: positive vs. negative vs. neutral) test showed that the main effect of language background was not significant ($F[1, 38]=0.15$, $p=n.s.$, partial $\eta^2=.004$), which indicated that native speakers' emotional cue annotation precision was not significantly different from non-native speakers' precision (Table 3). The main effect for lexical sentiment was significant ($F[2, 37]=6.99$, $p<.05$, partial $\eta^2=.27$). A post hoc Tukey test showed a significant difference between positive-negative and negative-neutral levels of lexical sentiment ($p<.05$). Difference between positive-neutral levels of lexical

sentiment was not significant (p=*n.s.*). The interaction effect between language background and lexical sentiment was not significant (F[2, 37]=0.38, p=*n.s.*, partial η^2=.02).

TABLE 3

Descriptive statistics for participants' emotional cue annotation precision

	Native speakers			Non-native speakers		
	M	SD	N	M	SD	N
Lexical sentiment						
Positive	0.33	0.09	33	0.31	0.09	33
Negative	0.37	0.04	32	0.38	0.05	32
Neutral	0.33	0.10	33	0.32	0.11	33
All messages	0.35	0.06	98	0.34	0.07	98

Regarding the recall of emotional cue annotation, results from a mixed ANOVA 2 × 3 (language background: native vs. non-native × lexical sentiment: positive vs. negative vs. neutral) test showed that the main effect of language background was significant (F[1, 38]=8.21, p<.05, partial η^2=.18), which indicated that native speakers' emotional cue annotation recall was significantly higher than the recall of non-native speakers (Table 4). The main effect for lexical sentiment was not significant (F[2, 37]=2.09, p=*n.s.*, partial η^2=.10). The interaction effect between language background and lexical sentiment was also not significant (F[2, 37]=1.17, p=*n.s.*, partial η^2=.06).

TABLE 4

Descriptive statistics for participants' emotional cue annotation recall

	Native speakers			Non-native speakers		
	M	SD	N	M	SD	N

Lexical sentiment						
Positive	0.36	0.09	33	0.29	0.10	33
Negative	0.39	0.07	32	0.31	0.09	32
Neutral	0.33	0.10	33	0.29	0.09	33
All messages	0.36	0.07	98	0.30	0.07	98

Discussion

Our results provide preliminary evidence on what problems may occur in socio-emotional communication in text-only CMC mediums between native and non-native speakers. While previous works have examined, for one, how similar or dissimilar non-native speakers' perceptions on individual emotion words are to native speakers (Moore et al., 1999; Russell, 1983; Romney et al., 1997), our findings extend the literature by examining how non-native speakers perceive the emotional valence of real text-only messages. Our results indicated that non-native speaking receivers are unable to detect the emotional valence of native speaking authors' messages with similar accuracy to native speaking receivers (Table 2).

The discrepancies between native and non-native speakers' emotional valence detection may be partly explained by disparate communication norms and display rules in text-only CMC (Meierkord, 2000; Seidlhofer, 2001), which were reflected in the differences in precision and recall of emotional cue annotations between native and non-native speakers (Table 3, Table 4). That is, although message authors may overestimate their effectiveness in accurately conveying their meaning to the receivers (Keysar & Henly, 2002), native speaking authors and receivers share more similar perceptions regarding which of the available emotional cues are important or relevant in a text-only message compared to native authors and non-native receivers.

Furthermore, previous work by Byron (2008) implies that larger discrepancies in norms

and display rules regarding emotional expression between authors and receivers may lead to stronger neutrality and negativity effects when detecting the emotional valence of a message. While Byron's (2008) work considered emotional communication in text-only CMC between interlocutors' with similar language abilities, our results extend the theoretical implications regarding neutrality and negativity effects to a multilingual context. In an intercultural group, the stronger neutrality and negativity effects experienced by non-native speakers may lead to lower connectedness, impaired group functioning and conflict escalation (Byron, 2008). On a personal level, these effects may cause non-native speakers to experience more confusion, increased anxiety and insecurity about their performance compared to native speaking group members (Byron, 2008).

Our results regarding the effect of message length on native speakers' emotional valence detection were similar to previous works by Gill, Gergle, et al. (2008) and Hancock, et al. (2007). Native speakers were more accurate in their emotional valence detection as the message length increased. However, our results suggested that this is not the case for non-native speakers.

This result has important practical implications regarding the communication norms, display rules and socio-emotional communication strategies in multilingual CMC. While the quality of socio-emotional communication may improve between native authors and receivers when the authors write longer messages, this strategy may be ineffective when the receivers are non-native speakers. Conversely, native speaking author's beliefs about the effectiveness of this emotional communication strategy may be misleading when the message receiver is a non-native speaker. Future studies are needed to investigate the discrepancies between native authors' perceptions and beliefs on the effectiveness of their socio-emotional communication strategies,

such as message lengthening, and non-native receivers' experiences in response to these strategies.

The results in Study 1 showed that non-native speakers were less accurate than native speakers at detecting the emotional valence of native speaking authors' messages, which can be partly explained by different norms and display rules on emotional expression between native authors and non-native receivers. However, the results do not answer whether other message properties, such as presence of replies, would affect non-native speakers' emotion detection. Text-only messages, such as emails, are often accompanied by replies from other receivers, which may provide passive receivers additional contextual cues to determine the emotional valence of the original message. Therefore, we conducted a second study to examine whether the presence of replies would influence native and non-native speakers' emotional valence detection.

Study 2: Effects Of Presence Of Replies On Emotional Valence Detection

Study 2 focuses on exploring how presence of replies to the original message affects native and non-native speakers' emotional valence detection. As the results in Study 1 depicted, non-native speakers were less accurate at detecting the emotional valence in native speaking authors' text-only messages compared to other native speakers. Non-native speakers' lack of experience using their second language outside a classroom (Benson, 1991; Hyland, 2004) may render it more difficult for them to detect the emotional nuances in text-only CMC, and make them less confident about their initial perceptions regarding the emotional tone of a message. Replies in turn can provide additional contextual cues for the message receivers, and non-native speakers may focus more on these cues to compensate for their lower second language fluency. We expect this tendency to be reflected in how non-native speakers adjust their perceptions regarding the

emotional valence of a message after viewing replies compared to native speakers. We hypothesize the following.

H1: Non-native speakers will adjust their perceptions on the emotional valence of a text-only message more than native speakers after viewing replies to the message.

Regarding the effect of additional contextual cues in replies on the accuracy of detecting the emotional tone of the original message, we ask the following research question.

RQ: After adjusting their perception on the emotional valence of a text-only message based on replies, will native and non-native speakers' emotional valence detection accuracy increase or decrease?

Furthermore, shorter messages have less emotional cues available for detecting the intended emotional valence (Gill, Gergle, et al., 2008; Gill, French, et al., 2008). Thus, we expected that native and non-native speakers would rely less on the additional contextual cues in replies to adjust their perception of the emotional valence when the messages are longer (i.e., include more emotional cues). Therefore, we hypothesized the following.

H2: Native and non-native speakers will adjust their perceptions on the emotional valence of a text-only message based on replies less as the message length increases.

To answer the hypotheses and research question we conducted a second study in which we examined how the presence of replies influences native and non-native speakers' perceptions regarding the emotional valence in native English speakers text-only messages.

Method

Design. In Study 2, we examine how the presence of replies to a message influences native and non-native English speakers' emotional valence detection in text-only messages

written by native English speaking authors. To this end, we used a subset of messages including the author ratings from Study 1 (N=47), which included real English replies to the original message. The same native (N=20) and non-native (N=20) participants from Study 1 also took part in Study 2.

Procedure for rating messages with replies. In order to analyze the effect of replies on emotional valence detection, we presented both native and non-native speakers a subset of the messages used in Study 1 (N=47). Spearman's correlation coefficient showed that in this subset, message length had a strong positive correlation with the number of author annotated emotional cues in a message ($r[46]=0.38$, $p<.05$) (Gill, Gergle, et al., 2008; Gill, French, et al., 2008). Each message in the subset included a maximum of two real replies to the original message written in English. During the experiment, the participants were instructed that some of the messages included replies to the original message and should be rated twice. The participants were instructed to first rate the emotional valence of a message on a 7-point Likert scale (1 = very negative, 4 = neutral, 7 = very positive). After their initial rating, they were instructed to view the real replies to the message, which were not visible in the first step, and rate the emotional valence of the original message again.

Measures. We collected two types of measurements: participants' emotional valence detection based on their ratings and participants' adjustment on emotional valence detection after viewing replies.

Emotional valence detection. The participants rated the emotional valence of a message on a 7-point Likert scale (1 = very negative, 4 = neutral, 7 = very positive) and the rating score reflects the participants' emotional valence detection for each message.

Adjustment on emotional valence detection. We measured the effect of presence of replies on how native and non-native speakers adjust their perception of the emotional valence in the original message. The participants rated their evaluation of the emotional valence of each message on a 7-point Likert scale (1 = very negative, 4 = neutral, 7 = very positive) before and after viewing the replies. The latter rating score reflects the participants' emotional valence detection after viewing replies to each message. The difference in the emotional valence rating before and after viewing the replies indicates the participants' adjustment on emotional valence detection.

Results

Our hypotheses and research question concerned how the presence of replies influences native and non-native speakers' perceptions on the emotional valence in native English speakers' text-only messages.

Adjustment on emotional valence detection based on replies. H1 concerned whether non-native speakers adjust their perceptions on the emotional valence in a text-only message more than native speakers after viewing replies. To answer this hypothesis, we measured the emotional valence detection adjustment as the absolute change of emotional valence rating in the 7-point Likert scale, and compared native and non-native speakers' rating adjustments.

Results from a independent-samples t-test showed that non-native speakers (M=0.96, SD=0.44) adjusted their emotional valence rating significantly more than native speakers (M=0.59, SD=0.33) after viewing the replies to each message: $t[38] = 3.01$, $p<.05$. H1 was supported.

Effect of presence of replies on emotional valence detection accuracy.

Our research question concerned how native and non-native speakers' emotional valence detection accuracy changes after they view replies to the original message. To explore this research question, we calculated the absolute distance of participants' emotional valence rating from the author ratings before the participants viewed the replies. Then, we calculated the rating distance again after the participants had viewed the replies to each message. We then compared the average distance for before and after viewing the replies to each message.

Results from a paired sample t-test indicated that viewing the replies did not have a significant effect on native speakers' emotional valence rating distance from author ratings ($t[19]=0.77$, $p=n.s.$) (Table 5). The difference in rating distances before and after viewing replies was also not significant for non-native speakers ($t[19]=0.04$, $p=n.s.$).

TABLE 5

Descriptive statistics for the effect of presence of replies on participants' absolute emotional valence rating distance from author ratings

	Native speakers			Non-native speakers		
	M	SD	N	M	SD	N
Before viewing replies	1.67	0.15	47	2.00	0.19	47
After viewing replies	1.64	0.13	47	2.00	0.20	47

Correlation of message length and adjustment on emotional valence detection. H2 concerned the correlation of message length to the adjustment of native and non-native speakers' perceptions on the original message's emotional valence based on replies. Spearman's correlation coefficient showed a strong negative correlation with adjustment on emotional valence rating and the length of messages for native speakers ($r[45]=-0.40$, $p<.05$), but no

significant correlation for non-native speakers (r[45]=-0.14, p=n.s.). This indicated that native speakers adjusted their emotional valence rating less as the length of the original message increased, while non-native speakers adjusted their rating based on replies regardless of message length. H2 was supported for native speakers, but not for non-native speakers.

Discussion

Study 2 examined how the presence of replies affected emotional valence detection in text-only messages for native and non-native speakers. Our results showed that the presence of replies did not have a significant effect on native speakers' emotional valence detection accuracy. While inconclusive, our results did suggest that native English speakers might use replies as additional contextual cues when the original message includes fewer emotional cues (i.e., short messages). However, our results regarding non-native speakers were unexpected. Regardless of message length, non-native speakers adjusted their perceptions on the emotional valence of the original message significantly more than native speakers after viewing the replies. What was surprising though is that non-native speakers' emotional valence detection accuracy did not increase or decrease significantly after they viewed the replies.

The results regarding the presence of replies may be partly explained by non-native speakers' lack of confidence in their second language ability. Previous research on second language acquisition links non-native speakers' low confidence in their language ability to the overuse of editing and correcting functions (Hong, 2008; Krashen, 1981). Our results suggest that the presence of replies to a message may trigger these correcting functions for non-native speakers leading them to adjust their initial perception of the emotional tone of the message. On the other hand, non-native speakers' cultural background may influence how they perceive the

replies as additional contextual cues. Communication in high-context cultures, such as in Japan, depends on contextual and environmental cues to decipher meaning, whereas low-context cultures rely more on verbally explicit statements (Hall, 1976). Considering that the non-native speakers in this study were from a high-context culture, they may have relied on the replies as contextual cues more than the native speakers, who originated from low-context cultures. Future studies are needed to investigate how non-native speakers with higher self-evaluated language proficiency (i.e., higher confidence) perceive the presence of replies as contextual cues, and whether factors related to cultural background persist when receivers are near-native speakers.

Our results provided important insights on how non-native speakers may misperceive the emotional tone of a text-only message due to contextual cues in replies when they are passive receivers. However, in Study 2 we did not consider the content or type of replies, but examined if the presence of replies would affect native and non-native speakers' emotional valence detection differently. Answering what emotional cues or properties in the replies, and what factors (e.g., second language fluency, cultural background) contribute to non-native speakers' perceptions regarding the emotional valence of the original message require further research.

General Discussion

Our goal was to shed light on how non-native speaking receivers perceive the emotional tone of messages in text-only CMC, where the lack of non-verbal and vocal cues makes the exchange of emotional information more challenging than in richer mediums or in face-to-face settings (Short et al., 1976; Walther 1992). Taken together, our results demonstrate that message receiver's first language and cultural background may influence (1) how accurately they perceive the emotional

valence in text-only CMC, and (2) how emotional and contextual cues affect their emotional valence detection.

The results from Study 1 showed that the Japanese non-native English speakers were not able to detect the emotional valence of native English speaking authors' messages with similar accuracy to other native English speakers. Besides disparate perceptions from native speakers regarding the nuances of emotional cues (Dewaele, 2004, 2008; Miyake, 2007; Moore et al., 1999; Nishimura, 2006; Park et al., 2013; Russell, 1983; Romney et al., 1997; Yuasa et al., 2006), non-native speaking receivers may not share the same communicative norms and display rules with native speakers regarding emotional expression in text-only CMC (Byron, 2008; Meierkord, 2000; Seidlhofer, 2001). These discrepancies may contribute to non-native speaking receivers' misperceptions on how emotional tone is expressed in text-only messages in their second language.

Extending on the work by Gill, Gergle, et al. (2008) and Hancock, et al. (2007) that suggested emotion detection to be less accurate as message length decreases, Study 1 showed that message length does have an effect on how accurately native speaking receivers' perceive the emotional tone in text-only CMC. However, our results suggest that this is not the case for non-native receivers. This result highlights a potential misalignment between native authors' and non-native receivers' perceptions on the effectiveness of socio-emotional communication strategies, such as lengthening of messages, in text-only CMC.

Further, our results from Study 2 showed that Japanese non-native English speakers, who belong to a high-context culture, adjusted their perceptions on the emotional valence of messages significantly more than native speakers based on the additional contextual cues in replies.

However, this did not affect non-native speakers' emotional valence detection accuracy. These results suggest that factors, such as message receivers' language background, confidence in their second language ability, and cultural background (Hall, 1976) may play a role in how they adjust their perceptions regarding message author's emotional tone based on subsequent replies.

In summary, non-native speaking receivers perceive native speakers' messages in text-only CMC differently from native speaking receivers. These results have important contributions to CMC theories as well as practical applications particularly in multilingual socio-emotional communication contexts.

Theoretical and Practical Contributions

First, our results add to our understanding on the problems experienced by people who do not share the same first language background and communicate over text-only CMC mediums. Byron (2008) suggested that receivers tend to perceive text-only messages more neutral or negative than intended by the message authors. Our results extend this work to a multilingual context. We found that non-native speaking receivers display stronger neutrality and negativity effects when discerning the emotional valence of a message compared to native speakers. Secondly, our results regarding the presence of replies to a message highlight an aspect in text-only CMC that to best of our knowledge has not been discussed in previous works; how native and non-native receivers perceive replies as additional contextual cues in socio-emotional communication. While native speakers mainly use replies as additional cues when the original message includes few emotional cues, non-native speakers' confidence in their second language ability and cultural background (i.e., high-context vs. low-context cultures) may influence whether or not they adjust their perceptions on the original message regardless of the emotional

cues available in the original message.

The findings in this study also carry practical applications. One limitation in existing software for automatic detection of emotions is that they are tuned based on native English speakers' evaluations. For example, SentiWordNet includes a numerical score for positive-negative polarity for subjective terms based on human ratings (Esuli & Sebastiani, 2006). However, based on the results of Study 1 the evaluations used in these systems may not adequately predict how non-native speakers perceive the emotional nuances represented in individual words. A system that would collect evaluations of emotion words from non-native speakers could be compared to the existing evaluations from native speakers to identify any discrepancies in the emotional valence of single words. This information could be displayed to the conversational participants, thus enhancing the awareness of how emotions are communicated between native and non-native speakers in text-only CMC.

Limitations and Future Directions

There are several limitations to our studies. First, although situated in a text-only CMC context, our two studies did not include any interactive aspects between message authors and receivers. Due to this, our results do not consider any longitudinal effects in socio-emotional communication, such as emotion contagion (Barsade, 2002), common ground, partner adaptation or collaboration between conversational partners (Clark, 1996), which may also affect emotion perception. In future work, we are interested in expanding our research to include not only the interactive aspects between message authors and receivers, but also consider the reversed communicative situation, where native and non-native speaking receivers detect the emotional valence of messages written by non-native speaking authors.

Secondly, we only included non-native English speakers who spoke Japanese as their native language as experiment participants. Whether our findings would generalize to other language pairs, or to non-native speakers with different language and cultural background, requires further study. In addition, while our two studies considered the emotional valence of text-only messages, future research should consider exploring non-native speakers' detection of the basic human emotions (anger, disgust, fear, sadness, surprise, anticipation, trust, joy/happiness (Ekman, 1992; Plutchik, 1994)). Besides more complex emotions, we are also interested in how our results may apply to other communicative contexts, such as when the author and receiver are familiar with each other, or socio-emotional communication through text-only mediums in a multilingual working group including more than two people.

Thirdly, our findings suggested that non-native receiver's confidence in their second language ability might affect how they evaluate the emotional nuances in text-only messages, particularly in the presence of replies to the original message. However, our second experiment lacked a true control condition in which the participants would be asked to simply evaluate each message twice. One potential outcome from our design was that non-native participants might have used the additional opportunity to revise their initial emotional valence rating whether or not the message included replies. This should be addressed in future works. Furthermore, we are interested in exploring in detail how different factors in the replies (e.g., content, valence, length, author's native language, familiarity, sex) contribute to non-native speakers' perceptions regarding the emotional valence of the original message.

Conclusion

We examined how non-native English speakers perceive the emotional valence of messages in

text-only CMC. In Study 1, we discovered that non-native speakers are unable to reach similar accuracy as native speakers when detecting the intended emotional valence of native speaking authors' messages. Specifically, non-native speakers perceived messages as more neutral or intensely negative than intended compared to native speakers. In Study 2, we found evidence that message receivers' confidence in their second language ability, and their first language and cultural background may influence how they perceive replies as contextual cues for emotion detection in text-only CMC. The findings have implications for our theoretical understanding of multilingual socio-emotional communication in text-based CMC mediums, and practical implications for communication support tools for multilingual distributed groups.

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Footnotes

[1] Average TOEIC score for tests administrated in Japan was 512 (SD=180; N=2304) in the year 2012 (The TOEIC Test – Report on Test Takers World Wide 2012, ETS. Retrieved from https://www.ets.org; TOEIC Program – Numbers & Analysis 2013, ETS. Retrieved from http://www.toeic.or.jp).