Are You Laughing When You LOL? Examining Emotion in Texting Shortcuts Using Event-Related Potentials

David Kovaz[1] Jamonté D. Wilson[2] James W. Rogers[2] Lauren A. Dahlke[2] Rachel K. Black[2] Jeffrey J. Sable[2] Roger J. Kreuz[1]

[1]University of Memphis [2]Christian Brothers University

Introduction

- People commonly use shortcuts (e.g., "lol", "omg") when texting and communicating online. Previous research using event-related potentials (ERPs) shows differences between standard and "texted" English in late semantic processing (e.g., Berger & Coch, 2010).
- Conveying emotion is often difficult in text-based communication (e.g., Kruger et al., 2005). The role of shortcuts in conveying emotion is still relatively unexplored.
- The aim of this study was to use ERPs to explore how the brain processes emotion in shortcuts compared to standard English words. Specifically, we examined the emotional late positive complex (LPC) effect (e.g., Naumann et al., 1992).

Hypothesis

- Emotional stimuli will elicit greater positive amplitudes during the LPC than neutral stimuli (i.e., the emotional LPC effect), but this effect will be greater for words compared to shortcuts.

Stimuli

- Experimental stimuli consisted of 40 emotional shortcuts, 40 neutral shortcuts, 40 emotional words, and 40 neutral words (see Table).

Shortcuts (Emotional and Neutral)

- Two online pilot studies were conducted to gather and norm stimuli.
- Undergraduates rated shortcuts on a 5-point scale from "strong negative emotion" to "strong positive emotion." Distance from scale midpoint was used to calculate average emotional arousal scores for each shortcut.
- Shortcuts with highest/lowest arousal scores with at least 70% recognition were selected as emotional/neutral stimuli.

Words (Emotional and Neutral)

- Emotional/neutral words were selected based on Affective Norms for English Words (ANEW; Bradley & Lang, 1999). Arousal scores were calculated based on distance from midpoint of the 9-point valence scale.
- Words with highest/lowest arousal scores with length of 6 letters or less were selected as emotional/neutral stimuli.

Method

- 30 CBU undergraduate students participated (57% women, Mean age 20).
- **Emotional decision task:** Participants indicated if each stimulus conveys emotion or not by pressing one of two buttons.
- Each stimulus was presented for 3000ms or until the participant responded (see Figure 1).
- Stimuli were presented in four blocks of 50 trials each.
- Each block contained shortcuts or words with 10 practice, 20 emotional, and 20 neutral stimuli per block. Experimental trials were randomized.
- Block presentation was randomized across participants, always alternating between shortcut and word blocks.
- Following the emotional decision task, participants completed a recognition test on a random sample of shortcuts.

Apparatus

- Electroencephalogram data recorded using 32 channel ActiCHamp system.
- Channels referenced to mastoids. Ocular artifacts removed with ICA.
- Data sampled at 500Hz and bandpass filtered at 0.1-30Hz.
- Electrode impedances kept below 20kΩ.
- Epochs recorded from 100ms before to 900ms after stimulus onset.

Table: Example Stimuli

	Shortcuts	Words
Emotional	lmao	abuse
	lol	cancer
	luv	fun
	stfu	hug
	sux	sad
Neutral	b4	foot
	btw	jug
	cuz	metal
	g2g	odd
	nvr	table

Figure 1: Emotional Decision Task Trial

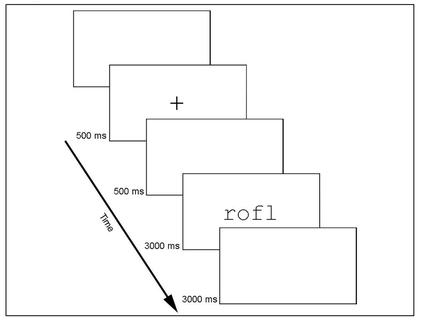


Figure 2: ERP Waveforms at Cz (left) and Pz (right) by Stimulus Type

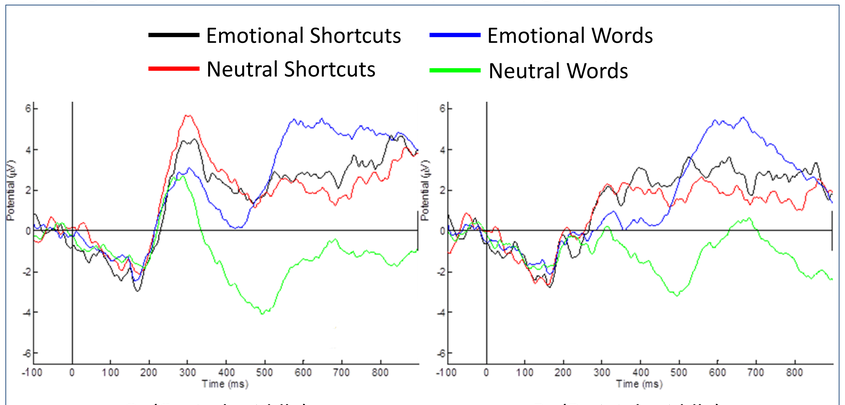
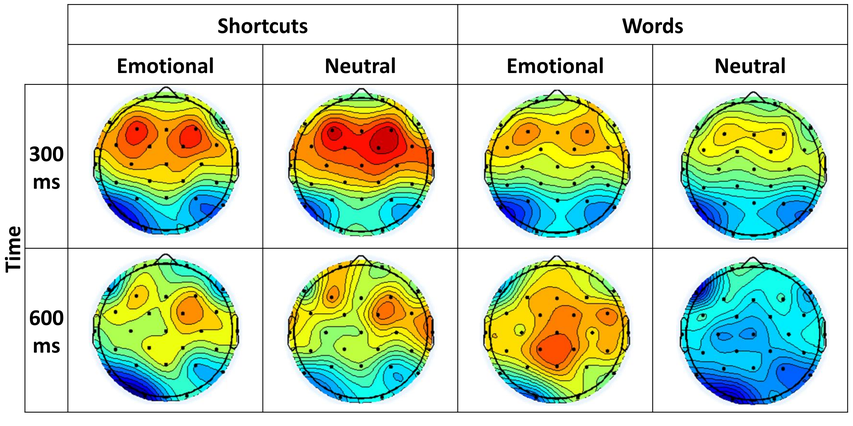


Figure 3: EEG Scalp Activity at 300ms and 600ms by Stimulus Type



Results

Reaction Times and Accuracy

- Only RTs for correct responses were analyzed. Participants with at least one correct response for all stimulus types were analyzed (n = 19).
- Shortcuts (M = 1176, SD = 343) took longer to judge than words (M = 1040, SD = 309) ($F(1,18) = 18.42$, $p < .001$).
- Participants were less accurate at judging emotional shortcuts (53%) than neutral shortcuts (75%), emotional words (78%), and neutral words (82%) ($F(1,18) = 9.82$, $p = .006$).

Event-Related Potentials

- Only trials with correct responses were analyzed. Due to technical problems, ERP data from only 10 participants were analyzed.
- Shortcuts elicited greater positive amplitudes than words at 300ms (P300). This effect was present at central and frontal sites (See Figures 2 and 3; main effect at Cz: $F(1,9) = 9.16$, $p = .014$, partial $\eta^2 = .50$).
- There was an emotional LPC effect (P600) for words but not for shortcuts. This effect was most apparent at parietal sites (interaction at Pz: $F(1,9) = 12.01$, $p = .007$, partial $\eta^2 = .57$). Emotional words elicited greater P600 amplitudes at Pz than neutral words ($t(9) = 3.94$, $p = .003$), but there was no difference between emotional shortcuts and neutral shortcuts ($t(9) = 1.36$, $p = .207$).

Discussion

- The emotional LPC effect was found for words but not for shortcuts. Therefore, our hypothesis was only partially supported.
- Additionally, participants were slower and less accurate at judging shortcuts (compared to words) in the emotional decision task.
- These results suggest that participants had greater difficulty in judging and processing emotional content of shortcuts compared to words.
- Differences between shortcuts and words in earlier processing (P300) expand previous work showing processing differences between "texted" and standard English (e.g., Berger & Coch, 2010).
- These results underscore the challenge of interpreting emotion online.

References

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