

Sentence Final Punctuation and Affect in Text Message Communication

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Abstract

In an age of increasing use of digital communication methods, it is important to consider how this new medium impacts the way we communicate with one another. Written communication inherently conveys information differently than spoken communication. Within the realm of written communication, text messaging sets itself apart due to its own set of grammatical norms, namely that punctuation is seen as superfluous in most situations. One particularly interesting trend that has emerged from this norm is that punctuation marks in text message communication serve as a means to convey emotion. For example, consider the text message interaction in Figure 1. Contrary to the literal linguistic meaning of the responses, we can sense that the respondent might be angry; this is the phenomenon of the “angry period”, described in Crair’s article “The Period is Pissed” (2013). This example illustrates how the use of (or absence of) punctuation marks in text message communication can impact the receiver’s perception of emotion. In the following paper we ask: how does the use of sentence-final punctuation, in particular the use of the period, influence the perception of affect in text message communication?

Keywords: language; rational speech act theory; Gricean maxims; text messaging; punctuation; emotion

Background

An utterance, whether in speech or writing, carries with it two meanings: a) a linguistic meaning (i.e. the literal meaning of the word, phrase or sentence) and b) a speaker meaning (i.e. what the person means in using it) (Bach, 1994). Moreover, linguistic meaning does not necessarily match speaker meaning. For example, cases of structural or lexical ambiguity and non-literality (i.e. hyperbole) can separate the two meanings. Communication is not simply about conveying a linguistic meaning, but rather also a set of attitudes and emotions. Thus, understanding a written or vocal utterance requires understanding not only the linguistic meaning, but also understanding the attitudes being conveyed that constitute the speaker meaning.

How then does the listener determine the speaker meaning that might be different from or not contained within the linguistic meaning? According to rational speech act theory, listeners assume that speakers choose their utterances approximately optimally and listeners interpret an utterance by using Bayesian inference (Goodman & Stuhlmüller, 2012). Under this view, speech is an action with

communicative goals. Therefore, a listener who views the speaker as rational will incorporate an understanding of the speaker’s belief state into understanding his or her utterances.

Grice’s theory of maxims provides a framework for understanding cooperative communication and the assumptions a listener can rightly hold if he assumes that the speaker is cooperative. Unlike scientific generalizations, these maxims are like contractual obligations that are assumed in order to communicate effectively. Grice’s super-maxim is the cooperative principle; it is assumed that the speaker makes his contribution as is required, when required for the conversation in which he is engaged. The following four maxims constitute the definition of cooperative as it pertains to speakers: quality (truthfulness), quantity (to be as informative as necessary), relation (relevance), and manner (brevity and coherence). Although we do not always satisfy these demands while communicating, they give us a basis to understand communication both explicitly in the literal sense and also implicitly through conversational implicatures. A conversational implicature is an inference that the listener is compelled to make if he maintains that the speaker is cooperative. For example, when a teacher announces after an exam, “Some students earned A’s,” a conversational implicature is that not all students earned A’s or, similarly, that some students did not earn A’s. Assuming that the teacher is cooperative, although the sentence using “some” is true, we know that she would have used the word “all” instead if all students had earned A’s due to the maxim of quantity, which holds that a speaker should contribute no more or less information than is required.



Figure 1: Text message communication illustrating the “angry period” phenomenon.

Rational speech act theory and Grice’s concept of linguistic maxims and conversational implicatures provide a possible explanation for the phenomenon of “the angry period.” Specifically, the use of the period in text messages seems to violate the Gricean maxim of quantity since, in informal text message communication, punctuation has become superfluous. For example, an American University study of college students’ texting and instant messaging found that students only use sentence-final punctuation 39% of the time in texts (Ling & Barron, 2007). Thus, there is an additional “cost”, so to speak, associated with including a period that adds no grammatical or informative value to a message. A speaker must have a reason for including the period, and incurring the associated “cost”, that maximizes informativeness, namely to convey affect. Therefore, in the infrequent cases when the period is used in a text, it conveys additional emotional quality and intensity. This illustrates how seemingly superfluous grammatical or linguistic features convey additional information about a speaker’s (or texter’s) emotion to the recipient. Thus, speakers can have the goal of conveying emotion rather than just conveying literal semantic meaning, and the use of punctuation in text messages lends itself to the former.

In their paper “Nonliteral understanding of number words” Kao, Wu, Bergen, and Goodman (2014) explore this idea that speakers can have different goals by examining the case of hyperbole with number words. They argue that certain communicative goals, such as conveying emotion and emphasis, are commonly satisfied by nonliteral language even though this violates the Gricean maxim of optimizing informativeness. Similarly, we believe the same types of communicative goals can be achieved in text messaging through the inclusion of or absence of certain punctuation marks, even though the use of superfluous punctuation in text message communication violates the Gricean maxim of quantity. Thus, the use of punctuation conveys information about the speaker’s goal: either to communicate the state of the world or to communicate the speaker’s affect toward the state of the world. We theorize that the use of a period in a text message indicates that the speaker’s goal is more likely to be that of conveying affect.

Model

Similar to the model in Kao, Wu, Bergen, and Goodman’s paper “Nonliteral understanding of number words”, our model consists of three different listener and speaker models: 1) the literal listener, 2) the pragmatic listener and 3) the speaker (or here, the text sender). The literal listener infers the question under discussion (QUD) value assuming the utterance is true of the state, whereas the pragmatic listener infers the speaker valence and QUD. The speaker chooses an utterance to convey their particular QUD (state, or state and valence). Specifically, the speaker has the option of sending one of two different phrases (a or b) combined with three choices of punctuation: 1) a period at the end, 2) an exclamation mark at the end, or 3) no

punctuation. In our model, we assign equal probability to the two possible phrases (a or b).

The speaker sends some text relevant to their communicative goal (i.e their QUD) and the listener infers the speaker’s QUD (and emotional valence if this is part of the QUD) based on the assumption that the speaker is trying to convey her communicative goal. This listener inference about the speaker’s QUD and affect is the output of our model.

Within this basic structure, the model incorporates several additional key assumptions. First, the model acknowledges that adding punctuation to a text message is costly because it is not grammatically necessary. Therefore, given that there is an additional cost, we set the prior probabilities on punctuation texts to be lower than non-punctuation texts. This assumption is incorporated in the code as follows:

```
;; Define list of possible texts (states +
punctuation (., !, or no punctuation))
(define texts (list 'a-nothing 'a-period 'a-
exclamation 'b-nothing 'b-period 'b-exclamation))

;; Prior probabilities for the text messages;
punctuation texts are costlier and have lower
priors
(define (texts-prior)
  (multinomial texts
    '(0.40 0.05 0.05 0.40 0.05 0.05)))

(define text-costs '(0 5 5 0 5 5))

(define (texts-prior-with-costs)
  (multinomial texts
    (map (lambda (cost) (exp (- cost)))
      text-costs)))
```

Second, we assume that the exclamation point is more likely to carry a positive meaning. The implication of this assumption is that a text sender will be less likely to use a period when trying to convey a positive emotion because he or she could have used an (equally costly) exclamation mark. Therefore, when a period is used the receiver will be more likely to think that the sender is conveying negative emotion. No-punctuation and periods have an equal probability on negative, neutral and positive valence, whereas exclamation point has a high probability of having positive valence.

In other words, the listener does not *a priori* have any knowledge of what the semantics of the punctuation “-nothing” and “-period” are. The punctuations have some meaning, but this meaning is inferred from context. Therefore, the meaning of “-nothing” and “-period” is initially uniform because the text receiver does not know what the meaning of the punctuation is. The meaning of “-exclamation” is skewed positive, though, because exclamation points carry a semantic meaning that is typically, though not always, positive. Bennett and Goodman describe this assumption in their paper “Extremely costly intensifiers are stronger than quite costly ones” (2015). These assumptions about *a priori* beliefs of

punctuation are reflected in the following portion of the code:

```
(define (nothing-valence-prior) (multinomial (list
-1 0 1) '(.33 .33 .33)))
(define (period-valence-prior) (multinomial (list
-1 0 1) '(.33 .33 .33)))
(define (exclamation-valence-prior) (multinomial
(list -1 0 1) '(.05 .05 .9)))
```

The model also reflects the intuition that if you, as a speaker, have a valence (i.e. you are feeling positive or negative emotions), then you want to tell someone about it. The fact that you want to share your valence is why you are willing to pay the additional cost of typing punctuation. If the speaker has no valence, the QUD is equally likely to include the valence or not, whereas if the speaker does have a valence, then there is some bias towards the QUD including valence. We code for this assumption in the model as follows:

```
(define (qud-prior-given-valence valence)
  (if (equal? valence 0)
      (multinomial (list 's 'sv) '(.5 .5))
      (multinomial (list 's 'sv) '(.1 .9))
  ))
```

Figure 2 below shows the output of the cognitive model, including the inferred percentage likelihood of each possible QUD of the speaker (state only, state and negative valence, state and neutral valence, and state and positive valence) for each category of punctuation.

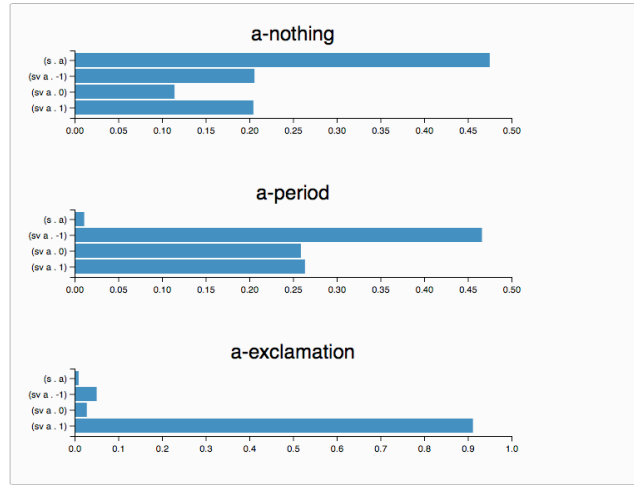


Figure 2: Output of the cognitive model.

Experiment

In our experiment we tested the hypothesis that the use of a period in text message communication is typically perceived to convey negative affect by recruiting participants to judge the emotional content of several text messages with different forms of sentence final punctuation.

Methods

We recruited 15 Stanford University undergraduate students for their participation. We asked each participant to provide his or her cell phone number so that the experimenter could send the participant a series of text messages and have him or her answer questions about those text messages. The possible text messages a participant could receive were: “I’m fine”, “Let’s talk soon”, “Come to dinner”, “Thanks”, “Your paper is on my desk” and “Have a good night” ended with either a period, exclamation point, or no punctuation. These particular messages were chosen for their relatively neutral content. Each participant was told to imagine they were receiving these text messages from a friend, although the context surrounding the text messages was left intentionally vague. The participant then received six texts (message-punctuation combinations) and was asked the following questions about each text: 1) On a scale from 0 to 10 (impossible to certain), how likely is it that the sender is trying to convey some kind of emotion? 2) Please describe what you think the sender is thinking and/or feeling, and 3) On a scale from -10 to 10 (very negative to very positive), what do you think the emotional state of the sender of this text message is?

Results

Table 1: The number of messages that were perceived to be negative, neutral or positive for each category of punctuation.

	Negative	Neutral	Positive
No punctuation	14	11	5
Exclamation point	3	2	25
Period	20	8	2

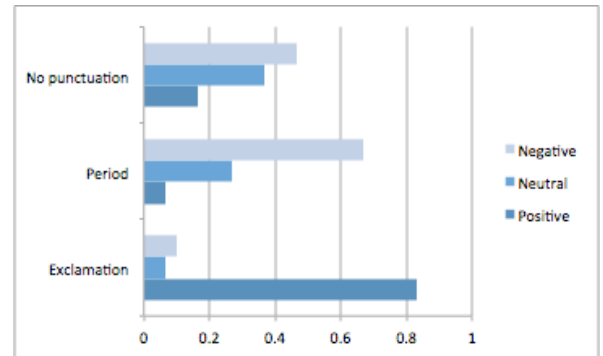


Figure 3: The percent of messages perceived to be negative, neutral or positive for each category of punctuation.

The results of our experiment generally match our cognitive model and original hypothesis. When a given message ended with an exclamation point, the participants marked it as positive most of the time (85%). This percentage is slightly less than the 91% positive result predicted by our model. When a message ended with a

period, the participants found it to be negative 67% of the time, while our model predicted 47% of the time. Lastly, when messages had no punctuation, they were understood as negative 47% of the time, while our model for messages without punctuation was evenly divided at 20% each for positive and negative.

The experiment results for messages ending with an exclamation point were strikingly similar to our model, but the results for messages without punctuation marks and for those ending with a period were slightly different from our predictions. While the model predicted that messages without punctuation would be determined positive and negative at the same rate, the results from our experiment showed that most of those messages were perceived to be negative. The messages with a period were marked negative more often than our model predicted and consequently marked positive less often.

Discussion

A potential cause for differences between the model results and experiment results is that the sentences chosen for the experiment may have not actually been neutral, independent of punctuation. One participant commented that “Have a good night” is not a neutral sentence because it already has an additional cost because the message could have simply been “Good night”. The addition of “Have a” adds formality and therefore also a more likely negative connotation when speaking to a friend through text message. In a future experiment, it would be helpful to run a test over the message content (without punctuation) to screen for neutrality beforehand. This would help us more accurately determine the change in valence that the punctuation adds.

Another factor that may have skewed results is the context of the messages. Many participants said that their determinations of the valence of the message would be affected by previous messages and their relationship history with the texter. Furthermore, since periods are sometimes used only for grammatical purposes, it can be difficult to separate when the texter is trying to convey emotion using the period and merely using proper grammar due to habit. Despite these limitations, the results of our model and experiment follow our intuitive understanding of text message communication and strongly validate our hypothesis.

General Discussion

As text messaging becomes an increasingly prevalent form of communication, it is important to consider the implications it will have on the way people signal emotion. Though narrow, our research strongly suggests that there is emotional valence associated with punctuation. The period, which is traditionally not associated with a particular emotion and, rather, serves as a practical tool in grammar, does in fact increase perceived negative emotion when used in text messaging. The valence of emotion associated with informal messaging leaves much room for interpretation and seems to be heavily dependent on social context. Research

going forward could focus on the emotional implications of using various emoticons and other punctuation marks (i.e. ellipsis or question marks) in text communication. In addition, for deeper insight into this topic it would be helpful to understand what (if any) additional emotional information is conveyed by the use of formal language, acronyms, contractions, and various other combinations of phrases and punctuation in text messaging. As text messaging continues to develop its own grammatical and conversational norms, it is important to continue this research to better understand cooperative communication in this medium.

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