wow, that's really interesting.

Or, the Tonal Effect of Capitalization and Punctuation in Online Communication

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Abstract

In verbal communication, the emotional states of speakers can be conveyed through prosody, such as intonation or stress patterns. In English texting communication, prosody is transcribed largely through capitalization and punctuation patterns (Heath, 2018), such as the use of lowercase letters with periods in (1a).

(1) Ready to go?
   a. yeah.
   b. Yeah.
   c. yeah

Previous work by Houghton et al. (2018) and Gunraj et al. (2016) finds that (1a) is interpreted more negatively and insincerely than (1b) or (1c). This thesis explores this intuition with regard to a scalars responses to questions (as described by Horn, 1972) as in (2).

(2) How are you feeling?
   a. great.
   b. great

This thesis proposes that lowercase communicates a casual register (McCulloch, 2019) or lower emotional energy (Heath, 2018); a period at the end of a short phrase suggests a falling declarative (Farkas and Roelofsen, 2017). The overall effect is a dismissive or sarcastic tone, the latter of which is strengthened with more scalarly positive lexical items.

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Chapter 1

Introduction

1.1 Overview of the Lowercase & Period Combination

The orthography used in texting often differs from that used in formal writing. In writing this thesis I capitalize the first letter of each sentence, and end each sentence with the appropriate punctuation (in almost every case, a period); this is standard orthography for English. But texting, particularly in informal contexts such as with friends or peers, often features non-standard capitalization and punctuation patterns. Common examples are writing entirely in lowercase, entirely in upper case, excluding punctuation, adding extra punctuation, and so forth. These different orthographic patterns can and do often communicate pragmatic or affective information, like the emotional state a texter intends to convey. For instance, an exclamation mark (!) often indicates surprise, joy, or anger, or and a question mark (?) often indicates uncertainty, confusion, or hesitancy.

The pattern focused on in this thesis is typing a text entirely in lowercase, but ending it with a period — particularly when the text is short enough to not require sentence delineation. For brevity, I will refer to this pattern as "LCP" (**l**ower**c**ase with **p**eriod) orthography. Suppose you are texting a friend, and you are planning to go to an event together. As you are preparing to leave, you ask them a question (1), and you receive one of two replies:

either (1a) or (1b).

(1) Ready to go?

a. yes

b. yes.

The two messages differ only in punctuation, but young adult texters tend to interpret them as carrying different attitudes. The answer in (1a) seems genuine and at least neutral, even positive, in its affect. On the other hand, (1b) seems relatively dismissive and negative in its affect. At a glance it would seem that the difference is caused by the presence of the period, given that this is the only change between the two answers. However, this cannot be the only factor; the same pattern is observed in (2) below, where (2b) is perceived as having a more negative affect than (2a).

(2) Ready to go?

a. Yes.

b. yes.

Unlike in (1), the responses to (2) are both punctuated — they only differ in capitalization. Therefore, it follows that the negative affect of (1b) and (2b) come not from lowercase capitalization or the period alone, but from the interaction between the two. Previous research has examined the connection between LCP and affect with polar yes-no questions, like those of the above examples (see Gunraj et al., 2016; Houghton et al., 2018); I describe this in depth in section 2.3. However, the connection holds widely in question-answer contexts, and does not appear to be exclusive to polar responses. When answering a question that prompts gradient answers — like those of Horn scales (see Horn, 1972) — we can observe a similar affect effect. Examples (3) and (4) below are interpreted most negatively when using LCP (as in (3c) and (4c)).

(3) How's your day going?

a. great

b. Great.

c. great.

(4) How's your day going?

a. alright

b. Alright.

c. alright.

For both (3) and (4) the lowercase and period combination seems to be the least enthusiastic and least sincere response (3c and 4c respectively). Furthermore, (3c) is perceived as even less sincere than (4c) — that is to say, it is perceived as being more sarcastic. Given that "great" is a more positive answer to "how's your day going" than "alright," this mirrors the findings of Gunraj et al. (2016) and Houghton et al. (2018), who observed affirmative responses (e.g., "yes," "yeah") are perceived less sincerely in LCP text messages than their neutral (e.g., "maybe") or negative (e.g., "no") counterparts.

Following from this, this thesis has two aims. The first is to establish that LCP leads to a relatively negative (particularly, dismissive) affective interpretation broadly in short answers, and not exclusively in polar environments. Examples are given above in (3) and (4), but these intuitions, and the populations they apply to, will be further explored in Chapter 3 by survey. The second aim is to explore *why* LCP leads to these affective interpretations, particularly why lowercase and period punctuation do not each have the same effect independently.

1.2 Outline

The rest of the introduction focuses on an overview of texting and other messaging systems as a medium. Section 1.3 provides an overview of what I mean in this thesis when I use the term 'texting,' and how different groups text. Section 1.4 discusses the necessity and

difficulties behind a pragmatic analysis of texting. Chapter 2 looks at previous research on the connections between orthography and prosody, and how these influence affect. These findings are then reviewed alongside the survey in Chapter 3.

1.3 Brief History on Texting, and Defining Terms

You are probably already very familiar with texting. Statistically speaking, you have probably sent and received at least a few text messages before reading this thesis today. American adults sent a median of ten texts per day in 2011 — quadruple that for young adults between 18 and 29 (Smith, 2011). And since then, the percentage of cell phone owners in the country has increased from 83% to 98%, and smart phone ownership has gone from 35% to 91% (Sidoti and Dawson, 2024). As interpersonal interaction has gradually shifted toward electronic mediums like texting over the last four decades, sociologists, linguists, and other researchers in communication fields have turned their attention towards what Kiesler et al. (1984) coined as "computer-mediated communication," or CMC. Texting is one example of CMC, but it is a relatively recent one; researchers were studying the use of email, computer bulletin boards, and other forms of digital communication years before the popularity of the cell phone (Dutton et al., 1987; Rice and Love, 1987; Sidoti and Dawson, 2024).

Throughout the 2000s to early 2010s, cellular texting was the dominant platform for electronic messaging among college-aged adults (Skierkowski and Wood, 2012). But since there has been a steady shift in this demographic towards the adoption of internet-based platforms for messaging, evidenced by a decline in annual text messages between 2011-2017 (CTIA, 2022). This trend is unsurprising; it wasn't until 2000 that over half of American households had a computer (Newburger, 2001), so many adults born before the early 90s had to adopt computers during their lifetimes. Those born later never had to adopt them; they were present in our lives for as long as we can remember, and this only becomes truer with the passage of time. A natural consequence of this that some adults who grew up after turn of

the millennium — older members of "Generation Z"[1] — favor "direct messaging" systems, accessible by a personal computer, over cellular texting. Unlike cellular text messaging, which uses cellular networks to communicate between mobile phones, direct messaging uses Internet connections. Direct messaging (also "DMing," or "IMing," **I**nstant **M**essaging) is a common feature on social media platforms, and many popular applications and websites exist for the primary purpose of DMing, including WhatsApp, Kik, Snapchat, and Discord.

For the purposes of linguistic analysis, I treat 'texting,' 'messaging,' 'DMing,' and so forth as synonymous. Although cellular text messaging and instant messaging are different platforms, young adults follow use similar conventions and shorthands for both, particularly since direct messaging platforms are frequently supported or even primarily used as phone applications.[2] Yudytska (2024), who examined message-initial capitalization on Twitter, found that 29% of computer-based messages on the platform were lowercase-initial, compared to 26% of phone-based messages. Although this difference is significant when comparing the hundreds of thousands of tweets that were analyzed in the corpus, it is possible — as proposed by both Yudytska (2024) and McCulloch (2019) — that sentence-initial auto-capitalization accounts for the difference. I believe the proportion is close enough to suggest shared trends in capitalization patterns. Therefore, I will be using 'texting' as an all-encompassing term for any digital sending and receiving of short, private messages.

1.4 The Trouble With Texting

Texting is rife with miscommunications.

This is a common sentiment. I have had friends ask me for my opinion on their wording

[1] I was born in 2003; Generation Z is loosely defined as those born from the late 90s through the early 2010s. Most members of the generation are young adults. As of 2025, the youngest "Zoomers" are in middle school.

[2] Of the platforms I mentioned, the desktop versions of WhatsApp and Snapchat are 'WhatsApp Web' and 'Snapchat Web' respectively, and Kik is entirely incompatible with desktop.

of a text ('does this sound *too* annoyed?'), and I have asked them the same. Comedians Key & Peele have done an entire segment on the absurdity of "text message confusion," where two friends entirely misinterpret the other's emotional state because of the ambiguity of their texts.[3] And although they exaggerate for humor, the joke is based in truth. After all, texting is purely visual; by its nature the auditory (i.e, prosodic) and visual (i.e., paralinguistic) cues to indicate emotion or sarcasm are lost in transcription. When speaking in person, for example, someone might raise their pitch or roll their eyes to indicate sarcasm — but without these hints, a text sent with sarcastic intent may be interpreted sincerely, or vice versa. The rise of tone indicators in some circles, like /s for 'sarcasm' or even ':)' for 'happy or positive attitude' (or *also* 'sarcasm'), imply that these elements struggle to come through in text.

However, the language used in texting is not as opaque as it is often characterized as being. Written language, particularly in fluid, ever-changing mediums, is very competent at overcoming these communicative challenges. Although text lacks the volume of the spoken word, texters have systematized methods of conveying this feature, filling auditory and visual gaps with orthographic markers. Consider (5a) and (5b) below:

(5) We're on our way!

   a. I'M SO EXCITED!

   b. I'm so excited!

Texters often interpret the complete capitalization, or "all-caps," of (5a) as more emphatic than (5b). One common interpretation is that (5a) feels as if it is 'shouting' in comparison (McCulloch, 2019, p. 115). But, of course, text cannot shout — it cannot make any noise at all unless it is being read aloud. The use of capitalization here is a purposeful attempt to communicate exaggerating intensity or emphasis as compared to (5b), reinforced by the exclamation mark; in spoken language, shouting can serve a similar function. As

[3]See Key & Peele, Season 4, Ep. 3. Also accessible at https://www.youtube.com/watch?v=naleynXS7yo.

a consequence, (5a) seems to have a stronger excited emotion than (5b) (Heath, 2018). I expand on this in sections 2.1 and 2.2, but (5) suffices to show that texts can carry emotional differences based not only on their lexical content, but also on their orthography.

A challenge in studying these orthographic patterns is that their meanings can vary significantly between communities, particularly generationally. One such example is in the usage of an ellipsis in (6), taken from a 2014 post by Mark Liberman in his blog *Language Log*.

(6) Address is correct... *[in an email sent by someone over 25]*

Younger texters are likely to be confused by the punctuation of (6), which they intuit as suggesting hesitancy, despondency, or sympathy (Liberman, 2014; Raclaw, 2006). However, in this particular context, none of these emotions apply; the intent was neutral. Liberman (2014) draws a parallel between this confusion and common reactions to *uptalk*, where a speaker ends an assertion with a rising pitch.[4] Uptalk is usually used to "[invite] a response," but is often misinterpreted as a presenting a question (Liberman, 2006). Similarly, the meaning one intuits from the ellipsis in (6) is informed both by immediate context, and also by the way one's community uses ellipses in general. These community differences in orthography, particularly generational ones, are often recognized by texters. For example, the X (formerly Twitter) user in (1.1)[5] references the prevalence of lowercase capitalization in Generation Z (Zoomer) texting, and the prevalence of the aforementioned ellipses by older texters. The difference in how these are used and perceived is combined for humorous effect.

[4]Liberman quotes Gorman, who coined the term in his 1993 *New York Times* On Language article "Like, Uptalk?" as conveying this pitch through question marks: "I was, like, appalled?"

[5]Available at https://x.com/zhuphilia/status/1896254341419544852

Figure 1.1: An X (formerly Twitter) post by 27-year-old (Generation Z) user @zhuphilia, who draws a generational distinction between "zoomer lowercase" and "boomer ellipses"

The LCP intuitions I discuss in this thesis are held most strongly (though not exclusively) by young adults. As a young adult myself, this is also the perspective I am writing from. But because LCP's affective meaning is not *universally* intuited, miscommunications can easily arise between parties who associate it with negative sentiments, and those who do not. This is not because LCP is vague in its meaning, but rather because not everyone is familiar with its usage.

Chapter 2

An Overview of Orthography and Prosody

2.1 Capitalization and Prosody

As I discussed in section 1.4 with the case of all-caps, different capitalization patterns can carry different meanings. Consider (7) below.

(7) a. i love this weather *[Standard]*

b. I love this weather *[Standard]*

c. i lOvE tHiS weAtHer *[Sarcastic]*

d. i Love this Weather *[Sarcastic]*

e. I LOVE THIS WEATHER *[Emphatic]*

f. i love THIS weather *[Emphasis on "this"]*

g. i LOVE this weather *[Emphasis on "love"]*

h. i Love this weather *[Emphasis on "love"]*

Each sentence in (7) features a different capitalization pattern that is relatively common among Generation Z texters. Although they all carry the same literal semantic content

— as in, they are composed of the same words in the same order, with the same intended definitions — they are interpreted as having different affects on account of their capitalization differences. Sentences like (7c) and (7d) are often interpretted sarcastically; I personally read the former as having a sort of warbling quality, and it is often used in online memes, as in (2.1).

Capitalizing individual words, such as in (7f) and (7g), communicates emphasis on those words; they are highlighted as being particularly important to the interpretation of the sentence. Some texters instead capitalize only a single letter of an emphasized word, as in (7h), which harkens back to the capitalization-as-emphasis patterns from the 17th through 18th centuries. The United States Declaration of Independence is one prominent document that uses this styling. And, just as certain capitalization patterns online fall in and out of style, written capitalization-as-emphasis fell out of use when it was perceived as being excessive (Crystal, 2005, p. 262).

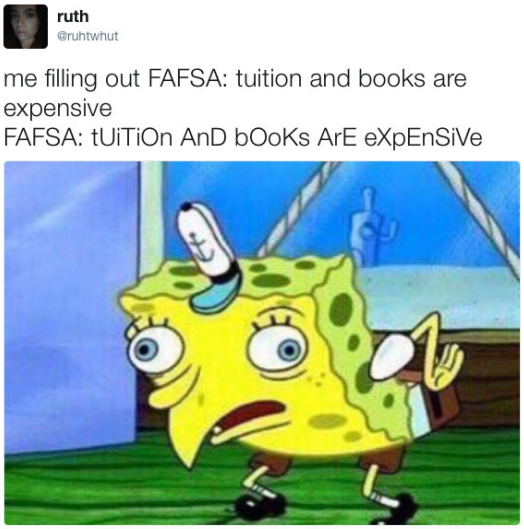


Figure 2.1: An X (formerly Twitter) post by user @rhutwhut, in which the FAFSA team is depicted as mocking tuition and book expenses. This capitalization pattern is standard for this particular Spongebob Squarepants meme.

Both (7a) and (7b) are relatively neutral, and can be seen in the course of standard conversation. Gretchen McCulloch characterizes the difference between them in terms of "minimalist typography" (p. 141) in her 2019 book *Because Internet*. She notes that the lack of capitalization of (7a) is often done for aesthetic reasons. Because cellphones will automatically capitalize the first letter of a text message or the first letter at the beginning of a sentence, a lack of capitalization becomes a purposeful choice on the part of the texter; the texter must actively choose to *not* capitalize, either in that

moment (by deleting and retyping the letter, for instance) or by disabling autocapitalization all together. By the R-principle "Say no more than you must" (Horn, 1989), it follows that this "aesthetic" cue likely serves some kind of meaningful or at least marked purpose, just as the other capitalization patterns in (7) do.

But what is this cue? Following from the analysis of Heath (2018), I believe it is *prosodic*, and intends to communicate a subtly lower volume and lack of stress when compared to standard capitalization patterns. As I discussed in 1.4, all-caps is often associated with the perception of 'shouting.' In some cases, as in (5a), this can function to emphasize joy. In other cases, as in (8a), it appears to emphasize anger.

(8) a. STOP IT

b. Stop it

Heath (2018) notes that previous work has connected prosody, such as volume and pitch, to different emotional states. Sometimes a speaker may even try to project a false emotional state. Sentential stress is also used to emphasize that a word is particularly important ("encoding semantic focus") (p. 3). Following from Wilson and Sperber (2006)'s Relevance Theory (that humans are efficient communicators who seek relevant cues), Heath proposes that capitalization is used to encode prosodic features, which are then interpreted by readers in a way analogous to spoken language and subsequently perceived as having some affect or semantic emphasis. She suggests that all-caps is not, in and of itself, functioning to communicate a 'sad' or 'angry' emotion. Instead, she looks at how capitalization is interpreted in terms of its pronunciation, which then has an effect on the emotional tone. Consider (8a) and (8b) above. Although the words are identical, the orthographic difference is used by a texter to signal a difference in intensity (volume, for instance). This difference in intensity is then *interpreted* as anger, or urgency; the prosody then maps to certain *affects* — the emotions and attitude carried by a phrase.

Returning to our lowercase example, recall how the uppercase letters in (7e), (7f), (7g),

and (7h) all function to add some level of prosodic stress. It is my intuition that the subtle difference between (7a) and (7b) is that (7a) marks an explicit *lack of* prosodic stress, rather than leaving the statement ambiguous or unmarked for stress. This lack of stress can then be interpreted by readers in a number of different ways, depending on the context, just as capitalization can be; for example, a lack of emotional intensity or investment, such as in perhaps despondency, flippancy, or tranquility.[1]

2.2 Punctuation and Prosody

Like capitalization, punctuation is used to convey prosody, and different punctuation patterns correlate to different affective interpretations. Consider (9) below, and the slightly different intonations of each example.

(9) Where would you want to go?

a. I don't know. [*Neutral, unmarked, or downward-inflecting statement*]

b. I don't know! [*Passionate exclamation*]

c. I don't know? [*Upward-inflecting statement; unsurety or "Why ask (me)?"*]

d. I don't know... [*Trailing off; doubt, unsurety*]

Much like with capitalization, these patterns — which are standard even in formal writing — are common in texting interactions. These normative forms are also sometimes modified and manipulated in texts. For example, repetition of some form of punctuation can serve to emphasize: multiple exclamation points, question marks, or ellipses as in (10) are more emotive in texting than their counterparts in (9); repeated question marks, as in (10b are interpreted as an emphatic or high-emotion question.

[1] As has been pointed out to me by my fellow linguistics seniors, the strength of this effect is inversely proportional to how often someone overrides this autocapitalization. If a person only very rarely begins a text with lowercase letter, this makes the effort it takes to do so especially salient, which thereby makes the prosodic effect more substantial.

(10) Where would you want to go?

a. I don't know!!!!!!! [*Very passionate exclamation*]

b. I don't know????? [*Emphatic confusion or shock*]

c. I don't know..... [*Trailing off; strong doubt, or a leading question*]

Much like how capitalization correlates with stress and intensity, Chafe (1988) similarly found that in reading aloud exercises, different punctuation marks often correlated with different spoken pitches. The period, for example, he notes as having a falling pitch (p. 402). (McCulloch, 2019, p. 114) notes this as well, and adds that this falling-pitch-period is not restricted to sentence-final position in texting (example from ibid.):

(11) Like. So.

A message such as (11) is read with two falling intonations, one on each word. Sostarics and Cole (2023) notes that a falling pitch accent is usually associated with an assertive, rather than an inquisitive, declaration in English; and Walker (2017) further notes that falling pitch often suggests turn finality; i.e., that someone has completed their turn speaking in the conversation.

2.3 Previous Work on LCP

As I discussed in 1.1, of particular interest to me is the LCP (lowercase with period) orthographic style, where a texter combines all lowercase with a sentence-final period. In short phrases, some texters — anecdotally, particularly those of younger generations — interpret LCP as dismissive or abrupt. Gunraj et al. (2016) were the first to analyze the negative affect of periods in these contexts in texting experimentally. In their study, they presented vignettes resembling cellphones displaying a texting exchange to undergraduate students. These exchanges took the form of polar (yes-no) questions, and their affirmative answers (e.g., yes, yeah). Students were asked to rate their perception of the answerer's sincerity on

a 1-7 Likert scale; Gunraj et al. (2016) found that text messages ending with a period were rated as less sincere than those that did not.

Two years later, Houghton et al. (2018) expanded on the findings of Gunraj et al. (2016). Using a similar vignette structure, they asked undergraduate students to rate the perceived sincerity and positive versus negative affect of polar answers to questions — affirmatives, negatives (e.g., no, nah), and neutral (e.g., maybe). They found that affirmatives were perceived as less sincere in LCP orthography than without a period, and that all kinds of answers were perceived as more negative in LCP than without a period.

2.4 Describing Insincerity

In previous sections, I have discussed the ways that orthography is connected to prosody and emotional states. Here I would like to focus on another aspect of affect: sincerity.

It is worthwhile to first define exactly what "sincerity" is. When Gunraj et al. (2016) performed their study, they did not formalize any definition for the term, which suggests that they intended the colloquial use. But there are a few different ways an utterance can be intuited as insincere, and their distinctions are important. Consider the insincere statement (12) below:

(12) Oh boy, I *love* going to the DMV!

Assuming that "Going to the DMV is unpleasant" is part of the common ground (Stalnaker, 1978), a statement like (12) would be *prima facie* absurd if it was intended literally; both speaker and hearer would know this, so it is also unlikely that the utterer is attempting to deceive the hearer. Instead, this is an example of irony, which Grice (1975) analyzes as the Meaning of an utterance being different (especially opposite) from what is said. The speaker in (12) is intending to communicate their displeasure with having to go to the DMV, and expects that the hearer will capture this meaning. But this intended meaning is entirely opposite to the literal semantic content of the sentence — we intuit it, therefore, as being

insincere, even if there is no deception at play. This is the first form of insincerity we want to capture in our definition.

The second form is exemplified by (13c) in the brief exchange (13), taken from season three, episode six of the television sitcom *Community*.

(13) a. [Britta] I can excuse racism, but I draw the line at animal cruelty.

b. [Shirley] You can excuse racism?

c. [Britta] *Shakes her head "no."*

Britta's head-shaking is insincere; she is intending to communicate to Shirley, a Black woman, that she, a white woman, *cannot* excuse racism, contrary to what she admitted moments before. The head-shaking in (13c) is therefore dishonest; Britta Means something that is untrue, and hopes she can convince Shirley, so as to avoid judgment. Unlike (12), there is no attempt at irony or sarcasm here; all statments were intended entirely literally. The intuition of insincerity comes instead from uttering something that the speaker does not themselves believe to be true.

Our formal definition of "sincerity" will capture both of these forms: an utterance is *sincere* if the speaker is, at the time of the utterance, committed to the truth of its literal semantic content. By this definition, (12) is insincere because although the speaker is committed to the truth of the Meaning of the sentence (that they dislike going to the DMV), this commitment does not align to the literal content (the opposite). Likewise, (13c) is insincere because the speaker is Meaning something they do not actually believe.

2.5 Hypothesis: LCP Through a Prosodic Lens

Both Gunraj et al. (2016) and Houghton et al. (2018) have concrete findings regarding the affective intuitions of speakers who receive punctuated responses; they lends themselves to negative affective interpretations, and color positive items as insincere. Although both

Gunraj et al. (2016) and Houghton et al. (2018) briefly discuss the pragmatic and social *effects* of LCP, they leave a deeper analysis of its *causes* to future researchers; this is the area built upon in this paper. Furthermore, I attempt to extend the findings of Houghton et al. (2018) in two distinct ways. First, it is my intuition that the effect they describe is significantly stronger for LCP (which is the orthography they used) than it is for other punctuated orthographies. Second, I believe LCP holds in a wider environment than just in polar questions. Following from the discussion in 2.1 and 2.2, all-lowercase texts are somewhat less stressed and emphatic than their sentence-capitalized counterparts; the period at the end of a statement, particularly a short one or one that forms a sentence fragment, marks for downward inflection and finality. I hypothesize these effects are compounding because the all-lowercase nature of LCP is a break from the normative capitalization style, meaning punctuation is no longer prescribed; this reinforces the *choice* to use punctuation as carrying a purposeful prosodic function. The overall effect should then be that LCP statements are more negative (often, dismissive) and, in literally positive utterances, less sincere than other orthographic patterns.

Chapter 3

Survey on Perceptions of LCP

3.1 Survey Methodology

3.1.1 Overview

As discussed in section 2.3, previous survey-based studies examining the affect of LCP found that responses to polar questions are perceived as more negative (Houghton et al., 2018) with LCP orthography, and affirmations (e.g., yes, yeah) in particular are perceived as less sincere (Gunraj et al., 2016; Houghton et al., 2018). Both of these studies look specifically at single-word or short phrase affirmative, neutral (e.g., maybe), or negative (e.g., no) responses.

I hypothesize that LCP has a negative affect in question-answer contexts more broadly, rather than solely in polar environments. To test this, I created a set of question-answer vignettes following the style of Houghton et al. (2018). Rather than testing polar questions, this surveys asks participants to evaluate questions that are answered *scalarly*, i.e., by answers on a Horn scale; I chose this because scalar answers can be analogous to polar answers, in the sense that some particular answer may be preferred by the asker (e.g., "good" and "yes" versus "bad" and "no"), and because scalar answers lend themselves to short phrases, where LCP seems to be the strongest. Each potential answer to a given question is a scalar item,

ordered such that one end of the scale would be seen as more desirable to the questioner, and the other end would be seen as less desirable. In some cases less extreme scalar items may be perceived as more desirable.[1] A complete list of possible questions and responses can be found in the Appendix. Consider (14) below:

(14) hows your day going?

a. meh.

b. okay.

c. good.

d. great.

e. amazingly.

It is safe to assume that, if the questioner and responder are friendly, then the questioner hopes that the responder is having a nice day. The scale here is positivity (of the day), where (14e) entails (14d) (or better), (14d) entails (14c) (or better), and so forth. That is to say, if someone had a good day, then their day was (at least) okay, but it may not have been great. Based on the findings of Gunraj et al. (2016) and Houghton et al. (2018), I would expect that (14e) would be perceived as insincere, and that all items in (14) would be perceived more negatively than unpunctuated counterparts.

3.1.2 Vignettes

The vignettes themselves follow a similar layout as the ones presented in Houghton et al. (2018). Each vignette is structured as a pairing of a question with one of its possible scalar answers, such as (14) and (14c). Participants were given images showing mock-ups of text conversations. The first message in the conversation (the question) comes from the right-hand side of the screen and is blue, which is shorthand in many texting user interfaces

[1]For example, respondents typically assessed "warm" as being more "excited" than either "average" or "hot" in the context of a question about the weather.

(particularly Apple's iMessage application) to denote a message sent by the reader. The second, experimental message (the answer) is gray, comes from the left, and has an icon with the first letter of a name (displayed at the top of the vignette); these signal that it was a message sent by someone the reading is speaking to. The names associated with each question were randomly selected from a list of the most common U.S. baby names, alternating in gender. Each question-answer pair has four variants, based on two axes: "sentence capitalization" (the standard capitalization used for sentences) [SC] versus "lowercase capitalization" (the entire text is in lowercase) [LC], and "punctuation" (in this case inclusion of a period "." at the end of the sentence) [P] versus "no punctuation" (the lack thereof) [NP]. This is to test if, as predicted by the hypothesis in section 2.5, the lowercase and period (LCP) combination is perceived as more negative than others combinations (SCP, SCNP, or LCNP).

Each question was presented once to each participant, with a random scalar answer and capitalization-punctuation combination. With 150 participants, 15 questions, and a total of 244 unique combinations, this would produce an average of 10.04 responses per combination. The fewer scalar variants any given question had, the more responses each variant received. See figures 3.1 and 3.2 below for examples of vignettes.

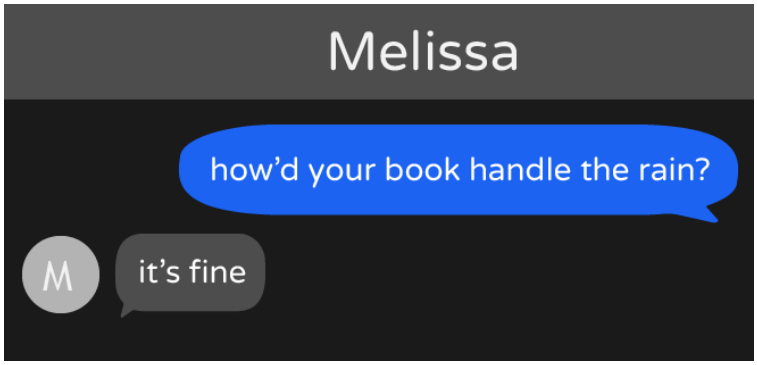


Figure 3.1: Question 13, response A, as found in the Appendix. The answer is in LCNP (lowercase, no punctuation) orthography. This is considered the most desirable (positive) response for this question, meaning we would expect the insincere effects of LCP to reflect most strongly with it.

Each vignette had have two associated questions, which were both graded on a five-point

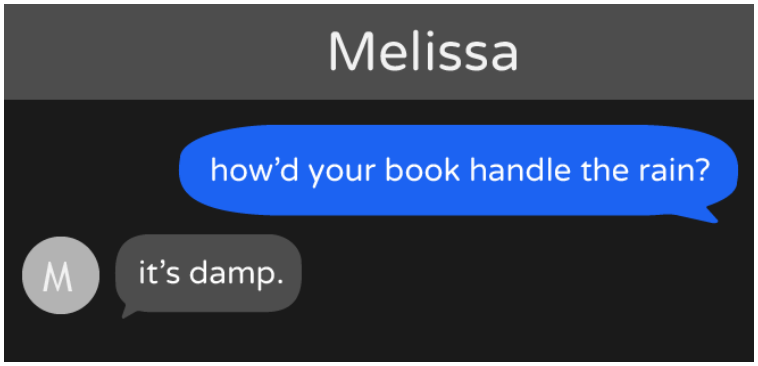
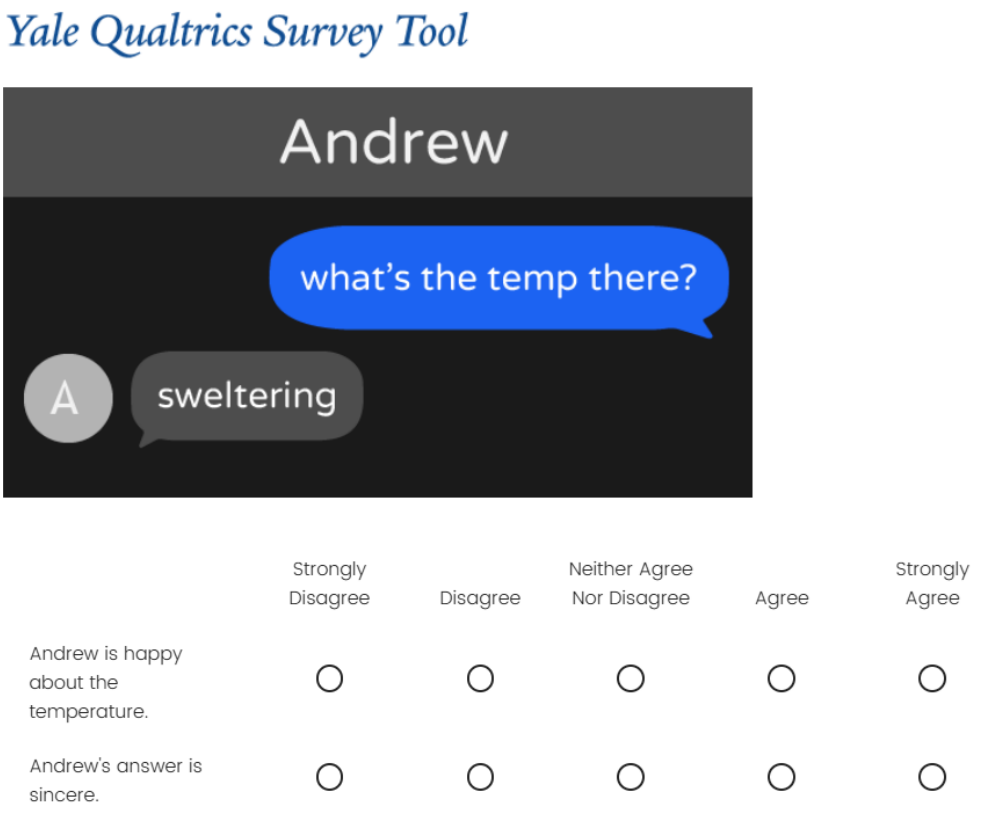


Figure 3.2: Question 13, response B, as found in the Appendix. The answer is in LCP (lowercase, punctuation) orthography.

Likert scale by participants. The first question varied based on the context of the vignette, but asked participants to assess the positivity of the answerer's emotional state in terms of excitement or happiness. The second question asked participants to rate the answerer's sincerity. See below for an example of one such vignette as it was presented in the survey.



3.1.3 Distribution & Participants

The survey was created using Qualtrics and distributed using Prolific. One hundred and fifty participants aged eighteen and older were each presented with fifteen vignettes, as described in 3.1.2. Participants had to affirm their consent to access the survey, and were pre-screened by Prolific as speaking English as their first and primary language, and as having used a chat or messaging app in the past. They were also asked to self-report their texting frequency, and had to succeed on two control tests to demonstrate an understanding of scalar items and basic texting proficiency. Participants that failed either of these were excluded from the results.

3.2 Data Analysis & Results

3.2.1 Analysis Overview

Of the 150 respondents, 139 were included in the survey results. Ten respondents were removed due to failing the control questions posed at the beginning of the survey, and 1 respondent was removed for failure to answer experimental questions. These 139 participants ranged in age from 18 to 83 years (M = 32.6, SD = 11.8). The median age was 32 years.

Each participant's responses were standardized (z-scored) based on their own response distributions, and data was initially analyzed using two-tailed unpaired t-tests comparing the set of non-LCP conditions to the LCP condition. I do not assume equal variance between conditions. Other analyses are described in the following sections. Analysis was performed in Google Sheets, and effects were considered significant at $\alpha = 0.05$.

3.2.2 Results: Positivity

Considering cross-participant comparisons, lower average positivity was judged in the LCP condition (M = -0.64, SD = 0.96) than in the non-LCP condition (M = -0.50, SD = 0.94),

t(1917) = 2.833, p = 0.005, d = 0.15. Responses which were unambiguously positive as marked in the Appendix were also perceived as having lower positivity in the LCP condition (M = 0.41, SD = 0.92) than in the non-LCP condition (M = 0.49, SD = 0.73), but this difference was not statistically significant (t(393) = 0.897, p = 0.423, d = 0.10).

Paired, within-participant comparisons had different results. For these, I calculated the mean of the z-scored positivity ratings each participant gave to both the LCP and non-LCP conditions. Five participants who did not see any items in LCP condition were not included in this analysis (n = 134).[2], and then performed a two-tailed paired t-test comparing the within-participant mean LCP z-scores (M = -0.54, SD = 0.67) to the within-participant mean non-LCP z-scores (M = -0.49 SD = 0.26). On average participants rated LCP items lower than non-LCP items, but the difference was not statistically significant (t(133) = 0.824, p = 0.411, d = 0.10). Because this may have been an age-related effect, I also performed this latter analysis isolated to respondents between 18 and 30 inclusive (n = 53). This cohort also reported a stronger negative affect with LCP (M = -0.62, SD = 0.62) than with non-LCP (M = -0.46, SD = 0.29), though this was also not statistically significant (t(52) = 1.692, p = 0.097, d = 0.33).

And to find whether or not lowercase or punctuation had effects individually, I compared the lowercase versus sentence case conditions and the punctuated versus unpunctuated conditions separately using the same paired t-test methodology described above (n = 139). Participants perceived punctuated answers (M = -0.56, SD = 0.36) as less positive than unpunctuated answers (M = -0.46, SD = 0.32) at a statistically significant level (t(138) = 2.3904, p = 0.018, d = 0.30). The cohort aged 18-30 (n = 56) had this same intuition, and in fact reported it with a greater magnitude (punctuated: M = -0.56, SD = 0.33; unpunctuated M = -0.43, SD = 0.33) (t(55) = 2.0607, p = 0.044, d = 0.39). Participants did not have a statistically significant difference in positivity judgments between lowercase (M = -0.53, SD

[2]Given that each of the 14 included questions had a 1-in-4 chance to be displayed as LCP to any given participant, this is not unexpected.

= 0.36) and sentence case (M = -0.51, SD = 0.34) answers (t(138) = 0.409, p = 0.683, d = 0.05). The age 18-30 cohort also did not have a statistically significant difference between lowercase (M = -0.54, SD = 0.45) and sentence case (M = -0.47, SD = 0.41) (t(55) = 0.8124, p = 0.420, d = 0.15).

3.2.3 Discussion: Positivity

In summary, the study found that LCP scalar *responses* were judged on average slightly less positively than their non-LCP counterparts (p = 0.005, d = 0.15), but did not find statistically significant evidence to suggest that individual *participants* were, on the whole, rating LCP scalar responses less positively (p = 0.411, d = 0.10). The fact that there is evidence of a negative affect associated with LCP *across* participants but not *within* participants suggests substantial between-participant variability, possibly due to a sampling bias or individual differences. While not statistically significant, it is unsurprising that the 18-30-year-old cohort's positivity judgments showed a larger-magnitude a trend toward negative affect with LCP when compared to the general population (p = 0.097, d = 0.33); LCP is, anecdotally, largely used by Millennial or Generation Z speakers — and that Gunraj et al. (2016) and Houghton et al. (2018) had surveyed undergraduate students in their own studies. In light of this, future study into LCP affect could look at this age bracket in particular; this study may have lacked sufficient statistical power on account of the low number of speakers in the cohort (n = 56). Alternatively, it is possible that the LCP affect is, indeed, either very minute or non-existent (i.e., the high p-value is not the result of a Type II error); in this case a larger sample size would be useful to confirm this.

Also interesting is that the study found a statistically significant (p = 0.018), moderate (d = 0.30) within-speaker difference in interpretation of positivity between the punctuated and unpunctuated conditions, and that the magnitude of this effect was stronger (d = 0.39) for participants between ages 18 and 30. Difference in positivity judgments between lowercase versus sentence case, on the other hand, had a trivial magnitude (d = 0.05) and was not

statistically significant (p = 0.638). Even for the 18-30-year-old cohort, the magnitude was quite small (d = 0.15) and far from statistically significant (p = 0.420). In tandem, these facts suggest that LCP derives most of its negative affect from its punctuation, rather than from its case. The general trend also suggests, though more tentatively, that these intuitions are marginally stronger for those under the age of 30. Future research could examine how LCP intuitions differs between age cohorts by having a larger number of younger speakers.

3.2.4 Results: Sincerity

Data for participant interpretations of sincerity in LCP versus other conditions were analyzed using the same methodology as described for positivity. A cross-participant comparison of z-scored sincerity ratings of all LCP (M = 0.53, SD = 0.67) versus non-LCP items (M = 0.52, SD = 0.70) did not reveal a significant difference in sincerity interpretations between the two conditions (t(1917) = 0.396, p = 0.686, d = 0.02). When comparing only positive scalar items between the two conditions, LCP was rated (M = 0.65, SD = 0.64) on average as being slightly more sincere than non-LCP orthographies (M = 0.61, SD = 0.65), but this too was far from statistically significant (t(393) = 0.511, p = 0.609, d = 0.059).

As with positivity, I then performed a two-tailed paired t-test using each participant's mean z-score for sincerity in both the LCP and non-LCP conditions. As before, the five participants who did not see any LCP items were not included (n = 134). On the whole, individual participants rated LCP answers (M = 0.52, SD = 0.44) as roughly equally sincere as non-LCP answers (M = 0.53, SD = 0.24), and the marginal difference was not statistically significant (t(133) = 0.263, p = 0.793, d = 0.03). There was little difference among the cohort of these participants aged 30 and younger; these participants rated LCP answers (M = 0.52, SD = 0.52) as marginally more sincere than non-LCP answers (M = 0.50, SD = 0.26); this was not statistically significant (t(52) = 0.242, p = 0.81, d = 0.05).

Finally, I compared the mean z-scored sincerity rating of the LCP orthography versus non-LCP orthography for every question-answer combination across all participants. Only

four answers showed a statistically significant difference in how participants judged their sincerity between LCP and non-LCP conditions, as calculated using unpaired two-tailed t-tests:

1. "how's the weather?"
   (a) Answer: "good"

   Avg. sincerity z-scores across participants,[3] LCP: M = 0.92, SD = 0.43

   Avg. sincerity z-scores across participants, non-LCP: M = 0.05, SD = 0.59

   LCP sincerity difference of +0.87, t(27) = 3.5789, p = 0.001, d = 1.30.

2. "how'd you feel about the sequel?"
   (a) Answer: "it's worse"

   Avg. sincerity z-scores across participants, LCP: M = 1.09, SD = 0.31

   Avg. sincerity z-scores across participants, non-LCP: M = 0.52, SD = 0.72

   LCP sincerity difference of +0.57, t(27) = 3.013, p = 0.006, d = 0.83.

3. "how often do they want to hang out with you?"
   (a) Answer: "sometimes"

   Avg. sincerity z-scores across participants, LCP: M = 0.58, SD = 0.40

   Avg. sincerity z-scores across participants, non-LCP: M = 0.12, SD = 0.65

   LCP sincerity difference of +0.46, t(20) = 2.3345, p = 0.030, d = 0.75.

4. "what do you think of the painting?"
   (a) Answer: "it's terrible"

   Avg. sincerity z-scores across participants, LCP: M = 1.05, SD = 0.88

   Avg. sincerity z-scores across participants, non-LCP: M = 0.39, SD = 0.92

   LCP sincerity difference of +0.66, t(17) = 2.3282, p = 0.032, d = 0.75.

[3]Because each participant would only see this question once, it is impossible to judge these within-participant; i.e., no participant would see this item in both LCP and non-LCP conditions.

3.2.5 Discussion: Sincerity

Following the findings of Houghton et al. (2018), I hypothesized that LCP orthography would be interpreted overall as less sincere by participants than other forms of orthography with positive scalar items. However, this has not been demonstrated by this data. There is no statistically significant or magnitudinal difference in sincerity judgments for LCP versus non-LCP scalar responses across participants *responses* ($p = 0.686$, $d = 0.02$), nor within-participant (paired; $p = 0.793$, $d = 0.03$); there is not even a statistically significant effect when limiting to positive scalar items ($p = 0.609$, $d = 0.059$). In fact, this latter effect leans slightly (albeit insignificantly) towards *heightened* sincerity with LCP, which is the opposite of our expected intuitions. It seems age is not a significant factor either; even when limiting the pool of participants to the 18-30-year-old cohort, the results are similar: LCP responses are rated marginally (but not statistically significantly) more sincerely than non-LCP responses ($p = 0.81$, $d = 0.05$).

Given that none of those findings on the perceived sincerity of LCP are statistically significant, I am hesitant to draw any conclusions based on them, aside from the fact that the study has failed to prove that LCP orthography is interpreted as insincere in scalar environments (positive or otherwise). This is especially surprising because it seems to contradict the findings of Houghton et al. (2018), but I table this for the time being.

The four statistically significant exceptions are of some interest, though it is important preface any discussion with the fact that these are 4 of the total of 56 question-answer pairings in the data. We cannot discount the possibility of a Type I error; perhaps these 4 only appear significant by chance out of the total pool, rather than because of anything particularly exceptional about them. On the other hand, the extraordinarily low p-values of the "good" ($p = 0.001$) and "it's worse" ($p = 0.006$) pairings make a Type I error statistically unlikely. This all being said, it is not entirely clear to me what these four items have in common that other items lack. "Good" is a positive scalar item, "sometimes" is relatively

neutral, and “it’s worse” and “it’s terrible” are both negative. Yet, for all of these, there is a statistically significant high-magnitude increase in sincerity judgment. No participant received all four of these items, so it does not appear to be a result of sampling bias (at least not apparently).

Chapter 4

Final Discussion & Conclusions

To summarize they key findings:

1. Participants interpreted short, scalar answers which end in a period as being less positive than those which did not, and this intuition appears somewhat stronger in those aged 18 - 30.
2. On average, LCP scalar responses were interpreted slightly less positively than non-LCP scalar responses; however, the study found no statistically significant evidence suggesting that the average participant interprets LCP scalar responses less positively than non-LCP scalar responses.[1]
3. There was no statistically significant difference in sincerity between LCP and non-LCP conditions.

This data is surprising for two reasons. In light of Gunraj et al. (2016) and Houghton et al. (2018), it is very unusual that LCP tended toward *higher* sincerity scores than other conditions (though, of course, not in a statistically significant way). It is also striking to me that lowercase did not play a notable role, it seems, in how sentences were interpreted; for me

[1]To clarify the difference, an example of a situation where we would expect this kind of result is if one participant with a strong intuition that LCP carries negative affect received a disproportionate number of LCP items. This would lower the overall positivity rating of LCP items with greater weight than it would lower the how participants on average interpreted them.

this is a strong intuition — one that is at least shared by a number of Yale undergraduates

Therefore, these findings pose some interesting questions, which leads me to three hypotheses that may explain this survey's results. The first and perhaps most straightforward possibility is that there has been no error, and that the intuitions of negativity and insincerity observed for polar answers either do not carry to scalar answers, or are so minute for scalar answers as to have not been detected by this survey. If this is the case, then we reject my hypothesis.

The second hypothesis is that particularly strong scalar items, like *ecstatic*, were already perceived as sarcastic by some participants; this is supported by Camp (2012), who finds that higher scalar items lend themselves to a more sarcastic interpretation. This is also reflected in my survey data, as many of the z-scores had extremely high standard deviations.

The third hypothesis — and the one that would likely be my next avenue of research — is that my LCP intuition is held more widely, but almost exclusively by younger speakers. If so, this would explain why I did not see these effects with statistical significance; I had too few participants in the relevant age bracket. Future research in this area could, therefore, repeat this experimental model with younger speakers (<30 years old) in greater numbers.

Appendix A

Vignettes

Below is the full list of vignettes presented to participants. **Bolded** items were treated as unambiguously positive.

(1) how's the weather?

   a. **great**.

   b. **good**.

   c. ok.

   d. bad.

   e. awful.

(2) how much of the project did you finish?

   a. **all of it**.

   b. some of it.

   c. none of it.

(3) how busy was the party?

   a. very.

   b. a little.

c. not.

(4) what's the temp there?

a. average.

b. warm.

c. hot.

d. sweltering.

(5) what's the temp there?

a. average.

b. cool.

c. cold.

d. freezing.

(6) are you ready for the show tomorrow?

a. **absolutely**.

b. maybe.

c. no.

(7) how'd you feel about the movie?

a. **loved it**.

b. **liked it**.

c. it was ok.

d. didn't like it.

e. hated it.

(8) how'd you feel about the sequel?

a. **it's the best**.

b. **it's better**.

c. it's fine.

d. it's worse.

e. it's the worst.

(9) how big is the problem?[1]

a. tiny.

b. small.

c. medium.

d. large.

e. huge.

(10) how often do they want to hang out with you?

a. always.

b. often.

c. sometimes.

d. rarely.

e. never.

(11) do you think I should do that?

a. you could.

b. you have to.

(12) how'd your date look?

a. **hot**.

b. fine.

c. ugly.

[1]This question was presented to participants but excluded from data analysis. A typographic error led to a disproportionate number of participants viewing this question in LCP condition, so it was excluded out of an abundance of caution to avoid skewing survey data.

(13) how'd your book handle the rain?

a. it's fine.

b. it's damp.

c. it's wet.

d. it's soaked.

(14) how are you feeling after today?

a. **ecstatic**.

b. **happy**.

c. ok.

d. sad.

e. miserable.

(15) what do you think of the painting?

a. **it's beautiful**.

b. **it's nice**.

c. it's fine.

d. it's not great.

e. it's terrible.

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