How people perceive and talk about miscommunication

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A R T I C L E   I N F O

A B S T R A C T

We examined how people perceive and talk about miscommunication. Participants in study one recalled a miscommunication incident, and then responded to a set of questions regarding their perceptions of the incident. These miscommunications were viewed as relatively unserious, largely the fault of the sender, humorous, confusing and frustrating. Most (76.8%) of the time both interactants were aware of the miscommunication. In a second study we harvested all tweets containing the word "miscommunication" and compared them with tweets containing the word "communication". Tweets about miscommunication were higher in negative emotionality and certain types of cognitive processing. Hence, the occurrence of miscommunication elicits levels of negative emotions and higher levels of cognition which we interpret as users attempting to make sense of the miscommunication.

Problematic communication can take many forms. In this research we focus on miscommunication, or instances in which there is a lack of alignment between two people (a sender and a receiver) such that they have different understandings of what had been communicated. Miscommunication is not uncommon (Coupland et al., 1991; Mustajoki et al., 2021), and the consequences can be severe as research on airline cockpit communication (Sexton and Helmrich, 2000) or health-care communication (Heritage and Robinson, 2006) has demonstrated. Across disciplines, researchers have investigated miscommunication, both in terms of its occurrence in specific contexts, as well as a more general phenomenon. However, with only a few exceptions (e.g., Kelly and Miller-Ott, 2018) the way people perceive and think about miscommunication has received relatively little attention.

Miscommunication is difficult to study due to its fleeting nature and the fact that it can go unnoticed. In the present research we approached this in two ways, first using a survey methodology to examine how people perceive instances of miscommunication that they can recall, and then a "Big Data" study to examine how people talk (in this case tweet) about miscommunication in general. In doing so, we focus on miscommunications that are either recalled and/or tweeted about, hence instances of miscommunication that may differ in important ways from miscommunications that are quickly and locally resolved and not recalled later.

1. Dimensions of miscommunication

Researchers have used multiple terms to describe the phenomenon of miscommunication including problematic communication, misunderstanding, communication failure, and others. The term miscommunication captures best the lack of

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sender-receiver alignment with which we are concerned. Terms such as misunderstanding can be viewed as a subset of miscommunication (which can, but does not necessarily, involve misunderstanding). We use the term miscommunication, rather than misunderstanding, in order to emphasize the collaborative nature of (mis)communication. Other facets of problematic communication such as turn-taking disruptions can contribute to miscommunication, but in our view do not constitute it.

Miscommunication is multidimensional and can be studied at varying levels. For example, some communication researchers (Dun, 2005; Sillars, 1998, 2002) take a broad view and consider miscommunication primarily in terms of the relationship between the interactants. Their focus is on motivated misunderstanding, or how relationship dynamics contribute to the occurrence of misunderstandings, as well as the difficulty in repairing them. Similarly, Edwards et al. (2020) examined the impact of misunderstandings, and the responses to them, on relationship satisfaction, as well as how relationship types can influence the nature of misunderstandings that may occur in that relationship. In contrast, our interest is in the communicative act itself rather than the interactants' relationship, and hence roughly equivalent to what Weigand (1999) refers to as the "standard case" of misunderstanding.

Miscommunication can occur with and without awareness on the part of one or more of the interactants (Coupland et al., 1991; Blum-Kulka and Weizman, 2003). When one or more interactants are aware of a miscommunication, then a repair sequence can be initiated in order to facilitate realignment. To a certain extent, the human communication system is designed to facilitate awareness of these communicative missteps because interactants will often quickly undertake moves to repair them (Schegloff, 1992; Schegloff et al., 1977). But repair is not inevitable, and people are not always aware, in the moment, that a miscommunication has occurred (Blum-Kulka and Weizman, 1988; Galantucci et al., 2020; Galantucci and Roberts, 2014; but see Micklos et al., 2020).

2. Miscommunication typology

We define miscommunication as an instance of a lack of alignment between two people (a sender and a receiver) such that they have different understandings of what had been communicated. We assume that alignment is an ideal type such that perfect and total alignment is rarely if ever achieved (e.g, see Coupland et al., 1991). There are, no doubt, many ways in which miscommunication can occur. A review of the relevant literature, however, suggests that at the highest level, there appear to be two basic types of miscommunication: referential miscommunication (i.e., what one is talking about) and intention miscommunication (i.e., what one is intending to communicate with an utterance). These two can of course occur simultaneously resulting in an additional hybrid category. We describe below these overarching categories as well as more specific types within each.

2.1. Referential miscommunication

Communication is typically about something and requires interactants to successfully identify what is being talked about, that is, to know to what a speaker is referring. We refer to miscommunication at this level as Referential Miscommunication. For example, when a speaker says, "He's coming over tonight", the recipient needs to infer to whom "he" refers. Of course, it is not just personal pronouns that need to be fixed. For example, when a speaker says, "It's really over the hill", the recipient needs to know that the speaker is referring to her car and not her computer. Similarly, deictic expressions require recipients to correctly identify a place (e.g., "I'm here") or a time (e.g., "I'll be there soon") and so on.

Other researchers have proposed a similar miscommunication category. For example, one of the themes to emerge in Kelly and Miller-Ott's (2018) research on miscommunication in texting is that of referential miscommunication, a failure to understand a single word/phrase and or the topic of the conversation. As well, one of Thomas' (1983) categories of misunderstanding is a failure to understand the conveyed proposition (a level 1 misunderstanding in her terms), a category similar to Blum-Kulka and Weizman's (1988) category of *aboutness*, or an understanding of the propositional meaning of the utterance. As Bosco et al. (2006) suggest, this category, in speech act terminology, represents failing to understand the locutionary act, or the sense and reference of an utterance (Austin, 1962).

The way referring expressions are processed has received considerable empirical attention. One popular approach in this domain assumes that interactants consider common ground (i.e., what is mutually known) when producing and comprehending referring expressions. In this sense, reference is viewed as a joint, collaborative process that requires interactants to engage in perspective taking. Herb Clark has provided many empirical demonstrations of how this occurs (for a review see Clark and Bangerter, 2004). Mustajoki (2012) makes this feature of communication explicit in his model of miscommunication. He argues that speakers and hearers have mental worlds (i.e., linguistic abilities, cultural background, cognitive patterns, etc.) that are never identical, and so successful communication requires recipient design, i.e., speaker's adjusting their remarks based on what they can assume about the recipient's mental world. This requires perspective taking. Empirical support for this view was provided by Edwards et al. (2017) who assessed situational and dispositional perspective taking and found both to be negatively related to the frequency (but not seriousness) of misunderstandings.

Other researchers, however, emphasize how referent identification is not perfect and that mistakes occur. For example, the model developed by Keysar and colleagues (Keysar et al., 2000) assumes that interactants' are initially egocentric by default, that is, they do not engage in perspective taking when identifying a referent. If a subsequent perspective adjustment process

is not initiated (i.e., where one considers what the other interactant knows), referent misidentification can occur. Multiple studies, often using eye-tracking methodology, have demonstrated this initial egocentricity, as participants will initially fixate on objects that are clearly not in common ground, and hence not mutually known (Horton and Keysar, 1996; Keysar, 1998; Keysar et al., 1998, 2000). Even if referent identification is clearly undermined, there is no guarantee that interactants will initiate a repair sequence. In an experimental referential identification task in which one interactant (actually an experimental confederate) used a nonexistent word (skask) for a referent, recipients frequently (29 out of 48) attempted to complete the task without initiating a repair sequence and requesting clarification (Galantucci et al., 2020).

In short, one way in which miscommunication can occur is when interactants are misaligned in terms of referent identification. There are multiple, lower-level ways in which this can happen. A speaker may mispronounce a referring expression, the hearer may not be paying attention, and so on. However, successful coordination of referring expressions is critical for successful communication to occur.

2.2. Intention miscommunication

In addition to knowing what a speaker is talking about, a receiver must also infer a speaker's intention in producing a particular utterance. Intention recognition is, of course, fundamental to successful communication, a view that is consistent with a variety of theoretical perspectives including speech act theory (Austin, 1962; Searle, 1969; Bach and Harnish, 1979), relevance theory (Sperber and Wilson, 2002), Clark's theory of language use (Clark, 1996), computational models of language comprehension (Cohen and Perrault, 1979; Stone, 2005), Gricean pragmatics (Grice, 1957), and others. Although the details vary, these approaches all view communication as an intentional activity in which interactants strive to recognize one another's communicative intentions.

This dimension is central to other models of miscommunication as well. For Thomas (1983), this constitutes pragmatic failure, or a failure to understand the intended pragmatic force of an utterance. Both Blum-Kulka and Weizman (1988), and Bosco et al. (2006), use speech act terminology and consider this to be a failure to understand the purpose of an utterance, or its illocutionary point. A related dimension is the affective miscommunication category that emerged in the research of Kelly and Miller-Ott (2018). Affective miscommunication refers to instances of a recipient misidentifying the intended emotional tone of a message, such as believing the sender is angry when they are not, or failing to detect intended sarcasm in a message. Affective miscommunication can be viewed as a subset of the broader intention recognition category that we are proposing.

Intention recognition appears to be a relatively automatic process. For example, using a reaction time procedure, Holtgraves (2008) demonstrated that specific implicit speech acts (e.g., remind) are automatically activated when participants read and comprehend utterances designed to perform that speech act (e.g., Don't forget to go to your dentist appointment today) relative to matched controls (e.g., I'll bet you forgot to go to your dentist appointment today). Related fMRI research has demonstrated the importance of theory of mind (TOM) networks for speech act comprehension (e.g., Egorova et al., 2016) and, using EEG technology, the relatively early occurrence (200 ms after target onset) of frontal positivities as a function of the specific speech act being performed (Gisladottir et al., 2015).

Yet, just like referent identification, intention recognition is not always successful. People sometimes miss the intended meaning of jokes or irony or hints and so on. Intentions typically need to be inferred, and as a result there is ample opportunity for intended meanings to be missed. Moreover, interactants' expectations may influence how they process and represent a speaker's utterances and hence lead them astray (Holtgraves, 1994, 1997). This may be due, in part, to relatively superficial, or "good enough" processing (Ferreira and Patson, 2007), which may undermine successful recognition of the speaker's intention. Also, similar to referent identification, interactants' egocentricity may hinder this process. Multiple studies have demonstrated that senders are overly confident that their intended meaning will be successfully recognized by a recipient. For example, Keysar and Bly (1995) demonstrated that people tend to believe that the idiomatic meaning of certain expressions is more transparent than those meanings really are. And Savitsky et al. (2011) demonstrated that people overestimate their ability to convey sarcasm via email.

In short, even though intention recognition is required for successful communication, there is no guarantee that intention recognition will be successful. The interpersonal context, interactants' overconfidence, good-enough processing, and no doubt other factors can lessen the likelihood of successful intention recognition.

2.3. Combined referent/intention miscommunication

Finally, it should be noted that referent and intention misidentification are not independent. It is possible, for example, for the misidentification of a referent to result in a misunderstanding of the speaker's intention. For example, the message "It's over" could be misidentified as an assertion that a relationship is over if the referent for "it" is misidentified as referring to the relationship rather than to a movie one has been watching.

3. The present research

Systematic empirical analyses of how people perceive instances of miscommunication are somewhat rare. This is due, in part, to the difficulty of observing and hence analyzing actual instances of miscommunication in real time. Our

approach was to combine a self-report methodology with a big data study in order to investigate how lay people perceive, categorize, and talk about miscommunications. Hence, our focus is on lay perceptions of miscommunication. We conducted two studies to examine this. In the first study we focused on digital communication and administered a survey in which we asked participants to recall a specific instance of a digital miscommunication that happened to them, and to then respond to a series of questions about that miscommunication. In the second study, we pursued further the examination of emotional and cognitive reactions to miscommunication by harvesting and analyzing tweets containing the words miscommunication and communication. All materials, data, and supplementary analyses are available at https://osf. io/tcxjm/.

4. Study 1

In study 1 we focused on digital communication. When communication is digital, paralinguistic and nonverbal accompaniments are not available (although emoji may function as partial substitutes), thereby both increasing the likelihood of miscommunication, and decreasing the likelihood of a repair sequence being initiated when they do occur. In fact, people do report higher levels of miscommunication when texting, relative to face-to-face interactions or phone calls (e.g., Johnson et al., 2016; Kelly et al., 2012). Our methodology was similar to that used by Kelly and Miller-Ott (2018). We asked participants to retrieve a digital miscommunication that had occurred to them, and to then answer a series of questions about it including whether both interactants were aware of the miscommunication, how the miscommunication could be categorized, who was responsible for the miscommunication, and the seriousness of the miscommunication and emotional reactions it evoked. Our general expectations were that participants would be able to categorize the majority of miscommunications with our three-part scheme (i.e., referent misidentification; intention misidentification; hybrid referent/intention miscommunication). Additionally, given their everyday nature, we expected that the miscommunications would not be rated as very serious but would elicit a range of emotions. Based on past conversation analytic research (e.g., Schegloff, 1992) we expected that the norm would be for both interactants to be aware of the miscommunication.

4.1. Methods

4.1.1. Participants

Participants were recruited using two different methods. One sample included workers from Prolific, an online recruitment website (N = 100; 48 male; 51 female; 1 transgender) who received monetary compensation ($2.00) for their participation. The second sample included undergraduate students (N = 103; 16 male; 86 female) who received partial research credit for their participation.

4.1.2. Miscommunication questionnaire

Participants were asked to report an instance of a digital miscommunication that had occurred to them. We defined miscommunication for participants as: "an instance when the meaning a sender intends to convey is not the meaning received by the recipient." Participants were advised that they could look through old conversations on their phone or computer to identify an occurrence that they could copy and paste exactly. If they could not locate a specific miscommunication, they were asked to recreate it in their own words from memory.

Participants then responded to the following questions about the recalled miscommunication and the context in which it occurred. First, participants were asked to categorize the miscommunication in terms of our three-part scheme by choosing one of the following: It was a misunderstanding about what the texter was talking about, that is, what the speaker was referring to; It was a misunderstanding about the overall meaning of the message, that is, the speaker's intention; It was both; Other. Participants also indicated their perceptions of the seriousness of the miscommunication (1 = Extremely Unserious to 7 = Extremely Serious), whether both individuals became aware of the miscommunication, whether emoji were used, and (using separate 7-point scales) the extent to which the sender and the receiver were responsible for the miscommunication.

Second, participants responded to items regarding the context of the miscommunication and their relationship to the other person. These items included: the medium over which it occurred, whether the participant was the sender or the receiver, the gender of the other individual involved, the age of the other individual involved, how close they were to the other person (1 = Extremely Close to 7 = Extremely Distant), and how well they knew the person (1 = Don't know really well to 7 = Know really well). Third, participants responded to items regarding their feelings about the miscommunication and their beliefs about the primary cause of the miscommunication. The response options provided for these two items were based on an earlier, pilot study in which participants responded to open-ended items regarding their emotional reactions to a miscommunication and their beliefs about what caused it. For emotions we included in our survey the five most frequent reactions as well as an "other" category. For causes, we included the four most frequent sender-based causes and the three most frequent receiver-based causes, in addition to an "other" category.

Finally, as a manipulation check item, participants were asked whether the miscommunication had actually happened to them. Overall, the survey took approximately 5 min to complete. The full survey can be viewed at https://osf.io/unkm3.

4.2. Results

We first provide descriptive statistics for the sample and the miscommunication episodes, followed by data regarding how these episodes were categorized, and then by whether both interactants were aware of the miscommunication, perceived responsibility for the miscommunication, and perceived causes and reactions to the miscommunications. In all reported analyses there were no significant differences, unless noted otherwise, between the two samples on the items of interest. Descriptive statistics for all survey items are presented at https://osf.io/5wvth.

4.2.1. Sample and miscommunication descriptive statistics

Participants in the Prolific sample were older ($M_{Age} = 29.73$, $SD = 10.63$) than those in the university sample ($M_{Age} = 18.60$, $SD = 2.06$). Regarding the platform used, text messaging was the most common medium used (75%), with email (5.9%), Facebook messaging (4.9%), instant messaging (3.9%) and other (9.9%) all under 10%. Participants were almost equally divided on whether they were the sender (46.8%) or the receiver (53.2%) of the miscommunication. In general, participants reported knowing the other person fairly well ($M = 5.92$, $SD = 1.78$ on a 7-point scale), although they were not particularly close to the other person ($M = 3.52$, $SD = 2.39$) on a 7-point scale.

4.2.2. Types of miscommunication

Participants were able to classify 95.6% of their recalled miscommunication episodes using our 3-fold classification scheme (referent miscommunication, intention miscommunication, referent/intention miscommunication). Our scheme, then, is consistent with past theoretical approaches and may have psychological reality for how people perceive miscommunication.[1] Overall, there were slightly more instances of intention miscommunication (41.4%) than referent miscommunication (36.9%), with combined referent/intention miscommunications being relatively infrequent (17.2%). There was a significant gender difference in miscommunication classification. Miscommunications reported by females (relative to males) were more likely to be about intentions (43.8% vs. 35.9%) and miscommunications reported by males (relative to females) were more likely to be about referents (42.2% vs. 35%) and referent/intention (18.8% vs. 16.8%), $\chi^2 = 24.58$, $p = .003$, $\varphi = .348$.

Overall, the miscommunications were not perceived as very serious ($M = 2.64$; $SD = 1.74$), and perceived seriousness did not vary as a function of how the miscommunication was classified, $F(3, 193) = 1.38$, $p = .251$, $\eta^2_p = .021$.

4.2.3. Awareness and responsibility

Consistent with past research (Schegloff et al., 1977), in the majority of miscommunication episodes, both the sender and the receiver were aware that a miscommunication occurred (76.8%). Still, there were several instances in which only one of the interactants was aware of the miscommunication (23.2%). When both interactants are aware of a miscommunication, it is possible to repair it quickly and efficiently. As a result, instances in which both people were aware of the miscommunication were judged to be less serious ($M = 2.377$, $SD = 1.601$) than when only one person was aware of the miscommunication ($M = 3.489$, $SD = 1.921$), $F(1,197) = 15.104$, $p < .001$, $\eta^2_p = .071$.

A dominant view of verbal interaction is that it is locally managed on a turn-by-turn basis (Clark and Wilkes-Gibbs, 1986; Sacks et al., 1974). As a result, miscommunication is typically viewed as emergent, with participants jointly responsible for its occurrence. In contrast to this perspective, in the present study responsibility for miscommunication tended to not be shared. First, participants viewed the sender ($M = 4.40$, $SE = .132$, 95%CI [4.129, 4.651]) as more responsible for the miscommunication than the receiver ($M = 3.79$, $SE = .133$, 95%CI [3.540, 4.065]), $F(1, 201) = 6.485$, $p = .012$, $\eta^2_p = .031$, a pattern that occurred regardless of whether the participant was the sender or the receiver (i.e., the interaction was not significant, $F(1,201) = 2.383$, $p = .124$, $\eta^2_p = .012$). Second, there was a significant negative correlation between ratings of sender and receiver responsibility, $r = -.516$, $p < .001$, such that increasing sender responsibility was associated with decreasing receiver responsibility (and vice versa).

4.2.4. Causes and reactions

Participants were asked to report what they interpreted as the cause of the miscommunication as well as their emotional reactions to it. Participants most often expressed that the sender was too vague and not specific enough (30.5% overall sample). This was followed closely by individuals reporting that the sender didn't consider the perspective of the recipient (18.2% overall sample). Individuals also described the receiver as not paying attention and reading the message thoroughly as a cause (14.8% overall sample). Even fewer individuals felt that the receiver did not use the appropriate amount of effort required to understand the message (8.9% overall sample). This was followed by the sender being distracted (9.9% overall sample), the receiver not knowing the meaning of a certain word or emoji (4.9% overall sample), and the use of ambiguous

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[1] Although our primary focus was on understanding how individuals perceive and categorize their miscommunications, we also examined the degree to which our own judgments aligned with the participants' assessments of the miscommunications. To accomplish this, the first author, who was unaware of the participants' codes, independently categorized the set of miscommunications using our three-part scheme. The distribution of categories showed similarities (referent: 40.9% vs. 36.9%; intention: 38.9% vs. 41.4%; both: 15.3% vs. 17.2%), and there was a significant level of agreement between these codes and those provided by the participants (kappa = .69).

words or emojis by the sender (3% overall sample). Finally, 9.9% of the overall sample described some other reason as the cause of the miscommunication.

4.2.5. Emotional reactions to miscommunication

Regarding emotional reactions to the miscommunication, the most endorsed reaction was humor (36.9% overall sample), a finding that is consistent with the low seriousness of the miscommunication episodes. The reactions were not all humorous, however, as the emotions of frustration (23.6% overall sample), confusion (21.2% overall sample), anger (5.4% overall sample), and sadness (2% overall sample) also occurred. Some other emotion (i.e., one not listed) was endorsed by 10.8% of the sample.

Interestingly, most participants indicated that the miscommunication did not involve the use of an emoji (90.6%), and miscommunication seriousness did not vary as a function of whether or not emoji were involved, $F(1,197) = .059$, $p = .809$, $\eta_p^2 = .000$. However, this finding was qualified by an Emoji by Sample interaction, $F(1,197) = 7.097$, $p < .05$, $\eta_p^2 = .035$. University participants rated miscommunications that included emoji as less serious ($M = 1.364$, $SE = 0.506$, 95%CI [0.365, 2.362]) than miscommunications without emoji ($M = 2.356$, $SE = 0.177$, 95%CI [2.006, 2.705]), $F(1,99) = 4.278$, $p < .05$, $\eta_p^2 = .041$. In comparison, participants in the Prolific sample rated miscommunications as more serious when emoji were involved ($M = 4.125$, $SE = 0.594$, 95%CI [2.954, 5.296]) than when they were not involved ($M = 2.935$, $SE = 0.175$, 95%CI [2.589, 3.280]), $F(1,98) = 3.073$, $p = .083$, $\eta_p^2 = .030$.

4.3. Discussion

Participants in this study were asked to recall an instance of a miscommunication, and not a single participant failed to produce such an episode. Although there is the possibility that participants produced miscommunication episodes that did not really happen, this seems relatively unlikely. In response to a follow-up item at the end of the survey, 97% of the individuals in the Prolific sample, and 100% of the University sample, reported that the miscommunication happened to them. In short, miscommunication does not appear to be uncommon. Almost all miscommunications were classified by participants as falling into one of our three categories. Hence, people miscommunicated about what they were talking about (referent misidentification), or about the sender's intended meaning, or both. There were a variety of referent misidentifications, including the referent for a number (e.g., The sender said "I'm up on 36, come on up lol" and the receiver misidentified it as Route 36 rather than the 36th floor), an impersonal pronoun (e.g., The sender said "I don't need it anymore" and the receiver believed they were referring to a book rather than a laptop), a spatial referent (e.g., The sender said "I'm here" which was misinterpreted to be referencing one's place of work rather than home), and a temporal referent (e.g., The sender said "I have a game Saturday" which was misinterpreted as this Saturday when instead the sender meant the following Saturday).

Similarly, intention misidentifications occurred in multiple ways, although common ones were missed requests (e.g., the sender said "Yum doughnuts" expecting the receiver to bring doughnuts; or the sender who thought their message "Will you have room for us in June?" would function as a request to reserve a docking spot) and interpreting someone as being mad when they (at least claimed they) were not as in the following exchanges:

hi. / What's wrong? / Nothing. Why? / You used a period
K. / are you mad?? / no why? / you just sent K.

Failed humor also occurred, as in the exchange:

Hey did you get your niece a present for Christmas? / Not yet. Geez she's three months old. / You should still get her a gift. You're her only aunt. / Ah yes because she understands that concept. / Wow. / I'm kidding.

The reported miscommunications were not very serious, and this did not vary as a function of the type of miscommunication. They were, however, perceived to be significantly more serious when only one interactant was aware of the miscommunication. When both interactants are aware, repair sequences can be initiated to ameliorate the effects; when this sort of interaction work is not undertaken, the unresolved miscommunication becomes more serious. In terms of responsibility for the miscommunications, participants tended to view the sender as being significantly more responsible than the receiver, a finding that is at odds with assumptions of coordinated language use, whereby interactants are assumed to together manage communications such that they jointly avoid miscommunicating (Clark, 1996). In terms of specific reasons for the miscommunications, senders were believed to have been too vague and distracted and having failed to engage in perspective taking. Responsible receivers, on the other hand, were viewed as lacking effort and not paying attention.

Emotional reactions to miscommunication were mixed. The most frequent response was humor, a finding that is consistent with the perceived lack of seriousness. The remaining emotional reactions, however, were negative, with frustration topping the list, followed closely by confusion, and then anger and sadness.

5. Study 2

The picture of miscommunications that emerges from study 1 is that they are common, relatively unserious, especially when both interactants are aware of it, believed to be largely the fault of the sender, and often humorous, but with

occasional negative emotional reactions as well. Surveying respondents about their miscommunications paints only a partial picture of miscommunication. Participants' memories could be vague, there may be social desirability processes operating, and our sample was relatively small. To examine miscommunication further we conducted a "Big Data" study, with the primary purpose being to examine how people naturally talk (in this case tweet) about instances of miscommunication. This allowed us to examine the cognitive and affective responses to miscommunication. To do this we harvested all tweets in English containing the word "miscommunication"; as a control, we harvested an equal number of tweets during the same time period that did not contain the word "miscommunication" but did contain the word "communication".

To systematically examine how people talk about miscommunication (relative to communication) we analyzed these tweets with the Linguistic Inquiry and Word Count program (LIWC15; Pennebaker et al., 2015). LIWC is a popular text analysis program that counts words within a text that match a pre-established dictionary of 90 relevant word categories. The LIWC dictionary is hierarchical, and includes linguistic categories (e.g., nouns, verbs, etc.) as well as psychological categories (e.g., affect, drives, etc.). Our primary interest was in the psychological categories, in particular the affective and cognitive categories, although we conducted exploratory analyses using the linguistic categories as well. Prior research has provided support for the validity of the LIWC as a means of assessing psychological content and processes (e.g., Cohn et al., 2004; Tausczik and Pennebaker, 2010).

Our hypotheses were clustered around cognitive and affective reactions to miscommunication. Regarding the former, the most frequent cognitive reaction to miscommunication in study 1 was confusion. As well, miscommunication is a negative event, and negative events (relative to neutral or positive events) are more likely to elicit enhanced cognitive processing as people try to make sese of them (Taylor, 1991). Accordingly, we expected miscommunication tweets to include more words in the cognitive processing category (e.g., cause, know, ought), and more words overall, than control tweets. More specific cognitive predictions included expected higher levels of causation (e.g., because, effect), differentiation (e.g., hasn't, but), and insight (e.g., think, know) (as indicators of attributional processing) for miscommunication tweets relative to control tweets. Confusion can also be manifested via expressions of uncertainty, and so we expected elevated rates of tentativeness (e.g., maybe, perhaps) and Clout (a proprietary category indexing a lack of confidence) for miscommunication tweets.

In terms of affective reactions, we expected tweets about miscommunication to be more emotional than control tweets and hence to contain more words referencing affect (e.g., happy, cried). Based on prior research documenting negative emotional reactions to instances of miscommunication (e.g., Dun, 2005; Edwards et al., 2020), we also expected the affective reaction to miscommunication to be primarily negative, and for miscommunication tweets to therefore contain more negative affect words (e.g., hurt, ugly), and fewer positive affect words (e.g., love, nice), than control tweets. Because of this, we also expected the Tone (which indexes the overall, emotional positivity of a text by computing the ratio of positive to negative emotion words, previously described as emotional-positivity index in Cohn et al., 2004) of miscommunication tweets to be higher than the Tone of control tweets. Within the negative emotion category, we also expected higher rates of anxiety (e.g., worried, fearful), anger (e.g., hate, annoyed), and sadness (crying, sad) for the miscommunication tweets relative to the control tweets.[2] We also expected elevated rates of swear words (an indicator of negative emotionality[3]) and lower levels of the Analytic category. The latter category is a composite, proprietary category (containing primarily function words) that indicates complex organization, abstraction, and emotional detachment (Pennebaker et al., 2015); the enhanced emotionality of miscommunication tweets should result in lower scores on this category.

Finally, we conducted exploratory analyses on all LIWC categories not mentioned above. These results can be viewed at https://osf.io/4kphg.

5.1. Method

5.1.1. Twitter harvesting

To capture individuals' reactions to miscommunication, we harvested all tweets posted in the English language between 2006 (the year Twitter[4] was created) and Dec 31, 2021 containing the word "miscommunication" and excluding the word "communication". Advertisements and re-tweets were also excluded using the rtweet arguments available in R. The final miscommunication sample consisted of ~1.28 million tweets containing ~26.3 million words.

We then harvested tweets from these years containing "communication" and excluding "miscommunication" using the same harvesting parameters. Given that there were substantially more "communication" tweets posted in the English language, we developed a random sampling procedure to obtain a comparable number of control tweets. When harvesting tweets containing commonly used words (e.g., "communication") from large time spans, R automatically harvests the last posted tweets matching the query arguments until the specified number of tweets is met. To account for this potential sampling bias and to randomly harvest a representative control group across the timespan of "miscommunication" tweets,

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we sampled tweets containing the word "communication" from random hours of each month between 2006 and 2021. This was completed by using a random number generator to identify a number between the first and last hour of each month (1–648, 696, 720, or 744 depending on the number of days within the month). For example, a randomly generated number of 490 corresponds to the ninth hour of the 21st day of month. All tweets meeting the search parameters during that hour were then harvested, and the procedure was repeated until the total number of "communication" tweets sampled during the month approximated that of "miscommunication" tweets from the same month. The final control sample consisted of ~1.31 million tweets containing ~24.9 million words (N_{final} = 2,604,025; total word count = 51,178,490).

5.1.2. Computerized text analysis

Upon completion of data collection, we combined the samples and submitted them to *Linguistic Inquiry and Word Count* program (Pennebaker et al., 2015), which is a text analysis software that counts words within a text that match a pre-established dictionary of psychologically relevant word categories. LIWC also provides a "dictionary words" variable that identifies the percentage of words within any text that match the dictionary. This is comparable to reliability in self-report measures, as it allows researchers to estimate the average percentage of words within a dataset that are not captured by the standard, LIWC2015 dictionary. Mean dictionary words indicated that LIWC was able to read most words in the dataset before ($M_{dictionary}$ = 69.12, $SD_{dictionary}$ = 17.89) and after exclusionary criteria ($M_{dictionary}$ = 72.82, $SD_{dictionary}$ = 16.44).

5.1.3. Exclusionary criteria

Prior to statistical analyses, tweets that were not posted by individual Twitter users were excluded from analyses. Our initial, combined dataset included tweets posted by 14,088 different sources. The term source is referencing the application, website, platform, or robot used to send a tweet. For example, "Twitter for Iphone" was the most common source and in-dicates that a tweet was sent from the Twitter app on an Iphone. To ensure that our data contained tweets that were sent by individual twitter users without individually vetting 14,088 sources, we implemented a modest exclusion criteria that removed any source that did not account for at least 0.20% of all tweets in the dataset. This removed most idiosyncratic sources and left 38 sources which were individually vetted for their validity. Finally, 11 more marketing platforms and bots were excluded, leaving a final set of 27 sources that accounted for 72.81% of all tweets in the original dataset. Importantly, rtweet does not reveal the "handle" of individual twitter users nor their IP address, and we were unable to exclude multiple tweets composed by the same user or determine the number of individuals within the dataset. However, given the remaining sample size (Ntweets = 1,896,032) and our inclusion criteria, it is unlikely that even the most prolific twitter users could post a sufficient number of tweets to have a measurable impact on the mean word count for any category. Overall, these exclu-sionary procedures did not substantially change the direction of magnitude of our results (analyses without exclusions are available at https://osf.io/tcxjm/).

5.2. Results

We conducted independent groups t-tests in order to compare the miscommunication and control tweets. Given the sample size, all comparisons were significant at $p < .001$ level. Therefore, we do not report p-values below, as they provide little information regarding differences in word-category frequencies between the two groups. Some sample miscommu-nication and control tweets can be seen in Table 1. The results for Cognitive Processes and Affect are presented in Table 2. All data are available at: =https://osf.io/tcxjm/?view_only=f9da83024513491582e505a8a6b6b2ca.

Table 1
Sample miscommunication and control (communication) tweets: Study 2.

Sample Miscommunication Tweets

i guess if miscommunication is in our hands then what i heard isn't what you said

Rich ass girl that I only saw on occasion ….I think it was only a miscommunication but we had fun

no i know i meant it in the way they that they called him straight?? Miscommunication on my part sorry!

it ends in pain if there was miscommunication or no understanding.

I truly hope there is a miscommunication here because it doesn't look or feel good to think they're being treated like tRump would've done.

Sample Control (Communication) Tweets

Eric is safe due to a large number of different people … A wonderful coordination and brilliant communication …

Doesn't matter how you slice it … Communication is key!

Relationships thrive on honesty, communication, mutual caring, and time spent together.

clear communication is so attractive

Spirit told me about myself today n I feel so blessed to have that line of communication with my ancestors ?????

need to work on my communication

Table 2
Cognitive and affective differences between miscommunication and control tweets: Study 2.

LIWC Category	Group	N	M	SD	t	d
Cognitive Processes						
Clout	Miscommunication	920794	53.26	30.17	−533.70***	−.79
	Control	924858	75.35	25.89		
Word Count	Miscommunication	920794	21.78	13.73	163.39***	.24
	Control	924858	19.17	6.72		
Cognitive Processes	Miscommunication	920794	12.10	10.33	197.22***	.29
	Control	924858	9.37	8.41		
Insight	Miscommunication	920794	2.65	4.75	88.95***	.13
	Control	924858	2.09	3.64		
Cause	Miscommunication	920794	2.43	4.94	118.80***	.18
	Control	924858	1.70	3.19		
Tentativeness	Miscommunication	920794	2.64	4.38	147.65***	.22
	Control	924858	1.78	3.43		
Certain	Miscommunication	920794	1.61	3.59	39.62***	.06
	Control	924858	1.41	3.26		
Differentiation	Miscommunication	920794	2.69	4.11	97.19***	.14
	Control	924858	2.12	3.82		
Affect						
Analytic	Miscommunication	920794	59.58	35.44	−215.95***	−.32
	Control	924858	70.08	31.54		
Tone	Miscommunication	920794	36.25	36.27	−250.33***	−.37
	Control	924858	50.10	38.87		
Affect	Miscommunication	920794	7.05	7.79	92.17***	.14
	Control	924858	6.03	7.12		
Positive Emotion	Miscommunication	920794	3.07	4.93	−130.70***	−.19
	Control	924858	4.14	6.12		
Negative Emotion	Miscommunication	920794	3.93	6.43	263.69***	.39
	Control	924858	1.83	4.13		
Anxiety	Miscommunication	920794	.35	1.60	58.65***	.09
	Control	924858	.23	1.24		
Anger	Miscommunication	920794	1.51	4.60	169.38***	.25
	Control	924858	.60	2.31		
Sad	Miscommunication	920794	.87	3.05	157.53***	.23
	Control	924858	.30	1.67		
Swear	Miscommunication	920794	.81	3.60	118.15***	.17
	Control	924858	.31	1.80		

***$p < .001$.

5.2.1. Cognitive processes

Overall, we expected tweets about miscommunication to display enhanced cognitive processing (cognitive processes category and word count), relative to the control tweets. This was the case as tweets about miscommunication preferentially focused on all cognitive processes compared to the control tweets; as well, miscommunication tweets contained more total words per tweet than the control tweets. We also expected miscommunication tweets to score higher on the more specific cognitive categories that reflected attributional processing including the categories of insight, causation, and differentiation. This was the case as miscommunication tweets were higher in insight words, causal words, and differentiation words compared to the control tweets. In terms of confidence and hesitancy, miscommunication tweets were lower in Clout (an index of self-confidence), and contained more tentative words, than the control tweets.

5.2.2. Affect

As expected, miscommunication tweets contained more affect words than did the control tweets. The affect contained in the miscommunication tweets was primarily negative, and they contained more words in the negative emotion category, and fewer words in the positive emotion category than the control tweets. Consistent with this pattern, miscommunication tweets scored lower on the Tone (overall positive emotionality) category than the control tweets. We also expected higher rates of specific negative emotion categories (anxiety, anger, sadness) for the miscommunication tweets, and this was supported. Specifically, miscommunication tweets contained a higher frequency of anger words, anxiety words, and sadness words than did the control tweets. Finally, consistent with the high rates for overall emotionality, miscommunication tweets were lower on the Analytic category (indicating complexity and detachment), and contained more swear words, than the control tweets.

5.2.3. Exploratory findings

The results of all exploratory analyses can be seen at https://osf.io/4kphg. The most notable findings concerned the use of pronouns. Overall, personal pronouns (e.g., I, them, her) were used more in miscommunication tweets ($M = 6.49$; $SD = 6.76$) than in the control tweets ($M = 5.22$; $SD = 6.28$), t (1834502.12) = 131.95, $d = .194$, 95% CI [1.25, 1.287]. This difference was

mainly driven by increased first person singular (e.g., I, me, my) use in miscommunication tweets ($M = 3.27$; $SD = 5.12$) compared to the control tweets ($M = 2.07$; $SD = 4.24$), $t\,(1781270.16) = 173.17$, $d = .255$, 95% CI [1.18, 1.21], and increased third person singular (e.g., she, her, him) pronoun use in miscommunication tweets ($M = .64$; $SD = 2.17$) compared to the control tweets ($M = .36$; $SD = 1.70$), $t\,(1741945.31) = 99.60$, $d = .147$, 95% CI [.28, .29].

5.3. Discussion

In this study we investigated peoples' naturalistic reactions to miscommunication by analyzing tweets containing "miscommunication". The results largely supported our expectations regarding cognitive reactions. Specifically, miscommunication tweets showed enhanced rates of words reflecting all cognitive processes, particularly insight, causal, and differentiation words. Tausczik and Pennebaker (2010) describe these categories as useful for reappraising and reconstruing past events. Thus, the use of causal and insight words in reactions to miscommunication likely reflects a tendency to engage in cognitive processes intended to understand and resolve the miscommunication after it occurs.

We also expected talk about miscommunication to display some confusion, as this was one of the more common reactions in Study 1. This was the case as miscommunication tweets were both more tentative, and lower in Clout (a marker of self-confidence) than were the control tweets. People tweeting about a miscommunication are relatively unsure about why it occurred, yet simultaneously seem to be trying to figure out why it happened.

Overall, our hypotheses regarding the association between miscommunication and affect were supported as well. Specifically, miscommunication tweets were more emotional (as indexed by the higher scores on affect and lower scores on the Analytic category) than control tweets, and these emotions were largely negative (as evidence by low scores on Tone and positive emotion, and higher scores on the negative emotion category). Consistent with Study 1, people responded to miscommunication on Twitter with frustration (*i.e.*, swear words, Tausczik and Pennebaker, 2010), anger, and sadness. It is worth noting that we were not able to capture the humorous responses to miscommunication that were demonstrated in Study 1, although some tweet content did contain humorous responses (e.g., "Lmfao the miscommunication?" or, "Miscommunication is so funny to me").

Our exploratory results for personal pronouns are consistent with the results for affect and cognitive processes. Pronouns tend to indicate attention allocation, whether attention is directed at oneself (*i.e.*, first person singular) or at others (*i.e.*, third person singular or plural) (Tausczik and Pennebaker, 2010). In reactions to miscommunication, people focused mostly on themselves, which has been demonstrated elsewhere to be associated with heightened emotionality (Pennebaker et al., 2003), honesty (Newman et al., 2003), and lower status (Kacewicz et al., 2014). First person singular pronouns are also negatively associated with psychological distance, whereas articles and prepositions (which are positively weighted in the Analytic category) positively predict psychological distance (Cohn et al., 2004). Likewise, the increased usage of third person singular pronouns is likely associated with identifying, explaining, and resolving miscommunication between other, singular individuals.

Overall**,** the results of this study demonstrate that people have strong affective reactions to miscommunication, reactions that are low in complexity (low Analytic) and largely negative as evidenced by the high frequency of negative emotion words and swear words. These reactions are not simply affective, however, as reactions to miscommunication included heightened usage of cognitive processes that may be used to better understand the occurrence of miscommunication (e.g., insight, causation).

6. General discussion

Communication typically seems to proceed effortlessly and successfully. And it usually does. But not always. Sometimes people are misunderstood, their intended meaning is taken the wrong way, or it is missed entirely. In other words, miscommunication happens. Indeed, it probably happens frequently, although it is difficult to obtain accurate estimates due to their fleeting nature, and because interactants are sometimes not even aware that a miscommunication has occurred. In a recent attempt to estimate miscommunication frequency, Mustajoki et al. (2021) used a retrospective commenting procedure and followed a single individual for 24 h. During this relatively short time period they documented the occurrence of 19 miscommunications.

Some prior research on miscommunication has focused on how it occurs (and is repaired) in specific contexts such as the workplace (Holmes and Stubbe, 2015), healthcare (e.g., doctor-patient) settings (Heritage and Robinson, 2006), aviation (e.g., cockpit) contexts (Sexton and Helmrich, 2000), and so on. Other researchers have analyzed miscommunication as a general phenomenon, focusing on observable features such as how it is repaired (Schegloff et al., 1977) and developing models of how and why it occurs (Bosco et al., 2006; Mustajoki, 2012). In contrast, there has been little research examining lay perceptions of, and reactions to, instances of miscommunication. This was the focus of the present research.

In our first study we asked participants to provide us with a recent miscommunication, and to respond to a set of questions regarding how they perceived and reacted to it. Respondents were able to classify almost all (95.6%) reported miscommunications with our three-fold scheme. Hence, the reported miscommunications almost always involved what was being talked about (referent miscommunications), what the speaker was trying to accomplish (intention miscommunication), or some combination of the two. This is consistent with two, broad, perspectives on communication: approaches that take intentionality as a prerequisite for communicative success (e.g., Grice, 1957; Searle, 1969; Bach and Harnish, 1979), and

those focusing on interactant coordination to successfully identify referents (e.g., Clark and Bangerter, 2004; Keysar et al., 2000). It also provides support for taxonomies similar to the one offered here, specifically the proposals of Thomas (1983), Blum-Kulka and Weizman (1988), Bosco et al. (2006), and Kelly and Miller-Ott (2018), all of whom make a fundamental distinction between misunderstanding what someone is talking about (or content) and misunderstanding someone's intention (albeit emotional intention in Kelly & Miller-Ott) with an utterance. Note that this is a high-level scheme, and at a more granular level there are, no doubt, many important differences between miscommunications. This higher-order scheme, however, should be useful in terms of providing an organizational basis for subsequent research in this domain.

Participants viewed the miscommunications that they recalled in Study 1 as relatively unserious, and sometimes humorous. Consistent with past conversational analytic research (e.g., Schegloff, 1992), these participants reported that most of the time both interactants were aware of the miscommunication. This wasn't always the case, however, and when only one interactant was aware, the miscommunication was judged as far more serious. This illustrates the important point that a fair amount of time (23.2% of the time in study 1) both interactants may not be aware of a miscommunication, and hence the likelihood of conversational repair is decreased.

Responsibility for miscommunications was viewed, for the most part, as the fault of the sender, a finding that is somewhat at odds with a collaborative view of communication (e.g., Clark, 1996), whereby interactants mutually monitor and repair miscommunications in real time. It may be that lay people do not think about communication as being a joint, collaborative process, but rather one that is more individualistic. The most frequent endorsed reasons for sender responsibility centered on their lack of specificity, ambiguity, and a failure to adequately take the perspective of the other, a finding in line with egocentric biases in communication (Keysar et al., 2000) and a failure to engage in recipient design (Mustajoki, 2012).

That miscommunications were viewed as relatively unserious in study 1, and sometimes humorous, is consistent with the findings of Edwards et al. (2017) that on-line misunderstandings are less serious than face-to-face misunderstandings. There were, however, negative reactions as well, and these included confusion and frustration. Reactions to miscommunication were explored in much more detail in Study 2, the findings from which dovetail well with Study 1 and paint a fairly comprehensive picture of how people talk about miscommunication. Tweets about miscommunication are affective and straightforward, and negative, especially in terms of anxiety and sadness. Because miscommunications are negative, people are motivated to try and understand them. Hence, miscommunication tweets contained high rates of cognitive words, especially causal and insight words, words that are used in attributional processing. But these attempted explanations are not definitive and are tentative and lacking in confidence. People are trying to make sense out of these negative events, and likely suggesting or trying out some possible explanations, but with a low degree of certainty.

Note that these results reflect important interactions between emotional and causal language that could determine whether the miscommunication is resolved. For example, Brett et al. (2007) analyzed text-based communications from disputes between eBay buyers and sellers. They found that the use of causal explanations of the dispute positively predicted conflict resolution. Alternatively, communication of negative emotion reduced the likelihood that a settlement between buyer and seller would be reached. In the present study, miscommunication tweets were high in *both* causal and negative emotionality. Considering most interactants sought to repair miscommunication in Study 1, future studies should potentially investigate the interaction between causal and emotional language for identifying when miscommunication is most likely to be repaired.

6.1. Limitations and future directions

We note here several limitations of our research. First, miscommunications in Study 1 were self-reported and hence open to memory distortions, social desirability, outright faking, and so on. Also, participants were asked to provide their judgments using a limited set of options, a procedure which puts artificial limits on their perceptions. Study 2 was nonreactive and hence lessened some of the biases associated with self-reports. The examination of tweets, however, raises different issues, in particular the generalizability of conclusions based on twitter data. Although sentiment analysis via twitter corresponds highly with the results of survey research, there are some limits to generalizability (Scarborough, 2018). Also, the circumstances leading to tweeting about a miscommunication may vary from those leading to tweeting about communication, and so our study 2 results may, to a certain extent, reflect those differences in addition to being informative about how people talk about miscommunication. Finally, the miscommunications examined in study 2 were likely more serious than those recalled by participants in study 1; a miscommunication prompting a tweet is likely to be more serious than one that does not result in a tweet.

Finally, it should be noted that the miscommunications examined in both studies represent a specific subset of miscommunications, specifically, those that people are able to recall (study 1) and those that prompt a tweet (study 2). What is being excluded, then, are the locally managed miscommunications that are quickly and efficiently handled, instances that are likely not remembered nor tweeted about. How people think and feel about those miscommunications is likely to be different from those examined here. As well, in study 1 we examined digital miscommunication, a phenomenon likely to be different, in important ways, from face-to-face miscommunication. Future work on miscommunication, especially in terms of the development of a miscommunication typology, will need to consider these differences.

Research on miscommunication has waxed and waned over the years. As noted by Verdonik (2010), however, research on the topic dropped off after 2000 and has not really recovered. Future research could focus on fine-grained analyses of miscommunication. For example, are certain types of referents or intentions more likely to result in miscommunication?

What role do interpersonal processes such as face management play in instances of miscommunication? Given that miscommunication may happen without awareness, how often does it actually happen? What are the consequences of miscommunication, and do they vary as a function of the type of miscommunication. How does miscommunication occur over an extended sequence of talk (e.g., Verdonik, 2010)? It is our hope that researchers will begin again to conduct research on this important topic.

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Declaration of competing interest

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