

Understanding Responses to Loneliness

In addition to the opportunity Twitter provides for understanding expressions of loneliness, it also allows us to investigate responses to these expressions. Our dataset included the Twitter replies to the lonely tweets. We developed a separate coding scheme for these responses.

Two of the authors developed a coding scheme for the set of responses in reply to the original expressions of loneliness. To this end, the authors independently coded the same set of replies to 30 lonely tweets. Each coder independently came up with categories that capture the nature of the responses. Next, the categories were consolidated and refined to reflect major categorical dimensions. The authors then coded another set of 30 tweets to test the reliability of the refined coding scheme, resulting in strong inter-coder reliability (80%).

Next, we describe the three different, but *not mutually exclusive* categorical dimensions that emerged from the analysis of responses: (1) explicit acknowledgement, (2) explicit social support, and (3) un-engaging responses.

Explicit Acknowledgement

The first category describes responses that directly acknowledge the original user's experience. These responses include a direct acknowledgement of the expressions of loneliness. These responses tend to mirror the loneliness (e.g., "I'm lonely too"), simply acknowledge the lonely tweet (e.g., "awww"), or reflect on responders' own experiences of loneliness (e.g., "sorry, I know how that is").

Explicit Social Support

This category includes responses that offer some type of help in consideration of the targets' well-being and perceived needs. Although one could argue that any response to a lonely tweet (such as a simple "awww") is an instance of social support, our analysis distinguishes explicit social support as offering some type of comfort to the person experiencing loneliness. Social support often emerges as informational (e.g. advice, guidance), emotional (e.g. affection, concern, love), tangible (e.g., goods, solution), and esteem support (e.g. enhancing feelings of one's attributes, abilities, and accomplishments) (Albrecht and Adelman 1987; Holmstrom and Burlison 2011; Wills 1985). Some examples of explicit social support responses are: "wait for me, I'll be right there," and "you're not alone anymore."

Un-engaging Responses

This category describes responses that move away from loneliness as the main topic of the interaction or dismiss the experience, the potential seriousness or gravity of loneliness. These responses do not explicitly address or acknowledge the person's experience of loneliness. These responses do not offer solutions to loneliness but

frequently emerge as small talk (e.g. "how was your day?"), jokes (e.g., "that's yo fault lmaoo"), or irrelevant topics (e.g., "happy Thanksgiving").

Studying Expressions of Loneliness at Scale

With the coding schemes for expressions of loneliness on Twitter, and reactions to these expressions, we are now able for the first time to quantify context and communication practices around expressions of loneliness in a natural environment where they occur. In this section, we provide a descriptive analysis of the lonely tweets in our dataset using a large-scale coding effort.

Our final sample, after accounting for tweets that had foreign language components or memes incorporated (and not caught by our initial filtering) included 4454 unique individual expressions of loneliness. The AMT coding labeled 70% of the users in our sample as women. On average, a user had 938 (SD=4300) followers, and was followed by 636 (SD=2920) others. Using the categories listed above for expressions of loneliness and responses to it, we qualitatively coded these tweets. We further marked whether the tweet included quoted speech (for those that the automatic detector missed).

Most of the people that posted lonely tweets in our dataset also actively posted other content on Twitter around the same time. About 97% of the users in our sample had posted a status update at least once within the 24 hours immediately before the expression of loneliness. On average, the time between the last twitter post and the lonely tweet was 6.8 hours. 78% of the users post an update within the hour, and 61% within the 10 minutes preceding the lonely tweet. The majority of the users (82%) also posted a Twitter update within the day after the lonely tweet.

We also performed an analysis of how the different coding dimensions were represented in the dataset. The majority (62.7%) of the expressions of loneliness were ambiguous about the duration of the experience of loneliness. 22.5% of the coded tweets indicated a transient experience, and 14.8% referred to an enduring, prolonged experience. More than half the expressions (55.8%) explicitly described a social context for the loneliness; perhaps unsurprisingly, about 25.2% of the tweets referred to an online social context, where 17.8% described an offline social context. 11.6% of the expressions have defined a physical factor in conjunction with the experience of loneliness. Romantic context was exposed in 8.7% of the tweets, where only 3.3% of all expressions had a reference to a somatic context. The analysis also showed that 42.9% of the tweets were other-directed, i.e. included an explicit call for interaction whether online or offline.

Next, we examine in more depth the factors related to the duration of the loneliness experience, perhaps the most critical variable captured in our coding.

Enduring Experiences of Loneliness

Both in the literature and in our dataset, the temporal dimension of the loneliness experience emerges as a critical dimension. In this section we focus on temporality of expressed loneliness, and use our data to test several hypotheses based on existing theories of loneliness.

Young (1982) emphasizes that transient experiences of loneliness emerge and die out quickly, unlike chronic loneliness, which lasts a long time even in absence of triggering stressful events. In Rubenstein and Shaver's early work (1979) on experiences of loneliness, a category of "Impatient Boredom", defined a mild and momentary form of loneliness, similar to transient loneliness. The responses to mild loneliness, according to this work, often include initiating social contact, or pursuing a solitary, yet fulfilling activity. On the other hand, Rubenstein and Shaver suggest that the more severe (or enduring) experiences (e.g. desperation, self-deprecation) lead to sad passivity, state of longing to be in social contact, yet not actively acting on it. These correlations can be captured by our categorical dimensions of interaction (action taken towards social contact) and temporal bounding (transient or enduring). Thus, we hypothesize that:

- H1.1: Expressions of transient loneliness are more likely to be other-directed compared to expressions of enduring loneliness.

One of the more severe manifestations of loneliness is *emotional loneliness*, which is a result of a person lacking an intimate / romantic relationship (de Jong Gierveld, Van Tilburg, and Dykstra 2006). In our coding scheme, the romantic context signified a tweet that referenced current, past, or aspired romantic relationships. We hypothesize:

- H1.2: Expressions of loneliness with a romantic context are more likely to be enduring than transient.

Previously, women have been shown to self-disclose loneliness more than men do (Borys and Perlman 1985), though this does not indicate women actually experience emotions in higher rates. Especially as communication in Twitter takes place in a public setting, we expect that:

- H1.3: Women are more likely to express enduring loneliness than men.

People who are lonely are less likely to disclose to others, regardless of the closeness of the relationships they have with them (Schwab et al. 1998). They are also found to be less involved in conversations, making them undesirable conversation partners (Bell 1985). We expect that those who have expressed enduring loneliness to exhibit lower self-disclosure and interaction characteristics

compared to those who express a transient experience. Operationalized on Twitter, we examined the users' rate of interactions. On Twitter, users can post public content that targets specific others by "mentioning" them (including their username in a tweet). For each user, we calculated the interactivity of the user *preceding* and *following* the lonely tweet. *Interactivity* was calculated as the ratio of interactions (e.g. public tweets contain mentions of other Twitter users) to total number of tweets. We hypothesize:

- H1.4: People who express enduring loneliness are more likely to have low interaction ratios than those who express transient loneliness.
- H1.5: People who express enduring loneliness will have fewer Twitter posts than those who express transient loneliness.

Findings

Below we summarize our findings and explain hypotheses support. An overview of our hypotheses, including the variables tested for each, and information on found support for them can be seen in Table 1.

Expressions of transient loneliness were other-directed in significantly higher rates compared to expressions of enduring loneliness (42.1% vs. 30%) ($\chi^2 = 62.1, df = 2, p < .001$), providing support to H1.1. Also, as suspected, expressions that had defined a romantic context also described an enduring experience at significantly higher rates (20.9% of tweets) compared to expressions with no romantic context (14.3%; $\chi^2 = 26.08, df = 2, p < .001$), supporting H1.2. Lastly, we tested whether there were significant differences in rates of expressing enduring loneliness between men and women. Our findings support our hypothesis; while 16% of women in our data expressed enduring loneliness, for men this ratio was 11% ($\chi^2 = 19.61, df = 2, p < .001$), supporting H1.3.

An ANOVA test revealed that interaction rates preceding and following the expressions of loneliness varied between people who expressed enduring versus transient loneliness, or were ambiguous in their temporal framing (preceding - $F = 20.55, df = 2, p < .001$; following - $F = 21.95, df = 2, p < .001$). People who have expressed *transient* loneliness had the highest rates of interactivity before ($M=0.31, SD=0.21$) and after ($M=0.30, SD=0.21$) the expression of loneliness. They were followed by people whose expressions were without an explicit temporal frame of reference (pre-expression rate- $M=0.29, SD=0.21$; post-expression rate $M=0.28, SD=0.18$). Supporting H1.4, people who have expressed enduring experiences of loneliness demonstrated the lowest interaction rates before ($M=0.24, SD=0.19$) and following the expression of loneliness ($M=0.24, SD=0.17$). All pairwise differences were significant based on Tukey HSD post-hoc tests. Previous work suggests that people who are experiencing

high levels of loneliness disclose and interact less than non-lonely people (Schwab et al. 1998). It is plausible that the people expressing enduring loneliness are also those who are experiencing it in high levels, and hence are less interactive before and after their disclosures.

Looking at H1.5, the volume of activity from the day preceding the expression of loneliness had no significant relationship with the expressed temporality of loneliness. However, we did see a significant relationship between the temporality and the volume of activity during the day immediately following the expression of loneliness (ANOVA $F = 20.97$, $df = 2$, $p < .001$). People who have expressed transient loneliness on average posted 30.37 ($SD=35.75$), a rate significantly higher than people who expressed enduring loneliness ($M=25.32$, $SD=31.05$) or who did not have temporal framing ($M=23.01$, $SD=28.94$), based on the post-hoc test.

H1.1	Transient loneliness → Other-directed	✓
H1.2	Romantic context → Enduring loneliness	✓
H1.3	Gender (female) → Enduring loneliness	✓
H1.4	Enduring loneliness (-) → Interaction ratio	✓
H1.5	Enduring loneliness (-) → Tweet volume	✓
✓ - supported hypothesis, ✓ - partially supported hypothesis, → - positive relationship, (-) → - negative relationship		

Table 1 – Hypotheses for Enduring Experiences of Loneliness

Responding to Expressions of Loneliness

Expressions of loneliness on Twitter are, inherently, social acts, even as people express social shortcomings. But when do audiences receiving the expressions of loneliness respond to their authors' calls for interaction? Who is more likely to get a response? What kinds of responses do people get? In this section, we examine several hypotheses regarding the responses to lonely tweets.

In our dataset of 4,454 manually coded expressions of loneliness, 1,030 had at least one public response (23%). To compare, we examined the "usual" response rate to tweets posted by the people in our data set, using the 200 most recent tweets for each of person. The overall average tweet response rate was 3.4%. Initial tests have shown that the general response rate for each user was not dependent on their gender, nor did it relate to receiving a reply to their lonely tweet.

We used the qualitative categorization for responses, detailed above to code the replies to the 1030 tweets that received one or more responses. Out of the tweets that had a response, the average number of replies was 4.44. 12% of these expressions had responses that could not be coded as they included utterances that were not English. This left us with ($N=903$) tweets, responses to which were coded, according to our coding scheme, for containing (one or

more of): acknowledgement of loneliness; a proposed solution or support; or an un-engaging response. Out of the tweets that received one or more responses, 49.7% received a response that was acknowledging the experience of loneliness. 45.2% of these tweets received a response explicitly offering a solution for their loneliness, whereas 34% received a response that was un-engaging, or ignoring the reference to the experience of loneliness.

Variables and Hypotheses

We first address some general hypotheses regarding responses to lonely tweets. We then focus on responses to tweets depicting enduring experiences. Finally, we study the outcomes of the response in terms of activity by the user posting the lonely tweet.

People vary in their propensity of self-disclosures, specifically emotional self-disclosure. After controlling for external circumstances, men are less likely to disclose emotions than women do. Thus, when subjected to men communicating disclosing loneliness, people may be more compelled to respond. We hypothesize:

- H2.1: Men are more likely to receive responses to their expressions of loneliness, than women do.

While Twitter users can offer social support, it can be burdening to hear the emotional distress of loved ones, especially if the experiences are severe (Fiore, Becker, and Coppel 1983). Thus we expect transient expressions of loneliness to get responses more readily:

- H2.2: Expressions of enduring loneliness are less likely to get responses than expressions of transient loneliness.

One categorical dimension that has surfaced in our qualitative analysis was the call for interaction in the expressions of loneliness. We expect that expressions that were framed with a summon for social contact, in other words, tweets that were marked "other-directed", are more likely to get responses. We hypothesize:

- H2.3: Other-directed (interactive) expressions are more likely to get responses.

The following hypotheses focus on understanding the responses to expressions of an enduring experience of loneliness. Different responses can have different end results for the people who express loneliness; for those who are expressing enduring feelings of isolation, dismissing responses can be further detrimental, whereas an explicitly supportive response can be of substantial use.

Approach-avoidance theory suggests that people often make involved decisions prior to taking action, when they face a situation with both positive and negative valences. When people are at the receiving end of an expression of loneliness, they can find themselves in an approach-avoidance dilemma. On the one hand, by approaching, they show social support, can develop their relationships with the person further, and represent themselves in their online

social networks as one that helps. On the other hand, by “avoiding” they eliminate the risk of getting involved in an emotionally straining conversation (Lewin 1935). Expressions of enduring experiences of loneliness particularly can carry an enormous load of stress for their audiences. We expect these severe expressions to garner less dismissive responses than expressions of transient loneliness might.

- H2.4: Expressions of enduring loneliness are less likely to receive responses dismissing loneliness, than expressions of transient loneliness.

However, suggesting explicit solutions for profound problems like prolonged loneliness can be emotionally and socially difficult for people, especially those who may be weak ties with the person expressing loneliness. We expect that expressions of enduring loneliness to receive responses explicitly acknowledging loneliness at higher rates, and responses offering explicit solutions at lower rates, compared to expressions of transient loneliness.

- H2.5: Expressions of enduring loneliness are more likely to receive responses explicitly acknowledging the experience of loneliness than expressions of transient loneliness.

Findings

Below we summarize our analyses and findings on direct responses of lonely tweets, and explain hypotheses support. Table 2 summarizes our hypotheses and whether or not they were supported.

What factors contribute to getting a response? To examine hypotheses H2.1-H2.3, we constructed a logistic regression model with the binary dependent variable capturing whether or not at least one reply was received for a “lonely” tweet. The independent variables included: the gender of the user who tweeted the expression (H2.1), the temporal bounding of loneliness in the expression (i.e., whether the tweet expressed enduring, transient, or temporally ambiguous loneliness, (H2.2), and whether the tweet was other-directed (H2.3). The model revealed that the most significant predictor for a lonely tweet receiving a response was the directionality of the tweet – an expression without call for interaction had a reduced chance of being responded to by 63% ($p < .001$). The results from the model showed that men were more likely to receive responses – being a man increased the likelihood of receiving a response by 27% ($p < .01$). However, even after controlling for gender and direction, it was revealed that expressions of enduring loneliness are significantly less likely to receive a response. An expression communicating extended loneliness has a reduced likelihood of the expression receiving a response by 37% ($p < .01$). Thus, hypotheses H2.1-H2.3 are all supported.

Our findings back up H2.4. 43% of tweets that defined a transient experience have received an un-engaging response, compared to 33.6% for tweets with no explicit temporal framing, and 10% of tweets expressing an enduring experience ($\chi^2 = 27.22, df = 2, p < .001$).

What kind of response did tweets receive when they conveyed a more severe experience of loneliness? Expressions referencing enduring loneliness received higher rates of responses explicitly acknowledging the experience, supporting H2.5. For expressions of transient and temporally undefined loneliness, the rate of receiving a response explicitly acknowledging loneliness was 39.6% and 51.1% respectively. In contrast, 70% of expressions of enduring loneliness received a response explicitly acknowledging loneliness ($\chi^2 = 22.49, df = 2, p < .001$).

H2.1	Gender (male) → Response	✓
H2.2	Enduring loneliness (-)→ Response	✓
H2.3	Other-directed → Response	✓
H2.4	Enduring loneliness (-)→ Un-engaging response	✓
H2.5	Enduring loneliness → Acknowledging response	✓
✓- supported hypothesis, →- positive relationship, (-)→ - negative relationship		

Table 2 – Hypotheses on Responding to Expressions of Loneliness

Discussion

In our study, we show how people using Twitter disclose experiences of loneliness, including details of the context and severity of the experience. Explicit expressions of loneliness receive replies from others in higher rates than the baseline (other content posted by the same user), suggesting that these messages are evocative and online social networks are responsive to people in distress.

SAS are passive communication environments that provide a variety of cues and affordances for content production activity, but provide no indication of passive consumption: there are no signals that inform an individual that his or her social network has actively viewed the information the individual shared. Indeed, this feeling or sense of “social presence” from one’s network is critical to understanding one’s psychological, emotional, and intentional states (Biocca, Harms, and Burgoon 2003; Singer and Witmer 1999). Therefore, the lack of verification of authentic social presence creates a peculiar environment for observing how people or groups of people respond to evocative emotional disclosures such as expressions of loneliness. In the physical world, when a friend cries for help, we run to her aid. What happens when the friend does not know whether we heard her cry?

Although nobody is *obliged* to respond to an expression of loneliness, some people do choose to publicly

acknowledge and reply to such disclosures. Our analysis revealed that expressions referencing a transient loneliness experience are much more likely to receive a response than those expressing an enduring loneliness experience. This finding may suggest that responders practice a certain level of discretion when responding to expressions of loneliness. The discretion may be a consequence of expressions of enduring loneliness being too onerous for potential responders. Enduring expressions of loneliness likely require less casual responses and more conscious awareness of the overall impact of the problem. When faced by an emotionally burdensome social circumstance, given the lack of social presence, the potential replies may be more easily suppressed. Further complicating the situation is that users suffering from enduring loneliness are less likely to post a call for social interaction. As a result, these users are even less likely to elicit a helpful response to start with.

While many individuals may feel more comfortable and safe *disclosing* enduring loneliness within a mediated context (Morahan-Martin 1999), the quality and frequency of *responses* to these disclosures can suffer. For instance, compared to face-to-face conversations, online interactions can yield lesser degrees of closeness, self-disclosure, and overall satisfaction (Mallen, Day, and Green 2003). Potential responders are likely to consider several factors when deciding if and how to respond, such as whether norms dictate the lonely person receive, or what the costs and rewards are for interacting with the lonely person (Weiss 1973). Moreover, within the mediated context, people are likely to feel less responsible for providing acknowledgement or support towards those who are weakly tied or not well known to them (Garton, Haythornthwaite, and Wellman 1997). In some way, potential responders are subject to less risk and burden when addressing disclosures of transient versus enduring experiences of loneliness, and may ultimately refrain from addressing expressions of enduring loneliness.

For people expressing an enduring experience of loneliness, Twitter may be a place where they receive acceptance, but not help or counseling. When people do respond to enduring experiences, they are not dismissive of the fact that these people are feeling lonely. On the other hand, they do not seem to prefer offering explicit solutions to their problems. One may think acknowledgement alone suggests a level of empathy, and knowing someone understands may be all that is needed by the people experiencing enduring loneliness. Thus, perhaps, SAS are ideal places for catharsis, yet not direct routes towards emotional healing.

We do not have evidence in this study that pertain to recovery, or evidence that people's expressions of loneliness persists or decays over time. In future work, it would be interesting to see if certain kind of responses on Twitter are

actually helpful, and under what circumstances (e.g. the type of tweet posted, the user posting it, the relationship with the user replying, and the type of reply).

Conclusion

In this work, we presented the first large-scale study of online expressions of loneliness, and of the responses to these expressions. Many of our findings correspond to what we know about the experience of loneliness from prior work, for example, the existence of prolonged, sustained condition where the suffering people are less likely to be interactive. However, our study helps expand our understanding of both the experience of loneliness and the responses to it, from the types of contexts that evoke loneliness, to the type of responses that lonely tweets of different kinds get.

Our study, of course, has several limitations. First and foremost, we looked at *explicit* expressions of loneliness in one SAS. By the nature of our sampling, we did not include expressions of loneliness that were not as straightforward as the phrases we chose to query. Moreover, as our study at this point was limited to one SAS, we cannot suppose that the experience is communicated in the same way on other SAS (e.g., Facebook) where the affordances for social interaction and privacy are different. Moreover, we looked at disclosures, which may not always imply genuine experiences, especially in public and performative settings of Twitter. Therefore, while we described the experience of loneliness as *communicated* on Twitter, we cannot claim to have described the actual experience. Finally, as we sampled our data from English speaking U.S., we may be missing nuances in communication practices around loneliness that can be introduced by cultural variation.

Turkle (2012) famously claims that we forgot how to be alone. Indeed, our data provided some anecdotal evidence to support this claim. Large numbers of tweets in our dataset expressed loneliness in almost-trivial contexts (e.g., a friend stepping out for a minute to take a shower, posting something and not receiving a response yet). Did we forget how to be alone? Perhaps technology is not making us lonelier, but instead this phenomenon can be explained by the recently increased ease of communication – the barriers for people to reach for contact have dropped. Before SAS became prominently accessible, we would have to find ways to be content with “impatient boredom”. Nowadays, we may be too quick to attempt to relieve it, SAS being the perfect setting for relief. We may not be lonelier, but be gratified more quickly for disclosing it.

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