Effects of Battle and Journey Metaphors on Charitable Donations for Cancer Patients

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Spring 2020

Abstract

Having cancer is often described metaphorically as a battle ("my fight against cancer") or as a journey ("my path through cancer treatment"). Previous experimental work has demonstrated that these metaphors can influence people's reasoning and emotional inferences about experiences with cancer (Hendricks, Demjén, Semino, & Boroditsky, 2018; Hauser & Schwarz, 2019). However, it is currently unknown how the use of these metaphorical frames translates into behavioral changes, such as the likelihood and magnitude of charitable giving. Using hand-labeled data from more than 5,000 Go-FundMe cancer-related campaigns, we ask how a campaign's use of metaphor predicts several measures of donation behavior beyond what other control variables predict (e.g. shares on Facebook). We find that the presence of either metaphor family (battle or journey) has a positive effect on campaign success and donation behavior.

To establish whether these relationships are causally meaningful, we designed an online experiment simulating the experience of donating to a crowdfunding campaign. We manipulate the metaphorical framing and recipient gender in the campaign. We find that participants under the battle condition donated a significantly higher amount than participants in the journey condition. A mediation analysis demonstrated that participants' perceived urgency of the campaign fully mediated the donation amount between the battle and journey conditions. As a result, battle campaigns may be more effective crowdfunding tools as a function of their ability to convey immediate need. Yet, this does not rule out the possibility of designing more externally valid stimuli and finding journey metaphors just as effective, like the GoFundMe analysis would suggest.

Introduction

People frequently talk about abstract and complex experiences metaphorically (Jamrozik, McQuire, Cardillo, & Chatterjee, 2016), which may guide how they conceptualize and reason about those experiences (Thibodeau, Hendricks, & Boroditsky, 2017). For example, experiences with cancer are frequently described using at least one of two pervasive metaphors—as a journey ("my path through cancer treatment") or as a battle ("my fight against cancer") (Sontag, 1977; Gibbs & Franks, 2002; Bowker, 1996; Magana & Matlock, 2018; Semino, Demjén, Hardie, Payne, & Rayson, 2017). Previous experimental work has demonstrated that these metaphors can influence people's reasoning and emotional inferences about experiences with cancer (Hendricks et al., 2018; Hauser & Schwarz, 2019). However, it remains unknown whether they impact real-world behavior.

Background

Can exposure to linguistic metaphor affect cognition? Conceptual Metaphor Theory (CMT) hypothesizes that metaphors structure our knowledge of abstract concepts and how we make meaning of them (Lakoff & Johnson, 1980). This claim is corroborated by substantial evidence that different metaphorical frames can produce distinct understandings of such concepts. For instance, Thibodeau and Boroditsky (2011) found that framing a city's crime as a beast (vs. a virus) led participants to believe in the effectiveness of fighting against the crime (vs. treating the root cause). Keefer, Landau, Sullivan, and Rothschild (2014) demonstrated that framing depression as either space (depression as down) or light (depression as dark) had positive effects

on how effective participants believed fictional anti-depressants (such as “Liftix” and “Illuminix”) would be in comparison to non-metaphorical medication (such as “Effectrix”). Jia and Smith (2013) found that personifying stock markets with an agentic frame (“the New York market leaped higher”) led participants to imagine a stronger market trajectory, compared to a literal framing. (For an extensive review, see Thibodeau et al. (2017).) Such evidence suggests that metaphor framing may broadly influence our conceptualization of common life experiences.

Within the domain of cancer, past research has demonstrated that journey and battle metaphors may affect how individuals reason about and conceptualize the disease. For example, Landau, Arndt, and Cameron (2018) found that battle metaphors used to describe skin cancer can cause fear and anxiety, and encourage preventative intentions. On the other hand, Hauser and Schwarz (2019) found evidence that battle metaphors lead to counterproductive beliefs about the difficulty of cancer and how quickly someone with symptoms should seek medical attention. Hendricks et al. (2018) identified distinct emotional implications of battle and journey metaphors, finding that journey metaphors led people to perceive cancer more optimistically. Finally, theoretical work by Reisfield and Wilson (2004) contrasted journey and battle cancer metaphors, arguing that while journey metaphors are more peaceful, they still convey cancer’s gravity.

Despite the well-theorized and growing evidence for the role of metaphor in thought, and on cancer specifically, thought may not necessarily translate into action. Current evidence focuses largely on the effects of metaphor framing on reasoning and perception, and has not yet identified whether and how these changes in conceptualization translate into real-world behavioral changes. We address this gap through the study of one common type of real-world

behavior tied specifically to cancer: charitable giving. Charitable donations allow us to quantify (through individuals' donation propensity, donation amounts, etc.) the influence of metaphor on where one chooses to allocate one's resources. This builds upon other related work (e.g. Landau et al., 2018; Hauser & Schwarz, 2019), by attempting to identify actual behavioral changes, rather than intended or hypothetical action.

Crowdfunding and donation behavior

In our effort to fill this gap, we measure the success of crowdfunding campaigns as a function of metaphor usage. Crowdfunding, the process of accumulating funds through many small donations, has grown significantly in the past decade (Short, Ketchen Jr, McKenny, Allison, & Ireland, 2017). Previous research has discovered links between crowdfunding campaign success and various predictors, for example, the social distance between donors and recipients (Agrawal, Catalini, & Goldfarb, 2015) and the fundraiser's passion toward the campaign (Li, Chen, Kotha, & Fisher, 2017).

Cancer-focused crowdfunding campaigns are extremely common, given the often rapid progression of the disease and expense of treatment. Indeed, as of 2020, one crowdfunding platform, GoFundMe, claims to have raised over $650 million annually for medical fundraising, which makes up one-third of their campaigns (GoFundMe, 2020). Crucially, crowdfunding campaigns offer an interpretable set of variables that allow us to quantify relationships between donation behavior and the language used in a campaign — specifically, the metaphors used to describe an individual's cancer experience. Jointly, the extensive independent work on crowdfunding, cancer experiences, metaphorical framing, and charitable donation psychology

make the success of cancer-related crowdfunding campaigns a promising measure of social behavior that may be affected by metaphor.

Study 1

This study investigated the relationship between the usage and presence of metaphor and donation behavior in online crowdfunding campaigns. It addresses three main questions, and three secondary points.

First, does the presence of at least one battle or journey metaphor predict the success of a campaign? One would expect under CMT and the literature on metaphor framing that campaigns which present a cancer appeal metaphorically will recruit mappings derived through embodied experience. The difference in a reader's ability to grasp or relate to the metaphor target given a metaphorical or a literal appeal may indeed have an impact on people's willingness to change their behavior (Flusberg, Matlock, & Thibodeau, 2017). People's reactions to literal language and figurative language can differ substantially, and the latter may likely help create highly elaborate mappings and mental imagery (Turner, 2005).

Second, does donation behavior change when narratives mix metaphors? Gibbs and Franks (2002) claim that multiple metaphors are necessary to understand the different aspects of illness, treatment, and healing. Perhaps readers understand, sympathize with, and donate more when narratives use a combination of metaphors. Conversely, mixed metaphors may cause confusion or hinder comprehension. Ceccarelli (2004) argues that although mixed metaphors may thoroughly convey the target concept, less apt metaphors can also detract from the more apt metaphor's rich associations.

Third, does one metaphor family influence donation behavior differently than the other? Previous work on battle and journey metaphors offers conflicting predictions. Battle metaphors may encourage people to act, but they also may encourage a fatalistic mindset, degrading one's perspectives on preventative measures (Hauser & Schwarz, 2019). Battle metaphors may also overemphasize the physical and biological aspects of cancer, while ignoring the psychological and social aspects (Nie et al., 2016). On the other hand, journey metaphors may highlight the many possibilities one may face during one's experience and avoid concepts such as winning, losing, and failing (Reisfield & Wilson, 2004). Journey metaphors may also lead people to have a more optimistic outlook towards eventual healing (Hendricks et al., 2018). However, journey metaphors may be less motivating or persuasive than battle metaphors. According to Das et al (2008), positive frames (e.g. journey metaphors) may be more effective when presented within anecdotal narratives, where negative frames (e.g. battle metaphors) may be apt within statistical narratives. Thus, within the context of campaigns funding individuals, journey metaphors may be more effective. Overall, battle metaphors may potentially incite charitable action at the expense of encouraging fatalism and conveying undesirable features; journey metaphors may convey an auspicious situation, yet fail to motivate donors.

Even within each metaphor family, we might expect campaign success to depend on how the metaphors are used. First, more rather than fewer metaphors within a campaign narrative may make the narrative more vivid or cumulatively construct a more complex mental image (Werth, 1994; Ortony, 1975). Further, some metaphors are more conventional than others. As metaphors become more conventional, there is a gradual shift in how they are processed (Bowdle & Gentner, 2005; Desai, Binder, Conant, Mano, & Seidenberg, 2011; Cardillo, Watson, Schmidt,

Kranjec, & Chatterjee, 2012). Consequently, novel metaphors, which generally elicit stronger neural and affective signatures, may be more compelling. Lastly, metaphorical frames may more effectively structure conceptualizations when the frame is introduced at the beginning of the stimulus, compared to the end (Thibodeau & Boroditsky, 2011).

Methods

Data collection

We scraped real campaigns soliciting donations for cancer treatment directly from GoFundMe. GoFundMe is a popular crowdfunding platform that hosts a wide spectrum of campaigns, including cancer-related fundraisers. In February 2019, we searched the site for a set of cancer-related keywords (e.g. leukemia, neuroblastoma, breast cancer, etc.) and collected the resulting campaigns until we had 10,000 total campaigns.

Each campaign was then coded for individual battle and journey metaphors. A search for battle and journey keywords (e.g. war, battling, path, etc.) provided fragments of campaign text which were then hand-annotated as cancer-related metaphors or not. Other well-documented cancer metaphors were sparse: cancer as a force or natural disaster (Bowker, 1996; Gibbs & Franks, 2002) showed up fewer than 2 times per 10,000 words. Whether a keyword was metaphorical was coded through a process similar to Steen's (2010) procedure. For each potential metaphor, we manually inspected and determined its contextual meaning. If a more concrete meaning could be found and the unit's intended target was cancer, then the unit was deemed metaphorical. This ensured that nonspecific ("my journey through life") and unrelated

metaphors (“he fought the insurance company”) were labeled correctly as not examples of cancer metaphors. An exemplary metaphorical battle phrase was “This is one fight that no one prepares for” and an exemplary metaphorical journey phrase was “My mother has a very long hard journey ahead of her.” After annotating, we limited campaigns to those launched in 2013 or later and originating from the US. This produced a total of 5,309 annotated campaigns in the final dataset. Battle metaphors occurred about 3.2 times per 1,000 words, and journey metaphors about 0.8 times per 1,000 words. For comparison, Semino, Demjén, Demmen, et al. (2017) found patients in an online forum used violence metaphors 1.8 times per 1,000 words and journey metaphors 1.5 times per 1,000 words.

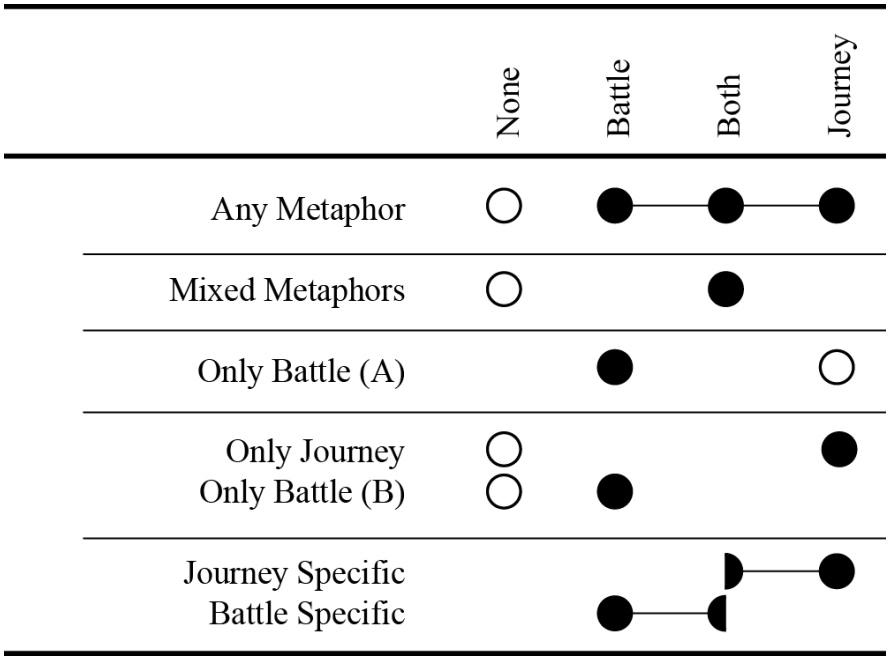

Figure 1: This analysis compared subsets of the full dataset: literal campaigns, campaigns which only use battle or journey metaphors, and campaigns which use both metaphors. All predictors were binary except for Journey Specific and Battle Specific. Open circles denote the negative class(es); filled circles denote the positive class(es); semi-circles denote partial inclusion of campaigns in that class.

Variables

Dependent measures

Campaign success was operationalized in three ways: the number of donors who contributed to the campaign (Number of Donors), the campaign's average donation per donor (Mean Donation), and whether the campaign met its funding goal (Success). Number of Donors was modeled as a truncated Negative Binomial distributed random variable to account for count data greater than zero with unequal dispersion and mean parameters. Mean Donation was log-transformed and modeled with a linear regression to account for the positive, continuous nature of mean donations. Success was modeled with an unregularized logistic regression.

Covariates

To measure the effect of metaphor, we controlled for a number of covariates. Prior work has identified factors that significantly influenced charitable giving, including the campaign's funding goal (Gleasure & Feller, 2016), number of words in the main text (Gleasure & Feller, 2016), campaign launch month (Ekström, 2018), number of photos and videos present on the page (Courtney, Dutta, & Li, 2017), number of Facebook friends of the campaign owner (Mollick, 2014), number of shares on Facebook (Agrawal et al., 2015), and number of campaign updates (Xu et al., 2014). We also identified several other factors a priori, including launch day of the week, launch year, fundraising duration, and inferred cancer type. Continuous variables were scaled; those with a meaningful zero were divided by one standard deviation, whereas those

without a meaningful zero were centered then divided by two standard deviations (see Gelman, 2008).

We controlled for these covariates in case they were confounded with metaphor use. For instance the number of words in the main text could correlate with metaphor usage. For example, Littlemore, Krennmayr, Turner, and Turner (2014) found that as the proficiency of English second language learners increased, so did the density of metaphors in their writing. It is not implausible that authors with greater English proficiency would write longer and more elaborate crowdfunding campaigns, producing a relationship between metaphor presence and text length. Indeed, within our data, campaigns that include either battle or journey metaphors have a significantly higher average number of words in the main text ($M = 401.2$) than literal campaigns ($M = 257.4$), $t(5497.4) = 24.2$, $p < 0.001$.

Predictors of interest

We were first interested in the overall effect of metaphor presence on donation behavior. The variable Any Metaphor represented whether the campaign included at least one battle or journey metaphor. Yet, this may conflate the individual effects of journey and battle metaphors. Thus, the Only Journey and Only Battle (B) variables represented whether the campaign contained only journey or only battle metaphors, respectively. To measure the effect of using mixed metaphors, the Mixed Metaphors variable represented whether a campaign included either both metaphor families, or neither.

To align our work with the literature that has contrasted battle and journey metaphors, we compared campaigns which used only battle metaphors with those that used only journey

Table 1: Categories of variables included in the analyses.

Dependent Variables	Covariates	Predictors of Interest
Number of Donors	Funding Goal	Any Metaphor
Mean Donation	Narrative Length	Mixed Metaphors
Success	Duration	Only Journey
	Cancer type	Only Battle
	Facebook Shares	Journey Salience
	Facebook Friends	Battle Salience
	Updates	Journey Rarity
	Photos	Battle Rarity
	Day of Week	Journey Earliness
	Month	Battle Earliness

metaphors. The Only Battle (A) variable was used to make this distinction. See Fig 1 for a visualization of which campaigns were included in Only Battle (A) and Only Battle (B).

We also tested for effects contingent on how metaphors were employed. We first examined the influence of metaphor prominence on campaign success with the Journey Salience and Battle Salience variables. These two predictors represented the ratio of metaphorical keywords (within each metaphor family) to the total number of words within each campaign. For example, an appeal with 100 total words and five metaphorical journey keywords would have a Journey Salience of 0.05.

The conventionality, or rarity, of metaphors in the appeal may also affect donation behavior. To account for this, we define Journey Rarity and Battle Rarity over each campaign; both were sums of the rarities of the metaphorical keywords used in each campaign. First, let M_f be the number of different keywords in the f metaphor family. The rarity for the

f metaphor family of the nth campaign is the sum of each metaphorical keyword's count in the campaign, C_{n_i}, weighted by $W_{i,f}$. This weight is the scaled, inverse term frequency of the i^{th} keyword across all documents. Thus, rarity for the f metaphor family of the nth campaign is:

$$R_{n,f} = \sum_{i=1}^{M_f} W_{i,f} \times C_{n_i} \text{ where } W_{i,f} = (\frac{C_i}{T_f})^{-r}$$

where r is the scaling constant (we use r = 0.4) and T_f is the total number of metaphorical keywords within the family. This is analogous to TF-IDF, but places less weight on infrequent terms. To reify this idea, consider two campaigns: the first employs one metaphorical use of "enemy" (e.g. "Cancer was Jennifer's worst enemy") and the second employs two metaphorical uses of "beating" (e.g. "He has steadily been beating cancer. . . Beating this disease is all he wants."). From the corpus, we know a priori that Wenemy,battle = 8.2 and Wbeating,battle = 3.2, therefore $R_{1,battle} = 8.2$ and $R_{2,battle} = 3.2 \times 2 = 6.4$.

Finally, how soon metaphors are introduced in an appeal may influence donation behavior. We define the Journey and Battle Earliness variables, which were the relative positions of the first metaphors within each campaign. For example, if the first journey metaphor in a campaign of 100 total words occurs at the 20th word, then Journey Earliness for this campaign would be 0.2. In Fig 1, Salience, Rarity, and Earliness were collapsed into the Journey Specific and Battle Specific categories.

Variable selection

We addressed the questions introduced above using a series of nested model comparisons. For each question, we subset the data to include only relevant campaigns, then fit base models for

each dependent variable (Number of Donors, Mean Donation, Success) including all of the non-metaphorical covariates and random effects. The final base models for each question were determined using backward stepwise regression to eliminate insignificant, non-metaphorical covariates. We then included each metaphor predictor of interest and asked whether the addition of that predictor improved the model fit (as measured by a log-likelihood ratio test over the difference in model deviance). The only random effect present was an intercept-only effect of year, since we did not exhaust all possible years that campaigns could be published. Models were built with lme4 (Bates, Maechler, Bolker, Walker, et al., 2014) in the R framework (R Core Team, 2018).

Results

We report the log-likelihood ratio tests for each model comparison, and when useful, the coefficient and 95% Wald confidence interval. For an overview of which subsets of campaigns were included in each question's analysis, see Fig 1.

Does the presence of metaphor influence campaign success?

To identify the effect of any metaphor on campaign success, we compared full models including a fixed effect of Any Metaphor to models omitting only this term. All 5,309 campaigns were used in the analysis (with 3,116 in the positive class of Any Metaphor). A significant main effect was revealed with the inclusion of Any Metaphor for Number of Donors [$\beta = 0.14$, CI (0.09, 0.19), $\chi^2(1) = 35.1$, $p < 0.001$] and Mean Donation [$\beta = 0.11$, CI (0.08, 0.13), $\chi^2(1) = 60$, $p <$

0.001]. Model fit was marginally improved for Success [$\beta = 0.15$, CI (-0.01, 0.32), $\chi^2(1) = 3.3$, $p = 0.07$].

Does the presence of a specific metaphor influence campaign success?

To identify the effects of each specific metaphor family on campaign success, we fit full models including either Only Journey or Only Battle (B). The former set of models included 2,643 campaigns that used either only journey metaphors or no metaphors at all (450 were in the positive class of Only Journey). The latter included 4,201 campaigns that used only battle metaphors or no metaphors at all (2,008 were in the positive class of Only Battle (B)). The inclusion of Only Journey significantly improved model fit for Number of Donors [$\beta = 0.12$, CI (0.03, 0.20), $\chi^2(1) = 7.8$, $p < 0.01$] and Mean Donation [$\beta = 0.09$, CI (0.04, 0.14), $\chi^2(1) = 12.8$, $p < 0.001$], but not Success [$\chi^2(1) = 1.0$, $p = 0.32$]. The inclusion of Only Battle (B) significantly improved model fit for Number of Donors [$\beta = 0.11$, CI (0.06, 0.16), $\chi^2(1) = 16.5$, $p < 0.001$] and Mean Donation [$\beta = 0.10$, CI (0.07, 0.13), $\chi^2(1) = 43.7$, $p < 0.001$], but not Success [$\chi^2(1) = 1.6$, $p = 0.21$].

Does the presence of both metaphors influence campaign success?

To identify the effect of mixed metaphors on campaign success, we compared full models including a fixed effect of Mixed Metaphor to models omitting this term. The 2,851 campaigns with either both metaphors or neither were used, with 658 in the positive class of Mixed Metaphors. The inclusion of Mixed Metaphors significantly improved model fit for Number of Donors [$\beta = 0.18$, CI (0.10, 0.26), $\chi^2(1) = 20.3$, $p < 0.001$] and Mean Donation [$\beta = 0.10$, CI

(0.06, 0.15), $\chi^2(1) = 19.3$, $p < 0.001$]. Model fit was marginally improved for Success given the addition of the Mixed Metaphors variable [$\chi^2(1) = 2.9$, $p = 0.09$].

Does campaign success vary between metaphors?

We also asked whether campaign success varied between the metaphor families. The analysis was limited to campaigns with either only battle metaphors or only journey metaphors; there were 2,458 such campaigns in total, with 2,008 in the positive class of Only Battle (A). Neither models for Number of Donors, Mean Donation, nor Success fit significantly better when Only Battle (A) was added [all $\chi^2(1) < 1.0$].

Does the way metaphors are deployed influence campaign success?

Finally, we were interested in how the way each metaphor was used influenced campaign outcomes. First, using only campaigns that contained at least one journey metaphor, we compared full models for each dependent variable including fixed effects for Journey Salience, Journey Rarity, and Journey Earliness to models omitting these. In total, 1,108 campaigns were included in these first analyses. Model fit for Number of Donors was not significantly improved with Journey Salience [$\chi^2(1) = 1.4$, $p = 0.23$], Journey Rarity [$\chi^2(1) < 1.0$], or Journey Earliness [$\chi^2(1) < 1.0$]. Fit for Mean Donation was not significantly improved with Journey Salience [$\chi^2(1) = 1.1$, $p = 0.30$] or Journey Earliness [$\chi^2(1) < 1.0$], although it was improved with Journey Rarity [$\beta = 0.05$, CI (0.01, 0.09), $\chi^2(1) = 5.9$, $p = 0.02$]. Fit for Success was not significantly improved with Journey Salience [$\chi^2(1) < 1.0$], Journey Rarity [$\chi^2(1) < 1.0$], or Journey Earliness [$\chi^2(1) = 2.4$, $p = 0.12$].

Second, using only campaigns that contained at least one battle metaphor, we compared full models for each dependent variable including fixed effects for Battle Salience, Battle Rarity, and Battle Earliness to models omitting these. In total, 2,666 campaigns were included in these analyses. Model fit for Number of Donors was significantly improved with Battle Rarity [β = 0.07, CI (0.01, 0.12), $\chi^2(1) = 5.4$, $p = 0.02$], but not with Battle Salience [$\chi^2(1) < 1.0$] or Battle Earliness [$\chi^2(1) = 2.0$, $p = 0.16$]. Fit for Mean Donation was not improved by the addition of Battle Salience [$\chi^2(1) = 2.0$, $p = 0.16$], Battle Rarity [$\chi^2(1) < 1.0$], or Battle Earliness [$\chi^2(1) < 1.0$]. Fit for Success was not improved with Battle Salience [$\chi^2(1) < 1.0$], Battle Rarity [$\chi^2(1) = 1.9$, $p = 0.16$], or Battle Earliness [$\chi^2(1) = 2.7$, $p = 0.10$].

Discussion

Across a large number of crowdfunding campaigns, we analyzed the correlation between donation behavior and patterns of metaphor usage. We focused on donations for cancer appeals, which often use well-documented metaphors, because of the lack of naturalistic evidence for metaphor's influence on a real-world behavior, like charitable giving.

The results suggest that campaigns that use at least one metaphor family—regardless of whether it is a journey or battle—attract about 15% more donors and about 11% larger average donations. For comparison, in the same models, an increase in goal amount (a significant non-metaphorical covariate) was associated with about 37% more donors and 13% larger mean donations. It may be the case that readers' understanding of the gravity of cancer relies on being guided by a more familiar, experience derived mapping. This is supported by the fact that campaigns which only used journey metaphors and campaigns which only used battle metaphors

were also associated with increases in both the number of donors and the average donation. Metaphors may not only be a conceptual guide, but, according to work in persuasive communication and social pragmatics, they may influence donors' perceptions of the patient and the author. Reinsch Jr (1974) suggested that figurative language affects the speaker's perceived credibility by increasing their perceived authoritativeness. This may have an impact on how people donate their money: higher credibility is known to encourage individuals to donate to online medical fundraisers (Kim, Kong, Karahalios, Fu, & Hong, 2016). However, the link between metaphor presence and judgements of credibility is still disputed (Sopory & Dillard, 2002). Metaphor's effect on donor behavior may also be attributed to models of illness being shared between the author and the donor, which could influence how donors resonate with and understand the appeal. Through spoken metaphors, Coreil, Wilke, and Pintado (2004) identified shared models of illness that breast cancer patients used in a support group. Ideally, knowing the donor's past relationships with cancer and their models of illness could help differentiate this explanation. All together, there appears to be a strong correlation between the likelihood and magnitude of charitable giving and the presence of a metaphorical frame. This effect may be the result of metaphors structuring donors' conceptualizations about cancer, but other social and cultural influences may be contributing to the persuasiveness of the metaphors used.

The lack of relationship between donor behavior and the family of metaphor suggests, like Flusberg, Matlock, and Thibodeau (2018) claimed, that idiosyncrasies may prevent one metaphor from being universally more apt. Some donors may respond more positively to battle metaphors, other to journey metaphors. As Fetterman, Bair, Werth, Landkammer, and Robinson (2016) argue, it is unsurprising that individual differences may impact the function of each

metaphor family. To increase donor generosity across many individuals, it may help to mix both journey and battle metaphors. We see a strong correlation between campaign success and mixed metaphors. This is consistent with Gibbs and Franks's (2002) proposal that understanding the full impact of cancer benefits from the combined contributions of multiple different metaphors.

The way campaign owners and patients employ these metaphors (which metaphor family they use, using unconventional metaphors, etc.) does not appear to reliably guide behavioral responses in the data we report here. Contrary to Werth (1994), who suggested that sustained metaphors across a text would positively affect mental conceptualizations, we find no relation between the salience of metaphors and campaign success. Furthermore, according to Thibodeau and Boroditsky (2011), we would expect metaphors introduced earlier in the narrative to structure the donor's conceptualization more, helping donors make meaning out of the appeal. Not finding this effect may be the result of donors' careful consideration of the entire text in their decision to relinquish their money; or perhaps framing in the context of cancer doesn't act in the way it does for crime, where the remaining narrative is framed by the initial metaphor. One aspect of the campaign text which could have influenced donors' decisions to give would be the cognitive complexity or coherency of the narrative. More complex or coherent stories could easily influence a donor's perception of the patient, especially if the donor has no positive perception of the patient.

This analysis is limited by being correlational in nature. In the next section, we test if metaphor presence exhibits a causal relationship with donation behavior by manipulating the presence or absence of metaphors in an experimental context.

Study 2

The results reported above provide naturalistic evidence that simply including metaphorical language in a fundraising campaign may compel donors to donate more than they would for campaigns that don't include metaphor. However, given that this evidence is correlational in nature, it is possible that these statistical relationships are spurious. Therefore, we propose and test:

> Donors contribute more to campaigns which employ either battle or journey metaphors compared to campaigns that do not include one of these metaphors.

Evidence for this hypothesis falls in line with much of what has been discussed; namely, that metaphors may evoke not only conceptual structures affecting our thoughts, but carry onwards to affect outward behavior.

Methods

Pilot Study

A pilot study was conducted under a similar experimental design and procedure as presented below. 200 participants were recruited via Amazon Mechanical Turk to complete the short task. Here, the purpose of the pilot data is not to determine the validity of the experiment or to run

null-hypothesis tests; instead, we use the data solely as a measure of the effect's magnitude, which should not necessarily depend on the number of participants assessed.

Participants

Participants for the primary experiment were recruited via Amazon's Mechanical Turk and had US IP addresses. Participants were compensated $0.40 — consistent with the U.S federal minimum wage of $7.25/hr, since the study was expected to take about 3 minutes to complete.

In order to achieve 90% power, we estimated the effect size (ES) of this experiment using the GoFundMe data and models, and data collected from the pilot study. We calculated Cohen's f^2, an ES measuring the variance explained by the metaphor of interest (Cohen, 1988). Based upon these two sources, we take the lesser, $f^2 = 0.0045$ from the pilot data, and calculate a proper sample size with a Type I error rate of 0.05 and 90% power. Thus, there should be 5,468 participants in the study. Naturally, there exist some groups of participants who should be excluded from the analysis: bots, participants who fail to demonstrate comprehension of the stimulus, and participants who identify the manipulation. Firstly, the data was reduced to only participants who self-identify as native speakers of English. Next, to disqualify bots, we included two bot check questions displayed immediately after the participant consents to the experiment. To exclude participants who fail to demonstrate comprehension of the stimulus, we had two qualifications. First, all participants with empty responses to the situation description question were removed. Second, using participants' response times on the main trial, all were removed who spent less than 5 seconds on the page. We assume that no reasonable comprehension of the task could happen in under this amount of time. To exclude participants who identify the

manipulation, those who mention a critical keyword (e.g. "metaphor", "framing", "manipulate", "wording", etc.) in their response to the prompt for their belief about the purpose of the experiment were automatically flagged for manual inspection and possible removal. To account for these exclusions, we added an additional 3% which is about 150, thereby asking for 5,632 participants.

Participants completed the study in a median time of 4.5 minutes. 46.8% and 0.6% of participants were female and non-binary, respectively. All participants were native speakers of English. Ages ranged from 18 - 84 (mean: 37.2, median: 34).

Materials & design

The experiment consisted of a 3 (Metaphor) x 2 (Patient Gender) between-subjects design. The first factor, Metaphor, was the type of metaphor family used: either Battle, Journey, or Literal (i.e. no metaphor). The second, Patient Gender, was the gender of the patient in the campaign, Male or Female. Participants were randomly assigned to each condition. After consenting to participation and reading the experiment instructions, the participants were shown a fictional crowdfunding campaign.

The campaign, written from the perspective of a cancer patient's best friend, asks for donations to mitigate the expenses the patient expects to face. The patient in the campaign was described as suffering from Stage II Lymphoma (a relatively gender-balanced and well-known cancer) and undergoing chemotherapy treatments. The passage was centered on the screen in a design similar to the GoFundMe website, although all potentially confounding cues (e.g. funding goal, amount already pledged, shares on Facebook, etc.) are omitted. The fictional campaign was

titled “Help (**Jennifer/Jason**) recover from ((**her/his**) *battle with/*(**her/his**) *journey with*) Lymphoma!” The campaign text follows, with the Metaphor condition factors in italics and Patient Gender condition factors in bold:

> Anyone who has met my best friend (**Jennifer/Jason**) knows that (**she/he**) has a heart of gold. But after undergoing a complicated thyroid surgery, (**Jennifer/Jason**) was diagnosed with Stage II Lymphoma. (**She/He**) knows that everyday in the near future is going to be (*a battle/a journey/difficult*) with this disease. The doctors say (**she'll/he'll**) need many treatments of chemotherapy and possibly local radiation as well. This is a rough (*fight/journey/situation*) that (**Jennifer/Jason**) now finds (**herself/himself**) in, but (**she's/he's**) ready to (*wage war/travel down this road/overcome these circumstances*) through the coming months of chemo treatments, hospital visits, and medications.
>
> (**She/He**) started (*the fight with/the journey through/undergoing*) chemotherapy the week after (**her/his**) surgery, and (**she/he**) will receive treatments every 21 days for the next 3-4 months. (**Jennifer/Jason**) had a few days of nausea and fatigue following the first (*battle through/journey through/round of*) chemo, but (**her/his**) energy is back up. We’re really hoping that (**she/he**) can (*recover from this fight/walk toward recovery/recover*) and that you can help.
>
> As (**Jennifer's/Jason's**) best friend, I am raising money to help pay for the many expenses that will come along during (*the tough battles/the lengthy road/the*

circumstances) ahead. (**She's/He's**) so strong and wants more than anything to get through this (*fight/journey/experience*). Any little bit helps! We appreciate you all for helping (**her/him**) through this (*difficult battle/bumpy road/tough situation*)! Thank you.

All materials were presented through jsPysch (De Leeuw, 2015). Each section was presented on separate pages, and participants were not permitted to move backward.

Procedure

Participants were told prior to the experiment that they would be contributing to a study on language comprehension and were presented with a crowdfunding campaign and asked to donate some amount to the recipient. Critically, the instructions make clear that each participant would be entered in an opportunity drawing with the chance to win, as a cash bonus, the amount they don't donate. This paradigm follows that of Soyer & Hogarth (2011) and Sussman et al (2015) to encourage more realistic donations. These studies captured meaningful differences in participants' donations to various charities, suggesting that this methodology is capable of soliciting donations that reflect genuine giving. The trial was self-paced and participants continued when they were satisfied with their donation amount.

Two bot/attention check questions were displayed immediately after the participant consented to the experiment. Then, after reading the instructions, the participants were shown on the next screen the fictional crowdfunding campaign that used either the journey frame, the battle frame, or no metaphorical language. Just below the stimulus, participants were asked "How

much would you like to donate to this campaign?" followed by a sliding scale from $0 to $50, incrementing by $1.

After choosing their donation for the fictional campaign, participants were asked on the following screen to explain the patient's situation to a friend in a free-response format. This is used as a source of data to formulate future hypotheses and to act as a comprehension check. Then participants were asked to indicate their agreement with two randomly presented follow-up statements on a 7-point Likert scale (1 = "Strongly Disagree", 7 = "Strongly Agree"). The two statements were intended to be exploratory variables regarding the participants' emotional reactions to the campaigns; they are: "His/Her situation is urgent" and "His/Her situation is one I sympathize with." The pronouns in each statement were changed to correspond with Patient Gender.

Participants were then presented with a series of demographics questions. These first asked for the number of times they have donated to charity in the last 12 months, then include "Have you ever been treated for cancer?" and "Have any of your close friends or family members been treated for cancer?" Participants are also asked for their gender (male, female, non-binary), highest degree or level of schooling completed, income (discretized), age (free-response), and whether or not they are native speakers of English. These questions all had an opt-out option.

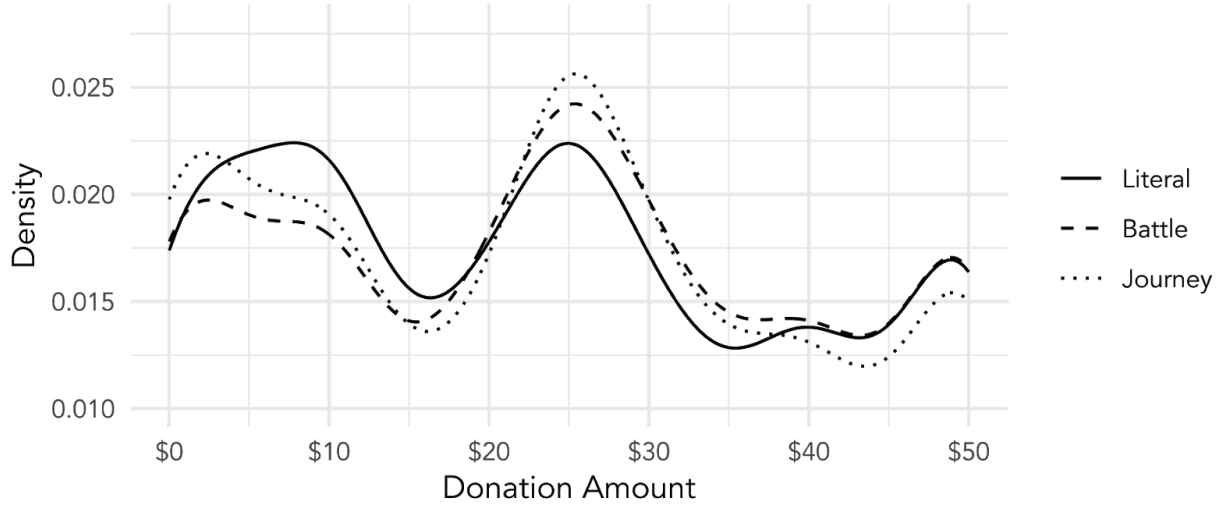

Figure 2: The distributions of donations by Metaphor Condition.

Results

Similar to our observational work, we employed model comparisons to assess our hypothesis regarding whether the presence of metaphor framing affects donation amounts. At the time of writing, data collection is incomplete: 94.2% of the data has been collected. About 100 participants are recorded per day, which implies that all data will be collected in about three to four days. We began by constructing full models including predictors for Patient Gender, characteristics of the participant (past donation behavior, gender, education, socioeconomics, age, whether they have been treated for cancer, and whether a family member or friend has been treated for cancer), and a fixed effect for Any Metaphor. Any Metaphor denoted whether the participant was exposed to either the journey or battle stimuli, as opposed to the literal stimulus.

This full model was then compared to a model omitting only the Any Metaphor term and the difference was measured by a log-likelihood ratio test. 4,585 responses were used in the analysis (with 3,023 in the positive class of Any Metaphor). The inclusion of Any Metaphor did not significantly improve model fit for the donation amount [$f^2 = 10^{-5}$, $\beta = 0.11$, CI (-0.88, 1.09), $\chi^2(1) = 0.05$, ns].

To check the validity of the experimental design, we examined the covariates which have had past work explaining their direct and indirect effects on charitable giving. First, past donation behavior and habitual charitable giving are notable predictors of current donation tendencies (Rosen and Sims, 2011). In line with this, we found that the number of times participants reported to have donated in the past year was a significant predictor of donation amount [$\beta = 2.60$, CI (1.65, 3.56), $\chi^2(1) = 28.7$, $p < 0.001$]. One's gender identity has had conflicting information regarding its influence on donations (Mesch et al, 2011; Greenberg and Mollick, 2015; Simmons and Emanuele, 2015). We found that females donated marginally significantly more than males [$\beta = 0.95$, CI (-0.01, 1.91), $\chi^2(1) = 3.8$, $p < 0.06$]. Social proximity and homophily have also been shown to influence donation and lending behavior (Gafni et al 2014; Galak et al, 2011; Greenberg and Mollick, 2015). Contrary to these results, we did not find a significant effect of gender congruence between the patient and the participant on donation amounts [$\chi^2(1) < 1.0$, ns]. Like Whillans et al (2017), who demonstrated that with higher income, one is more likely to donate to a plea written under an agentic frame (opposed to a communal frame); we did not find a main effect of income on donation amounts [$\chi^2(6) = 9.7$, $p = 13.8$]. According to some work on the motives for donating, experience with similar need is often noted as a significant predictor of charitable giving (Radley and Kennedy, 1995; Midlarsky and

Hannah, 1989). While we did not find a main effect of a linear predictor of age, there was a significant quadratic effect of age [$\beta = 2.61$, CI (0.87, 4.35), $\chi^2(1) = 8.7$, $p < 0.01$]. There were also significant effects on donation behavior of those who had been previously treated for cancer [$\beta = 4.35$, CI (2.05, 6.66), $\chi^2(1) = 17.8$, $p < 0.001$] and those who had had family or friends treated for cancer [$\beta = 1.85$, CI (0.83, 2.87), $\chi^2(1) = 15.5$, $p < 0.01$].

Exploratory Analyses

A set of planned but not confirmatory analyses were also executed. First, we examined the individual effects of each metaphor family's presence. Specifically, we used a framework similar to the main analysis and compared a full model with the Metaphor condition variable to a reduced model without the Metaphor condition variable; first with only data for the battle and literal conditions, and second with only data for the journey and literal conditions. This, in essence, compared the individual effects of battle metaphors compared to literal campaigns and journey metaphors compared to literal campaigns (see Fig. 3). The inclusion of Metaphor given data for the battle condition and the literal condition did not improve model fit [$\beta = 0.74$, CI (-0.41, 1.88), $\chi^2(1) = 1.6$, $p = 0.21$]. The inclusion of Metaphor given data for the journey condition and the literal condition did not improve model fit [$\beta = -0.45$, CI (-1.60, 0.70), $\chi^2(1) = 0.6$, $p = 0.44$]. The inclusion of Metaphor given data for the journey condition and the battle condition did significantly improve model fit [$\beta = -1.15$, CI (-2.31, 0.00), $\chi^2(1) = 3.9$, $p < 0.05$].

The trial design could have unintentionally constrained the participant or not incentivized them to donate the exact amount they may have under a more realistic setting. The strongest evidence for this is the trimodality within the donation distribution (see Fig. 2). Participants may

have been most inclined to donate either $0, $25, or $50, or some nearby amount. $25 was the default value of the slider, so the passive, risk-averse participant could easily have quickly continued the experiment with this decision. Participants were aware that the odds of winning the drawing were slim, which may have encouraged donations near $50. Yet, by nature of the work, some participants may have nonetheless been keen on winning all money offered, thus donating $0. To account for the coarser categorization of donation possibility which participants may have experienced, we grouped participants into three bins, Small, Medium, and Large, according to their donation: $0 - $16.67, $16.67 - $33.33, and $33.33 - $50. Participants in either metaphor condition were significantly more likely to donate a medium amount over a small amount than those in the literal condition were [$\beta = 0.16$, CI (0.01, 0.31), $\chi^2(1) = 4.2$, $p < 0.05$]. Upon inspection, this effect appears to be held together by the difference between those in the battle condition compared to the literal condition [$\beta = 0.2$, CI (0.03, 0.38), $\chi^2(1) = 5.1$, $p < 0.05$], as opposed to the journey condition compared to the literal condition [$\chi^2(1) = 1.7$, $p = 0.19$].

Second, we binned each participant into quartile bins according to their response time[1] on the main stimulus page. We conducted a separate model fit similar to the main analysis, except

[1] Split by quartiles such that Bin 1: 5 to 23 seconds, Bin 2: 23 to 42.7 seconds, Bin 3: 42.7 to 69.3 seconds, Bin 4: 69.3 seconds to 70 minutes

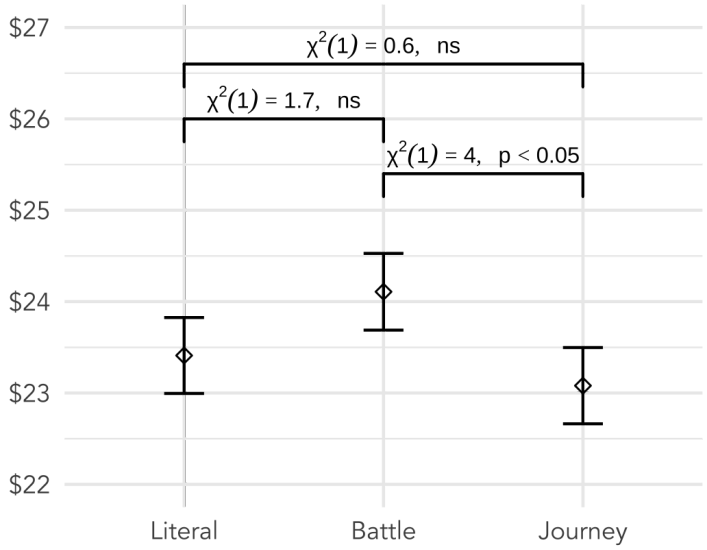

Figure 3: Average donations within each condition, with means and SE bars.

examining the main effect and interaction between the response time bin and the metaphor condition. It may be the case that comprehension of the stimulus, which we believe could be correlated with reading and decision making time, may influence one's donation amount. In reality, participants are not faced with a sudden task to donate, and taking time to understand the situation may be crucial to developing the most authentic donation amount. The inclusion of the categorical response time bin variable significantly improved the model fit beyond what was explained by the covariates and the metaphor condition [$\chi^2(3) = 48.6$, $p < 0.001$]. There was not, however, an interaction between the response time bin and the metaphor condition [$\chi^2(6) = 3.6$, $p = 0.73$].

Lastly, using the responses to the questions about perceived urgency and sympathy toward the patient, we conducted a mediation analysis to explore their role in mediating metaphor's effect on donation amounts. Since the main hypothesis was not supported, but there

was a significant difference between the battle and journey conditions, we tested the role of sympathy and urgency in mediating these relationships. The effect of battle metaphor framing over journey metaphor framing on donation amount was not mediated by perceived sympathy. Via a BCa bootstrap procedure, we tested its significance with 1,000 resamples and 95% confidence intervals, and the unstandardized indirect effect was insignificant (ACME: -0.04, CI: -0.37, 0.24). Thus, the indirect effect of metaphor framing through perceived urgency on donation amount was not significant. The effect of battle metaphor framing over journey metaphor framing on donation amount was fully mediated by perceived urgency. The unstandardized indirect effect of metaphor framing through perceived urgency on donation amount was significant (ACME: 0.49, CI: 0.18, 0.78, $p < 0.01$).

Discussion

Many believe that metaphor may influence behavior (e.g. Lakoff & Johnson, 1980; Landau et al, 2018; Hauser & Schwarz, 2019), however little has been done to measure this in actual behavioral changes. Here, we have attempted to ask not what one might intend to do in a hypothetical situation, but rather we have measured individuals' charitable donations after exposing them to both literal and metaphorical language. Participants read a fictional cancer-related crowdfunding campaign and were asked how much they would donate to it, where they would have a chance to win as a cash bonus the amount they didn't donate. They either read a campaign which used either literal language or was framed by battle metaphors or journey metaphors. We identified a significant difference in donation amounts between the battle and journey conditions, however the average literal condition donation fell between the averages of

these two conditions. Admittedly, the experiment differed from charitable donations in the real world in many important ways, which is why we found it important to study the difference in donation on a coarser scale. Specifically, after grouping donations into small ($0 - $16.67), medium ($16.67 - $33.33), and large ($33.33 - $50) donation groups, we identified that participants in both metaphor conditions were significantly more likely than those in the literal condition to donate a medium amount compared to a small amount. Through observation, many participants selected a donation amount rounded to the nearest $5 increment. This is further evidence that participants did not value the granularity of the scale, but tended toward broader amounts.

Critically, participants perceived the patient's situation as significantly more urgent under the battle condition compared to the journey condition, whereas there was no difference between the battle and journey conditions on how much sympathy the participants felt. Moreover, a mediation analysis demonstrated that urgency fully mediated the donations from those in the battle condition compared to those in the journey condition. A mediation analysis reported that donations were not mediated by sympathy. This paves the path for exploring a potential mechanism of our results. Hurley (2014) questions whether alternatives to the battle metaphor are capable of allowing patients to express the urgency sometimes needed during the experience, but also notes there are times when patience is necessary. Within crowdfunding, it could be important to raise money quickly. Context clearly matters, so battle metaphors may be effective tools for rapidly acquiring funds, but less apt when discussing treatment options or test results with patients.

General Discussion

Cancer patients face a tremendous burden due to the physical demands of the disease and the subsequent treatments. On top of this, they must endure a world void of the vocabulary to express all that they may feel while attempting to communicate with many individuals who have never experienced their struggle. Cancer patients have adopted metaphors as a means to communicate what they experience. Researchers have recognized the consistent use of metaphors by cancer patients across mediums, locations, and languages (Reisfield and Wilson, 2004; Semino et al, 2017; Magaña and Matlock, 2018). Others have demonstrated that the metaphors we use to discuss cancer experiences can influence our thoughts and perceptions about the disease and those who are being treated against it (Hendricks et al, 2018; Hauser and Schwarz, 2019). Yet, despite this evidence, the way one thinks may not necessarily be the way one acts. To address this gap, we have studied one type of real-world behavior, charitable giving, and how it relates to the metaphors used within the cancer domain.

Our first study found a strong relationship between the presence of metaphor and higher donations toward cancer patients on an online crowdfunding site. Our second study tested this finding, and others, in a controlled setting, but failed to find the same pattern. Instead, we found participants donated more to a campaign which employed battle metaphors compared to one that employed journey metaphors. One interpretation for our combined results would follow what's most in line with past work on the implications of battle and journey metaphors. Specifically, battle metaphors are stronger, which could motivate individuals (Landau et al, 2018). It is possible that the driving factor is the level of urgency conveyed by the campaign. We have

evidence that battle metaphors convey stronger urgency than journey metaphors do, and high urgency is likely to engender high support (Sargeant, 1999). Future work should identify the relative levels of urgency between these cancer metaphors and others. However, the GoFundMe analysis was unable to control for important covariates that could mediate the interpretation of journey metaphors, such as socioeconomic status. Should more information about the donors have been known, it may have been the case that journey campaigns received less per donation than battles.

There is also the possibility that the two metaphors do elicit the same magnitude of donations, but we fail to identify this in the experiment as a result of poor wording, specifically in the journey condition. Despite the stimuli language being drawn from actual campaigns, some phrases had to be accommodated to fit all three conditions. As seen in Study 1 and in work by Semino et al (2017), journey metaphors are less common, therefore having the same number of metaphors in each condition may have resulted in an overload of an otherwise rare metaphor. Participants may have been subtly discouraged from higher donations, which harks back to the idea that donors may make implicit judgements on the patient's social agreeableness.

Between both studies, battle metaphors appear to stand out from literal and journey metaphors as potential catalysts of action. Metaphors appear to, perhaps indirectly, influence behavior, and future work should explore other mechanisms which influence behavior, such as the conveyed urgency.

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