Thinking about the future: The role of spatial metaphors for time

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Abstract

People often use spatial language to talk about time, and this is known to both reflect and shape how they think about it. Despite much research on the spatial grounding of temporal language and thought, little attention has been given to how spatial metaphors influence reasoning about real events, especially those in the future. In a large online study (*N*=2362), we framed a discussion of climate change using spatial metaphors that varied on *reference-frame* (ego- vs. time-moving), *speed* of movement (fast vs. slow), and *time horizon* (near, medium, or far future). We found that describing climate change as *approaching* (time-moving frame) – versus something we approach – made the issue seem more serious, but also more tractable, at least when the rate of motion was *fast* (e.g., "it's rapidly approaching"). These findings offer novel insights into the relationship between spatial metaphors and temporal reasoning and how we communicate about uncertain future events.

Keywords: metaphor, space, time, framing, reasoning, future

Introduction

People often talk about time in terms of space (Clark, 1973; Lakoff & Johnson, 1980). Two holidays can be described as *close* together, and deadlines, as *rapidly approaching*. Spatiotemporal metaphors, which underlie such talk, are ubiquitous across cultures (Boroditsky, 2011; Núñez & Cooperrider, 2013). What's more, much research has established that we actually mentally represent and reason about time in terms of space as well, and that this happens in a manner that is consistent with the particular language we use (Boroditsky, 2000, 2011; Boroditsky & Ramscar, 2002; Casasanto, 2005; Casasanto & Boroditsky, 2008; Núñez & Cooperrider, 2013; but see Casasanto, 2016).

A popular method for assessing this claim is to manipulate how someone is thinking about space before asking them to reason about time. In one early study, for example, Boroditsky (2000) showed participants spatial primes that depicted an agent moving towards a goal or an object moving toward an agent, and then asked them to answer an ambiguous temporal question: "Next Wednesday's meeting has been moved forward two days. Which day is the meeting now that its been moved?". English speakers use two spatial reference frames for talking about time: *ego-moving*, which depicts the agent as actively moving through time-space (e.g., "we are approaching retirement") and *time-moving*, which depicts the agent as stationary while events in time move toward them (as in, "the holiday season is approaching"). In the ambiguous 'Wednesday's meeting' question, the implied vector of motion (*forward*) differs depending on which frame you adopt – toward (*time-moving)* versus away from (*ego-moving)* the individual – such that the meeting could now be interpreted as falling either on Monday (*time-moving*) or Friday (*ego-moving*). Boroditsky found that ego- and time-moving spatial primes reliably biased participant responses to the ambiguous question in a metaphor-congruent manner, suggesting that people were relying on active spatial representations to reason about time (see also McGlone & Harding, 1998).

This basic pattern of results has been replicated and extended in many ways, from the use of more ecologically valid spatial primes (Boroditsky & Ramscar, 2002), to non-linguistic measures of temporal reasoning (Casasanto, 2005; Casasanto & Boroditsky, 2008), to cross-cultural comparisons (Boroditsky, Fuhrman, & McCormick, 2010). These data offer converging support for the view that people (frequently) represent and reason about time using their knowledge of space, and that the specific spatial relations that are mapped onto the domain of time are shaped by patterns of metaphor in language (along with other factors like writing direction and cultural values; Boroditsky, 2011; Casasanto, 2016; Núñez & Cooperrider, 2013).

While research has been largely focused on showing links between space and time in the mind, scant attention has been given to whether metaphors influence how people reason about real world events in the future. Do people conceptualize impending events differently when they are described using different spatial metaphors for time?

To address this question, we conducted a large-scale linguistic framing study to assess how people think about negative outcomes associated with climate change. We chose climate change because it is a real-world problem laden with uncertainty. In general, people have a very poor

understanding of what climate change is, what the specific outcomes will be, and what to do about it (see Barnosky et al., 2017). We reasoned that this inherent ambiguity might make it easier to observe the effects of spatiotemporal metaphors on how people think and feel about the issue since people's prior beliefs may be somewhat nebulous.

In our experiment, participants first read a brief article about US efforts to tackle climate change, and then responded to questions about how serious and tractable they viewed the issue. We manipulated whether the report described climate change with the ego- or time-moving *reference-frame*, whether *speed* of movement in time-space was *fast* or *slow*, and whether US conservation goals were situated in a relatively near, medium, or far future *time horizon*.

We hypothesized that using a time-moving reference frame would make the effects of climate change seem more urgent and serious, since this perspective represents the individual as fixed in place, unable to control the arrival of a negative future event. This would be consistent with prior research showing that people who spontaneously adopt a time-moving perspective tend to show higher levels of state and trait anxiety and depression, which are associated with a loss in feelings of agency (Richmond, Wilson, & Zinken, 2012).

However, this increase in feelings of urgency does not imply an increase in pessimism about the tractability of the issue. In fact, it could be the case that the time-moving frame might lead people to view climate change as a *more* tractable problem, given that the individual is free to engage in their own actions on this construal (since they are not occupied with the task of moving through time). This would resonate with research showing that people who spontaneously adopt the time-moving reference frame procrastinate less and are more conscientiousness than those who spontaneously adopt the ego-moving reference frame. (Duffy & Feist, 2014; Duffy, Feist, & McCarthy, 2014). One way of thinking about this is that the decrease in feelings of control (and increase in anxiety) that results from the time-moving frame might lead to a compensatory counter-response, such that people would now be motivated to believe that personal actions are likely to be effective in addressing the problem. In other words, when it feels like you cannot stop a future event from happening, you will feel better if you consequently believe that at least you can deal it when it arrives.

We included the speed manipulation to assess whether the "rate" at which we approach future events (or they approach us) might affect or interact with the temporal reference frame in shaping these attitudes towards climate change. It is plausible, for instance, that faster "motion" would be associated with a greater sense of urgency. The time horizon manipulation was included in part to affect perceptions of whether the US seemed likely to achieve the conservation milestones in the article, which allowed us to assess effects of the other spatial metaphors independently of this judgment (see Flusberg, Matlock, & Thibodeau, in press).

Experiment

Methods

Participants A total of 2400 participants were recruited and paid through Amazon's Mechanical Turk for the study in the Spring of 2016 (Berinsky, Huber, & Lenz, 2012; Buhrmester, Kwang, & Gosling, 2011). We restricted our sample to people living in the US who had a good performance rating (>90%) on previous Turk tasks. Data was not analyzed from 38 participants who did not complete the study (i.e. from participants who did not submit a valid completion code), leaving a sample size of N = 2362. The sample was 46% male and had a mean age of 35.2 years (SD = 11.1).

Materials & Procedure Participants read a brief fictional article that described US efforts to reduce greenhouse gas emissions. It used (1) an ego- or time-moving *frame of reference*; (2) temporal language about climate change as a slow or fast process (*speed*), and (3) identified an outcome on a *time horizon* in the relatively near (2025), medium (2040), or distant future (2115).

As shown in Figure 1, the report began, "In response to the recent Paris Climate Talks, the Associated Press release the following brief statement." The title was presented below this heading in capital letters. The rest of the passage was an appeal for addressing climate change and identified a specific goal for the US: to reduce greenhouse gas emissions by more than 30% by 2025, 2040, or 2115.

In response to the recent Paris Climate Talks, the Associated Press released the following brief statement:

Frame of Reference	Speed: Fast	Speed: Slow
Ego-Moving	WE'RE MOVING QUICKLY TOWARDS DISASTER	WE'RE MOVING SLOWLY TOWARDS DISASTER
Time-Moving	DISASTER QUICKLY COMING OUR WAY	DISASTER SLOWLY COMING OUR WAY

As a result, the United States has pledged to reduce its carbon footprint in the next few decades, approving dozens of projects as part of an effort to reduce greenhouse gas emissions by more than 30% by...

Time horizon	2025	2040	2115

Figure 1. Participants read this report, which varied on frame of reference, speed of change and time horizon.

The body of the report for the ego-moving *frame of reference* condition read (differences by *speed* and *time horizon* conditions are noted in the text):

> We're {rapidly / gradually} approaching the day when it will be too late to prevent the devastating effects of climate change. We will {quickly / eventually} find ourselves in a world that includes more extreme weather conditions, more public health problems, as well as severe economic challenges if we don't start {racing / inching} towards a solution soon. As a result, the United States has pledged to reduce its carbon footprint in the next few decades, approving dozens of projects as part of an effort to reduce greenhouse gas emissions by more than 30% by {2025, 2040, 2115}. The projects will leverage scientific expertise and individual engagement to improve the energy efficiency of cars and

buildings, reduce personal energy use, and increase the use of renewable energies such as wind and solar. Let's avoid the {race / slow crawl} towards disaster!

The body of the report for the time-moving *frame of reference* condition read (differences by *speed* and *time horizon* conditions are noted in the text):

> The day is {rapidly / gradually} approaching when it will be too late to prevent the devastating effects of climate change. If a solution doesn't start heading our way {quickly / eventually}, more extreme weather conditions, more public health problems, as well as severe economic challenges will {swiftly / slowly} appear. As a result, the United States has pledged to reduce its carbon footprint in the next few decades, approving dozens of projects as part of an effort to reduce greenhouse gas emissions by more than 30% by {2025, 2040, 2115}. The projects will leverage scientific expertise and individual engagement to improve the energy efficiency of cars and buildings, reduce personal energy use, and increase the use of renewable energies such as wind and solar. Let's watch out for disaster as it {quickly / slowly} approaches!

Target and Background Questions. After reading the article, participants answered question about whether they thought the US would achieve its climate reduction *goal* in the stated time frame (i.e., by 2025, 2040, or 2115). Then they answered questions about whether they thought the problems of climate change would be *solved*, whether the disastrous effects of climate change were *inevitable* at this point, how *urgent* it is for the US to implement energy reduction programs, and how much *risk* they perceived to be associated with climate change. Participants also answered questions about their *willingness to change their own behavior* to reduce greenhouse gas emissions (see Figure 2).

Dependent Measures:

Goal: The United States will achieve its goal of reducing greenhouse gas emissions by more than 30% by…
1, Strongly disagree, to 5, Strongly agree

Solvable: Humans will inevitably solve the problems associated with climate change, preserving the earth for future generations.
1, Strongly disagree, to 5, Strongly agree

Inevitable: The disastrous effects of climate change are inevitable, and there is nothing we can do to prevent them.
1, Strongly disagree, to 5, Strongly agree

Urgent: How urgent is it for the US to implement energy reduction programs right away?
1, Not at all urgent, to 5, Very urgent

Risk Perception: How concerned are you with the following potential consequences of climate change? (e.g., soil erosion, water drought, economic decline; 13 items; α = .93)
0, Not at all concerned, to 7, Extremely concerned

Behavioral Intentions: Would you be willing to pay a carbon offset cost on future purchases of items derived from fossil fuels? (6 items; α = .87)
1, Definitely no, to 5, Definitely yes

Background Questions:

Belief in Global Warming: I believe that burning fossil fuels increases atmospheric temperature to some measurable degree. (2 items; α = .90)
1, Strongly disagree, to 5, Strongly agree

Political ideology (0, very liberal, 100, very conservative)

Age, Gender, Education, Political affiliation (Democrat, Independent, Republican, or Other)

Figure 2. Dependent measures and background questions.

Most dependent measures were rated on a 5-point scale. One exception was the measure of risk perception, recorded on an 8-point slide bar. The measure of risk perception included 13 items (Cronbach's α = .93). The measure of behavioral intentions included six items (Cronbach's α = .87). All other dependent measures were a single question.

Participants then answered demographic questions about their age, gender, educational history, political ideology (categorically and on a continuum), and about their belief in global warming (two items: "I believe that burning fossil fuels increases atmospheric temperature to some measurable degree" and "I believe that the burning of fossil fuels on the scale observed over the last 50 years has increased atmospheric temperature to an appreciable degree"; Chronbach's α = .90; Lewandowsky, Oberauer, & Gignac, 2013).

Data Reduction. As expected, the dependent measures were correlated with one another. As shown in Table 1, the six measures clustered into two groups: there was a high correlation (a) between the *goal* judgment, assessment of whether climate change would be *solved*, and whether the consequences of climate change were *inevitable* (*r*s > .19), and (b) between the measures of *urgency, risk perception,* and *willingness to change one's behavior* (*r*s > .5).

Table 1. Correlations between the dependent measures. Asterisk indicates statistical significance at the $*p < .001$ level.

	1	2	3	4	5	6
1. Goal		.38*	-.19*	.15*	.15*	.15*
2. Solvable			-.29*	-.04	-.01	-.01
3. Inevitable				-.13*	-.06	-.10*
4. Urgent					.52*	.56*
5. Risk						.55*
6. Behavior						

To further investigate the relationship among dependent measures, we did an exploratory factor analysis: a principal components analysis, using singular value decomposition (Mardia, Kent, & Bibby, 1980). Principal components analysis (PCA) extracts the common variance in measures that are conceptually and empirically related (Dunteman, 1989). The analysis revealed, based on the Kaiser criterion and an analysis of the Scree plot, two major underlying sources of variance in the data, consistent with the pairwise correlations in Table 1. As shown in Table 2, the first factor loaded most heavily on the measures of *urgency*, *risk perception,* and *willingness to change*. The second loaded most heavily on the *goal* judgment, whether people thought climate change would be *solved*, and whether they thought the consequences of climate change were *inevitable*.

To analyze the data parsimoniously, we created two composite outcome variables based on the clustering of dependent measures found in the pairwise correlations and exploratory factor analysis. We combined the first three questions, using PCA, into a measure of how *tractable* participants considered the problem of climate change, and the last three questions into a measure of how *serious* participants considered the problem of climate change (see Table 2 for weights used to create the composite measures). The composite measures captured the majority of the variance in the raw data: the measure of how *tractable*

participants' considered climate change to be captured 53% of the variance in the first three questions; the measure of how *serious* participants' considered climate change captured 70% of the variance in the last three questions[1].

Table 2. Factor loadings of exploratory factor analysis and weights used to create composite outcome measures.

	PC1	PC2	*Tractable*	*Serious*
Goal	.27	**.50**	.58	
Solvable	.11	**.66**	.64	
Inevitable	-.20	**-.46**	-.51	
Urgent	**.54**	-.18		.58
Risk	**.53**	-.19		.57
Behavioral intentions	**.55**	-.18		.59

There was a moderate correlation between the two composite measures (*tractable* and *serious*), $r(2360) = .12$, $p < .001$ (in contrast, *pc1* and *pc2* are orthogonal), and both were positively correlated with participants' belief in global warming: *tractable*, $r(2360) = .14$, $p < .001$; *solvable*, $r(2360) = .66$, $p < 001$.

Results

Analysis We conducted our primary hypothesis tests on the two composite measures (i.e. how *tractable* and *serious* people consider climate change to be). We also analyzed the six dependent measures separately in exploratory follow-up analyses. For each analysis, an initial omnibus between-subjects ANOVA is presented with tests for main effects of and interactions between the three experimental manipulations. We show the results of the two ANOVAs, along with the coefficients from the corresponding linear regression models in Tables 3 and 4. *Time horizon* (2025, 2040, 2115) was treated as an ordinal variable; *frame of reference* (ego- versus time-moving) and *speed* (fast versus slow) were treated as factors.

To account for the primary source of variance in the dependent measures, we included participants' *belief in the anthropogenic origins of climate change* as a covariate, although this did not affect the reliability of the results. To address secondary research questions (e.g., who is affected by manipulating the *reference frame*?), we tested for 2-way interactions between the experimental manipulations and participants' belief in global warming.

Serious The results of a model in which the *Frame of reference* (ego- or time-moving), *speed* (fast or slow), and *time horizon* (2025, 2040, or 2115), as well as participants' *belief in global warming*, were used to predict how *serious* people consider climate change to be (see Table 3). The strongest predictor of *seriousness* was participants' *belief in global warming*. People who recognized the anthropogenic origins of climate change thought the issue was more *urgent*, recognized more *risk*, and were more *willing to change their behavior* to reduce greenhouse gas emissions.

The model also revealed a main effect of the *frame of reference*, qualified by an interaction with participants' *belief in global warming*. Overall, participants were more likely to think of climate change as an *urgent* issue with important *risks* worthy of *behavior change* in the time-moving condition ($M = .06$, $SD = 1.44$), compared to the ego-moving condition ($M = -.05$, $SD = 1.52$). This was especially true for people who were skeptical about the anthropogenic origins of climate change, likely due to a ceiling effect on this measure for non-skeptics.

Table 3 Effects of experimental manipulations and belief in global warming on perceptions of the *seriousness* of climate change. The results of the ANOVA ($df_1 = 1$ and $df_2 = 2350$ in every case) are shown in the first column; regression coefficients (and standard errors) are shown in the second column.

	F(p)	*B (SE)*
Intercept		0.00 (.02)
Time horizon	0.63 (.429)	-0.03 (.03)
Speed: Slow	0.05 (.818)	0.00 (.02)
Frame of reference: Time	4.55 (.033)	0.01 (.02)
Belief in global warming	1775.65 (< .001)	0.95 (.02)
Time horizon * Speed	0.51 (.475)	0.02 (.03)
Time horizon * Frame	0.84 (.359)	0.03 (.03)
Speed * Frame	0.04 (.839)	0.01 (.02)
Time horizon * Belief	1.41 (.236)	0.04 (.03)
Speed * Belief	1.55 (.213)	-0.03 (.02)
Frame * Belief	4.66 (.031)	-0.05 (.02)
Time * Speed * Frame	2.06 (.151)	0.04 (.03)

Separate analyses on "raw" questions about *urgency, risk perception*, and *behavioral intentions* yielded consistent results. For example, people reported perceiving more *risk* in the time-moving *reference frame*, $B = .43$, $SE = .20$, $p = .032$. Perceptions of *risk* were related to *beliefs about global warming*, $B = 1.01$, $SE = .04$, $p < .001$. These predictors also

[1] We created the composite outcome measures using two separate PCAs because we wanted the outcome measures to clearly reflect participants' responses to the original questions. For example, as shown in Table 2, *pc1* primarily reflects variability in judgments of *urgency*, *risk perception*, and *willingness to change one's behavior*, but it also loads onto the other three judgments; *pc2* loads positively on the first two questions (*goal* and *solvable*) and negatively on the remaining four (*inevitable*, *urgent*, *risk*, *behavioral intentions*). These patterns of weighting the original questions present some difficulty in interpreting what each factor actually reflects (e.g., *pc2* mostly reflects an optimistic outlook regarding our capacity to address climate change, but also, to a lesser degree, reflects the inverse of judgments of *urgency, risk perception,* and *willingness to change one's behavior*). In contrast, conducting separate principal components analyses—one on the first three questions, one on the last three questions—yields two outcome variables that clearly correspond to the original questions: *tractable* is tightly correlated with the three questions used to create it (*goal*, $r = .73$; *solvable*, $r = .80$; *inevitable*, $r = -.64$) and only slightly correlated with the other three questions (*urgency,* $r = .10$; *risk perception*, $r = .09$; *behavior*, $r = .10$); *serious* is tightly correlated with the three questions used to create it (*urgency,* $r = .83$; *risk perception*, $r = .82$; *behavior*, $r = .85$), and only slightly correlated with the other three questions (*goal*, $r = .18$; *solvable*, $r = -.02$; *inevitable*, $r = -.11$).

interacted, B = -.12, SE = .05, p = .029, suggesting that the effect of the *reference frame* most strongly affected people who reported skepticism about climate science.

Finally, the exploratory analyses of participants' responses to questions of *urgency, risk perception*, and *behavioral intentions* suggested that one effect was obscured by analyzing the composite measure: of *speed* on perceptions of *urgency*. Participants reported that global warming was a more *urgent* issue to address when the language suggested that the climate was changing quickly, B = .27, SE = .14, p = .049, regardless of *time horizon* or *frame of reference*.

Tractable The results of a model in which the *Frame of reference* (ego- or time-moving), *speed* (fast or slow), and *time horizon* (2025, 2040, or 2115), as well as participants' *belief in global warming*, were used to predict judgments related to how *tractable* people consider climate change to be (see Table 4). Consistent with the analysis of how *serious* people consider the issue, the strongest predictor in the model was participants' *belief in global warming*. People who recognized the anthropogenic origins of climate change were more optimistic about being able to address the problem, probably due to the fact they are the ones who think it is a problem in the first place. There was also a main effect of the *time horizon* manipulation: people considered the issue more *tractable* when the specific goal was situated in the distant, as opposed to the near, future.

Table 4. Effects of manipulations and belief in global warming on perceptions of *tractable-ness* of climate change. ANOVA results (df_1 = 1 and df_2 = 2350 in every case) are in the first column; regression coefficients (and standard errors) are in the second column.

	F (*p*)	*B (SE)*
Intercept		0.00 (.03)
Time horizon	8.29 (.004)	0.07 (.03)
Speed: Slow	0.00 (.981)	0.00 (.03)
Frame of reference: Time	1.34 (.247)	0.02 (.03)
Belief in global warming	43.04 (< .001)	0.17 (.03)
Time horizon * Speed	1.94 (.164)	-0.04 (.03)
Time horizon * Frame	0.02 (.888)	0.00 (.03)
Speed * Frame	3.11 (.077)	0.05 (.03)
Time horizon * Belief	6.42 (.011)	-0.08 (.03)
Speed * Belief	0.22 (.638)	-0.01 (.03)
Frame * Belief	0.22 (.643)	-0.01 (.03)
Time * Speed * Frame	0.56 (.454)	0.02 (.03)

Finally, there was an interaction between participants' *belief in global warming* and the *time horizon*. The effect of the *time horizon* manipulation was driven by participants who were more skeptical about climate science. For example, among participants who reported the most skepticism about climate change (a score less than 2 on the measure of *belief in global warming*; n = 196), there was a relatively large effect of the *time horizon* manipulation (M_{2025} = -.75, SD = 1.34; M_{2040} = -.57, SD = 1.44; M_{2115} = -.11, SD = 1.31), F(1, 194) = 8.652, p = .004. In contrast, among participants who reported the strongest belief in climate science (a score greater than 4 on the measure of *belief in global warming*; n = 668), there was no effect of the time horizon manipulation (M_{2025} = .10, SD = 1.22; M_{2040} = .10, SD = 1.40; M_{2115} = .19, SD = 1.35), F(1, 194) = 0.36, p = .551. In other words, people who reported a belief in climate science tended to be optimistic about the issue, regardless of the *time horizon* of the goal, whereas people who were skeptical about climate science were more likely to think the issue would be solved on a more distant *time horizon*.

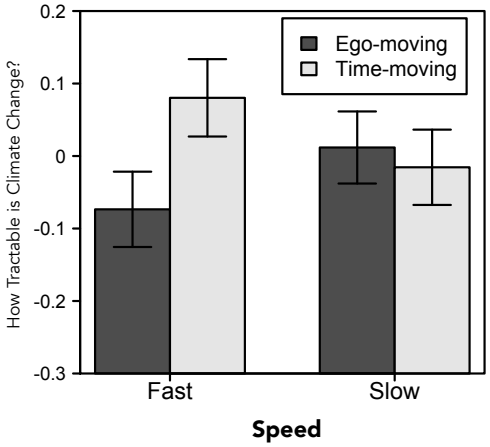

Figure 3. Participants' perception of the *tractability* of the problem of climate change, as a function of the *reference frame* and *speed*. Error bars denote SEMs.

The omnibus test also revealed a marginal interaction between the *speed* manipulation (whether the effects of climate change were described as happening quickly or slowly) and the *frame of reference* (ego- or time-moving). As shown in Figure 3, there was an effect of the *reference frame* when the report described the effects of climate change as occurring quickly (but not slowly). In the fast *speed* condition, participants were more optimistic about solving climate change on the time-moving *reference frame* compared to the ego-moving *reference frame*, t(1160) = 2.07, p = .039. In the slow *speed* condition, there was no effect of the *reference frame,* t(1198) = 0.38, p = .704.

Discussion

Time is highly abstract, but people manage to talk and think about it by drawing on spatial language and knowledge (Boroditsky, 2011). In this paper, we examined how particular spatial metaphors used to describe uncertain future outcomes would affect how people think about an important issue. So, instead of focusing on *whether* people reason about time using spatial representations, we looked at how different spatial construals would affect how they think about a real-world event. In a large online study, we framed a discussion of US efforts to tackle climate change using spatial metaphors that varied according to *reference-frame*

(ego- vs. time-moving), *speed* of movement (fast vs. slow), and *time horizon* (near, medium, or far future).

People appeared to be more optimistic about solutions for climate change with a more distant time horizon (implying there would be more time to address it). This was especially true for people who were skeptical of climate science, which probably reflects a ceiling effect for those who are more inclined to accept the scientific consensus.

More interestingly, and consistent with our initial hypothesis, climate change seemed more *serious* and urgent when described with a time-moving metaphor than with an ego-moving metaphor. This supports the view that talking about uncertain future events as approaching of their own accord may be associated with additional anxiety surrounding the issue. Because this effect was actually most pronounced for people who were skeptical about climate science (again suggesting a ceiling effect for non-skeptics), this finding may have important practical applications for policy makers and climate science communicators. We also observed some suggestion that metaphorical *speed* affects this sense of *urgency*, such that fast "motion" language makes people think the issue is more urgent.

Also consistent with our initial prediction, the *reference frame* appeared to affect perceptions of the *tractable-ness* of the issue of climate change, though only when the process was described as happening quickly: people felt the issue was more tractable on the time-moving *reference frame* when climate change was said to be occurring rapidly. This may arise from the increased sense of urgency and risk surrounding the issue on the time-moving frame – to effectively compensate for this increase in existential anxiety, people may come to view the problem as something they can actually address through concerted action.

Though preliminary, these findings have shed some new light on how metaphor can affect reasoning – both in general and for an issue with real world consequences. Taking a nuanced approach like this to investigating metaphor has the potential to advance our understanding of how metaphor works in the context of communicating about real world problems.

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