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When do Metaphorical Frames Exhibit Psycholinguistic Effects? The Case of the Ego-Moving and Time-Moving Metaphor in Climate Change

ABSTRACT

In this paper we discuss the framing effects of the ego- vs. time-moving metaphor in relation to climate change. Previous studies have found that time-moving metaphors (e.g., *climate disaster is approaching us*) led participants to assess the urgency and perceived risk of climate change as higher than ego-moving metaphors (e.g., *we are approaching climate disaster*). Our results did not show the framing effect of metaphor, but observed individual differences in participants' political orientation. We discuss factors that may influence framing and argue for a non-reductionist perspective of discourse or experimental studies.

Keywords: framing effects, metaphor, ego-moving, time-moving, climate change

1. Introduction

Metaphor is a way to understand and conceptualize one domain in terms of another (Lakoff & Johnson, 2003). Metaphors in discourse are used as framing devices (Semino et al., 2018; Thibodeau, 2017). This refers to imposing a frame of interpretation, whereby some aspects of reality are hidden, whereas others are highlighted (Goffman, 1986, p. 21). For instance, *fight against climate change* vs. *race against climate change* frame climate change as a fight/war or a race, respectively. The latter expression highlights the need to act quickly (to win the race), but hides the potentially dangerous consequences that the fight/war metaphor draws attention to.

Alternative metaphorical frames may lead to different evaluations of and affective reactions to reality (Stanojević & Šarić, 2019), perpetuating varied ideologies. A range of qualitative discourse studies have made such claims, with

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the dehumanization of refugees, asylum seekers, and immigrants garnering special attention (Musolff, 2015; Tsakiris et al., 2019). Framing effects of metaphor have also been observed in psycholinguistic studies, for instance in advertising (Burgers et al., 2015), crime (Vasquez et al., 2014) or health (Landau et al., 2019). Recently, a number of meta-analyses, both more general (Thibodeau et al., 2017; van Stee, 2018) and more specific ones (dealing with a single topic such as politics, e.g., Boeynaems et al., 2017a; Brugman et al., 2019) have shown that metaphor framing effects may be influenced by factors relating to the source domain, the target domain and individual factors.

In this paper we discuss another oft-studied metaphor, that of the moving ego vs. moving time (Gentner et al., 2002), and its relation to climate change. It has been found that time-moving metaphors (e.g., *climate disaster is approaching us*) lead participants to assess the urgency and perceived risk of climate change as higher than ego-moving metaphors (e.g., *we are approaching climate disaster*) (Flusberg et al., 2017b). This is in line with psycholinguistic studies which have observed that ego-moving metaphors (vs. time-moving metaphors) cause participants to be more optimistic (Lee & Ji, 2014; Margolies & Crawford, 2008; Richmond et al., 2012), probably because they feel more in control (Mikša & Tonković, 2018). The research has turned full circle back to discourse studies, which have found that ego-moving metaphors in discourse are preferred with a positively anticipated event and time-moving metaphors with a negatively anticipated one (Piata & Soriano, 2022).

Still, not everything is entirely clear. For instance, in addition to the role of metaphor, Flusberg et al. (2017b) found that participants' belief in the reality of climate change was particularly important for their assessment of urgency. Moreover, they varied other factors alongside metaphor, and the speed of climate change (rather than the ego- vs. time-moving metaphor) had the greatest influence on the perceived urgency. Furthermore, with faster moving changes, participants were more optimistic when the time-moving metaphor was used, which is contrary to other studies. Therefore, it is worthwhile to simplify the design, and vary only the metaphor without the additional elements. Such an approach may be helpful in specifying the factors that may lead to metaphorical framing effects in discourse.

Given all this, in this paper we present a study of the effect of the ego- vs. time-moving metaphor (e.g., *we are approaching climate catastrophe* vs. *climate catastrophe is approaching*) on the feeling of urgency and willingness to act concerning climate change. In contrast to Flusberg et al. (2017b), we use a simpler design, testing only metaphorical framing. Based on our results and previous literature, we discuss several factors contributing to the potential impact of metaphorical framing. We then look into the relationship between psycholinguistic experiments vs. discourse studies in this area.

This paper is organized as follows. The next section presents the aims and hypotheses, section 3 presents the methods, section 4 the results, followed by a discussion and a conclusion.

2. Aims and hypotheses

In this study we investigate whether ego- vs. time-moving metaphors frame how participants see climate change. In line with the literature, we hypothesize that the time-moving metaphor will result in climate change being seen as more serious, urgent, concerning, and behavior change inducing in relation to the ego-moving metaphor.

3. Method

Participants. To test our hypothesis, we recruited 458 native speakers of English (56.1% women) from the USA via the Prolific platform. Their average age was 36.4 ($SD = 12.1$; range 18 to 81). Most participants (50.1%) identified as Democrat, 13.9% participants identified as Republican and 28.8% identified as independent. Most participants completed high school (29.2%) or college (42%).

Materials and procedure. Participants were randomly assigned to one of two conditions: reading a text on climate change with ego-moving metaphors ($N = 215$) or the same text with time-moving metaphors ($N = 246$). The text (see Appendix) is based on Flusberg et al. (2017b) and Flusberg, Matlock, and Thibodeau (2017a)[1].

After reading the text, the participants assessed:

a) the inevitability of climate change – by rating their agreement with the statement "The disastrous effects of climate change are inevitable and there is nothing we can do to prevent them" on a scale from 1 ("strongly disagree") to 5 ("strongly agree");

b) the solvability of the problem – by rating their agreement with the statement "Humans will overcome climate change and its impacts" on a scale from 1 ("strongly disagree") to 5 ("strongly agree");

c) urgency – by answering the question "How urgent is it for the world to take action to stop climate change?" on a scale from 1 ("not at all urgent") to 5 ("very urgent");

d) their concern – by answering three questions about their concern that life on Earth, their life and lives of people in the future will change because of climate change on a scale from 1 ("not concerned") to 5 ("very concerned"). These ratings were highly correlated (all $r > .73$ or higher) and we combined them to form an average rating of perceived concern about climate change (Cronbach's $\alpha = .92$);

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[1] The study obtained the ethics approval from the Department of Psychology Ethics Committee, Faculty of Humanities and Social Sciences, University of Zagreb.

e) their willingness to change – by answering five questions about their willingness: to pay a carbon offset cost on future purchases of items derived from fossil fuels, to contribute money toward education initiatives designed to teach people about risks associated with climate change, to decrease the use of air conditioning and heating in order to reduce their carbon footprint, to decrease the use of goods and services that contribute to greenhouse gas emissions and pollution and to decrease the intake of agricultural products that derive from farming techniques known to contribute to climate change on a scale from 1 ("definitely no") to 5 ("definitely yes"). These ratings were also correlated (all $r > .$ 53 or higher) and we combined them to form an average willingness to change rating (Cronbach's α = .91).

As a manipulation check, we asked participants to rate their emotional reaction to the text ("How did you feel while reading this text?") on a scale from 1 ("not at all distressed") to 5 ("very distressed").

At the end, in addition to demographic questions about age, gender, education and political party orientation, participants indicated their political orientation on a continuous scale from 0 ("very liberal") to 10 ("very conservative") and rated their belief in climate change ("How convinced are you that climate change is happening?") on a scale from 1 ("not at all convinced") to 5 ("completely convinced").

4. Results

The results show no effect of the ego- vs. time-moving metaphor on inevitability, solvability, urgency, concern, willingness to change their behavior or emotional distress because of reading the text. The results are very similar between the two metaphors, and none of the differences are significant, as shown in Table 1.

Table 1. Descriptive statistics of the ratings in two experimental conditions and results of t-tests

	Ego-moving metaphor		Time-moving metaphor		*t-test*
	M	SD	M	SD	
inevitability	2.18	1.08	2.30	1.05	$t(458) = 1.22; p > .05$
solvability	2.87	1.02	2.94	1.00	$t(459) = 0.74; p > .05$
urgency	4.35	1.03	4.46	0.97	$t(459) = 1.10; p > .05$
concern	4.04	1.05	4.04	1.06	$t(453) = 0.08; p > .05$
willingness to change behavior	3.46	1.07	3.41	1.08	$t(459) = 0.48; p > .05$
emotional distress	3.30	1.11	3.27	1.21	$t(459) = 0.31; p > .05$

Overall, participants were mostly convinced that climate change was happening ($M = 4.42$; $SD = 0.98$; C = 5). This correlated with political orientation assessed on a scale, with more liberal participants being more convinced that climate change was happening ($r = -.62$; $p < .01$). Moreover, participants who were more convinced that climate change was happening gave higher assessments of urgency, concern and willingness to change (respectively: $r = .78$, $p < .01$; $r = .75$, $p < .01$; $r = .61$, $p < .01$). Similarly, political orientation correlated with the assessment of urgency, concern and willingness to change (respectively: $r = -.58$, $p < .01$; $r = -.55$, $p < .01$; $r = -.52$, $p < .01$), with more liberal participants giving higher ratings.

Participants who were more convinced that climate change was happening also gave lower ratings of its solvability ($r = -.28$; $p < .01$) and of the inevitability of its disastrous effects with there being nothing that could be done to stop the change ($r = -.14$; $p < .01$), although these correlations were fairly low.

5. Discussion

Our results show that the ego-moving vs. time-moving metaphor had no framing effect on the assessment of the inevitability of consequences, solvability of the problem, urgency, concern, willingness to change one's behavior or the emotional distress upon reading the text. Instead, political orientation was correlated with the belief that climate change was happening, and both correlated positively with the feeling of urgency, concern and willingness to change. Non-skeptics were also less prone to believing that climate change was inevitable or that there was nothing people could do to change it, but were, at the same time, less optimistic about being able to deal with it. This may mean that non-skeptics believe that not enough is being done to stop climate change.

In contrast to our findings, Flusberg et al. (2017b) found framing effects of the two metaphors. The main difference between their study and ours was that, alongside metaphor, they manipulated the time when the changes were going to happen, and how fast. Therefore, they found complex effects between these factors and the ego- vs. time-moving metaphor. Still, they found (non-)skepticism towards climate change to be the strongest predictor of seriousness and tractability of climate change (Flusberg et al., 2017b, pp. 364–365). This makes our finding that participants' (non-)skepticism towards climate change influences their attitudes unsurprising. In Flusberg et al's study, however, skeptics were more susceptible to the framing effects of metaphor, which they ascribe to ceiling effects for non-skeptics (Flusberg et al., 2017b, p. 366).

In our sample the ceiling effect for metaphor may have been reached for all participants, given that the overall belief that climate change was happening in our study was very high. Flusberg et al. (2017b) do not report the average rating for this question. However, another study by the same research group conducted in 2016 (Flusberg et al., 2017a, p. 5) reports values ranging from 3.94 to 3.98,

which is lower than the result we obtained. Of course, the reason for this may be a difference in the sample (with our participants perhaps being more liberal). However, what may have also played a role are the general opinions at the two time points (data from 2016/2017 vs. 2022). Gallup poll data shows a significant increase in the concern about climate change in 2017 (Saad, 2017) in relation to previous periods, with little change since (Saad, 2021). This suggests that general views towards climate change shifted, with everyone being less skeptical. Flusberg et al.'s (2017a) data indirectly corroborates the assertion that external events and political situation at different points in time may influence framing effects. They found differences in urgency and risk perception between data collected at three different time points (Flusberg et al., 2017a, pp. 9–10), which they ascribe to external factors such as hot weather and the elections.

Overall, this is in line with the findings that metaphors do not influence people directly or in the same way, but that figurative framing effects can be moderated by participant opinions (Boeynaems, 2019), political knowledge (Vandeleene et al., 2022) or indeed other external factors such as the elections. Other factors – such as how extended or familiar a metaphor is – may also influence its framing effect (van Stee, 2018). This is another possible reason why Flusberg et al.'s (2017a, 2017b) manipulation of speed and time may have been successful. What may also play a role in framing effects is the topic. For instance, in her meta-analysis of metaphor framing effects (vs. literal expressions), van Stee (2018) found that studies of advertising and crime had a significant positive effect, whereas studies of other topics did not (p. 557). Unfortunately, climate change did not appear in van Stee's study.

Framing effects may also be influenced by the characteristics of the metaphor at issue, e.g., metaphor novelty (van Stee, 2018) or perceived novelty and aptness (Boeynaems et al., 2017b). In our study, the lexical expression of metaphor may be such a factor. The ego- vs. time-moving metaphors used in our study are lexically largely the same, and primarily exhibit a difference in the order of elements rather than (potentially) rich imagery. For instance, our participants read sentences such as *we're heading towards disaster* (ego-moving) vs. *disaster heading our way* (time-moving; see Appendix). In fact, it is difficult to think of a single word that would unequivocally show the difference in framing for these two metaphors. This is in stark contrast to the metaphors for war and race in climate change in Flusberg et al. (2017a), which used the two terms referring to the two source domains: *the war/race against climate change*.

To these factors we would like to add another, often overlooked in metaphor studies (both discursive and psycholinguistic): the grammatical form of metaphor. There is evidence that certain grammatical forms are more likely to be metaphorical than others (Stanojević et al., 2014; Sullivan, 2007). Thus, Sullivan (2007, pp. 134–136) found that metaphors seldom appear in the copulative construction

in running text (only 3.7% of all metaphors were copulative), as opposed to the predicate argument construction featuring the highest overall percentage (47.3% among all metaphors in her material). Note that ours and Flusberg et al.'s (2017a, 2017b) studies primarily used predicate argument constructions. Some studies in different domains which found consistent results, such as Thibodeau and Boroditsky's (2015) study on crime being portrayed as a virus vs. a beast, used the less frequent copulative construction (*Crime is a beast/virus ravaging the city*). Despite its comparative rarity in naturally occurring material, the copulative construction *X is Y* is often considered a typical exemplar of metaphor (the mere fact that we think of conceptual metaphors as TARGET IS SOURCE is an indicator of this). Whether this is a separate factor, or simply increases the perceived aptness of metaphor, is yet to be untangled.

Overall, then, several factors influence the appearance of framing effects. Given the varying evidence between metaphor sources, metaphor targets, different time points, different individual characteristics, etc. we should think of metaphor as a local rather than a global phenomenon (as argued about discursive metaphor by Stanojević, 2019). This means that rather than taking framing effects wholesale, as something that necessarily happens globally, we can think of them more locally: as effects that may happen if particular conditions are satisfied, as has recently been argued Panzeri et al., (2021).

Relating this back to the relationship between psycholinguistic and discourse-based studies, this is precisely where the correspondences between the two research paradigms may be useful. As noted by Thibodeau et al., (2019), the differences in the results (the fact that critical discourse analysis nearly always finds framing effects, whereas psycholinguistic experiments do not) come from their divergent methodologies and aims. Discourse-based studies select their natural material deliberately (p. 190), because metaphors in it were found to be of interest. Thus, they analyze the contextual factors in detail, but idealize the effects on all individuals. In contrast, experimental studies idealize the context (to control the confounding variables) but can report effects. Thus, although the two methods are in a way complementary, we should keep in mind that neither should be reduced to the other. Finding effects using discourse analysis does not mean that these effects are any less real if they are not corroborated by experimentation. By the same token, finding effects through experimentation does not mean that they will be valid for every naturalistic situation, but that does not make the effect any less real. We simply need to strike the right balance between psycholinguistic and discourse-based studies.

6. Conclusion

In this paper we studied the framing effect of the ego- vs. time-moving metaphor (*we are approaching climate catastrophe* vs. *climate catastrophe is approaching*)

on the feeling of urgency and willingness to act with regard to climate change. In line with the literature, we hypothesized that the time-moving metaphor would lead to climate change being seen as more serious, urgent, concerning and lead to greater willingness to change in contrast to the ego-moving metaphor.

In contrast to a previous study (Flusberg et al., 2017b), our results did not show a framing effect of metaphor on the assessment of the inevitability of consequences, solvability of the problem, urgency, concern, willingness to change one's behavior or the emotional reaction to the text. Rather, it was political orientation that correlated with the belief that climate change was happening. We attribute the results to an overall change in how climate change was perceived in earlier research and in our study. In addition to the factors identified in the literature as influencing framing effects, we discuss yet another possible individual factor, that of lexical and grammatical differences between metaphors. Along with other studies, we argue that framing effects should be thought of as effects that may happen in certain conditions rather than across-the-board. On a more general level, this means that neither experimental studies nor critical discourse analyses should be seen as primary or reduced to each other.

Acknowledgements

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Appendix

EGO MOVING
WE'RE HEADING TOWARDS DISASTER

More devastating fires in California. Persistent drought in the Southwest. Record flooding in Europe and Africa. A heat wave, of all things, in Greenland. Because of climate change*, we may also be drawing closer to another pandemic*. All this means that *we're approaching the day* when it will be too late to prevent the devastating effects of climate change. *We are getting dangerously close to a point* when ice loss and other effects of climate change will become irreversible. *Our advance toward this dark future can be stopped*, however, if we transform all facets of our economies. This may sound daunting, but scientists say that *we are coming within reach of this goal*. Still, *we must come to a solution before it is too late*. *We must avoid heading towards climate disaster*.

TIME MOVING
DISASTER HEADING OUR WAY

More devastating fires in California. Persistent drought in the Southwest. Record flooding in Europe and Africa. A heat wave, of all things, in Greenland. Because of climate change, *another pandemic may also be drawing closer*. All this means *that the day is approaching* when it will be too late to prevent the devastating effects of climate change. *The point when* ice loss and other effects of climate change will become irreversible *is getting dangerously close*. *The advance of this dark future towards us can be stopped*, however, if we transform all facets of our economies. This may sound daunting, but scientists say that *this goal has come within our reach*. Still, *the solution must come before it is too late*. *We must avoid the climate disaster heading our way*.