



Review

Personal experience and the ‘psychological distance’ of climate change: An integrative review

Rachel I. McDonald ^{a, b, *}, Hui Yi Chai ^b, Ben R. Newell ^b^a Department of Psychology, University of Kansas, USA^b School of Psychology, University of New South Wales, Australia

ARTICLE INFO

Article history:

Received 28 April 2014

Received in revised form

25 September 2015

Accepted 18 October 2015

Available online 21 October 2015

Keywords:

Climate change

Psychological distance

Personal experience

Mitigation

Adaptation

ABSTRACT

Studies examining personal experiences of climate change-related events highlight the potential to encourage climate action by framing it as happening now, in your neighborhood, and affecting people like you – that is, psychologically *close*. We compare this literature to studies that examine psychological distance. The review reveals a disconnect: while studies of personal experience suggest merits of reducing psychological distance, other studies present a more nuanced picture in which psychological proximity does not always lead to more concern about or action on climate change. Despite its emphasis, psychological distance has not been widely studied in experimental work in the climate change context, and there is a need for more systematic examination of its effects across a range of mitigation and adaptation actions. Further, our review identifies potential pitfalls associated with decreasing psychological distance, such as fear and avoidance. Finally, we provide preliminary recommendations for optimal ways to bring climate change “home.”

© 2015 Elsevier Ltd. All rights reserved.

Contents

1. Psychological distance	110
2. The current review	110
3. Personal experience of weather and climate-change related events	110
3.1. Personal experience and willingness to act	111
4. The psychological distance of climate change	111
4.1. Hypothetical distance	112
4.2. Temporal distance	112
4.3. Spatial distance	113
4.4. Social distance	113
4.5. Mutual influences between dimensions of psychological distance	114
5. Reconciling personal experience and psychological distance	114
5.1. How personal experience and psychological distance diverge	114
5.2. The utility of (sometimes) keeping climate change at Arm's length	115
5.3. Can climate change get too close?	115
5.4. Framing climate change as close in the absence of salient experience	115
6. Psychological distance and construal level	116
7. Future directions	116
8. Conclusion	116
Acknowledgement	116
References	117

* Corresponding author. Department of Psychology, University of Kansas, Fraser Hall, 1415 Jayhawk Blvd, Lawrence, KS 66045, USA.

E-mail address: rachel.mcdonald@ku.edu (R.I. McDonald).

Climate scientists claim that extreme weather events around the globe are inextricably linked to anthropogenic climate change (Trenberth, 2012). Despite this, climate change still appears to be treated by many as a distant phenomenon – temporally, socially, and geographically removed from our everyday experience. Researchers have argued that perceiving climate change in this “psychologically distant” manner decreases the likelihood of coming to terms with the reality and implications of climate change, and thus has the potential to reduce support for mitigating action and even for adaptive behavior (Lorenzoni & Pidgeon, 2006; Milfont, 2010; Newell, McDonald, Brewer, & Hayes, 2014; Rayner & Malone, 1997; Swim et al., 2009; Weber, 2006, 2010).

1. Psychological distance

Psychological distance is a construct referring to the extent to which an object is removed from the self – such as in likelihood of occurrence, in time, in geographical space, or in social distance (Trope & Liberman, 2010). Research from a Construal Level Theory perspective (Trope & Liberman, 2010) has shown that psychological distance (or proximity) tends to be associated with divergent construals of objects and events. When an object is perceived to be psychologically close to the self, it tends to be perceived in more concrete, low level terms, whereas when psychologically distant from the self, objects tend to be construed more abstractly. Concrete construals focus on the details, whereas abstract construals focus more on the “big picture.” These construals may have behavioral and attitudinal implications. For example, if climate change is perceived to be psychologically close (i.e., near to the self), it is possible that people may construe it more concretely, and increase their willingness to take action in line with the concrete threat it poses. In contrast, if climate change is perceived as psychologically distant from the self, people could 1) construe it in more abstract terms, potentially impeding action if the threat is perceived as less real, tangible or relevant, or 2) encourage action if it led to more global, holistic perspectives (i.e., by seeing the “big picture,” realizing the need for action now).

In support of the general contention that psychological distance plays a role in accepting the reality of climate change, a growing literature on the effects of personal experience of weather and climate change-related events (e.g., experience of a drought) highlights how direct contact with events perceived to be related to climate change can increase concern and action on climate change (e.g., Akerlof, Maibach, Fitzgerald, Ceden, & Neuman, 2013; Li, Johnson, & Zaval, 2011; Spence, Poortinga, Butler, & Pidgeon, 2011). Such findings are encouraging in one sense because they suggest that the inevitable reduction in perceived psychological distance to climate change (as climate change impacts are increasingly felt) will, in turn, lead to more ‘climate-positive’ attitudes and behaviors. They also suggest that the optimal strategy for communicators is to reduce perceived distance to climate change to the extent that this is possible. But in another sense these findings on psychological distance are alarming because it is essential to change attitudes and behavior *before* more serious climate impacts occur. Our review attempts to address this challenge for climate change communication.

2. The current review

In the context of this challenge, we examine the extent to which psychological distance can be used to help us understand responses to climate change, and encourage support for climate action. We examine the currently available evidence to ask whether framing climate change as a problem that is happening right now, to people like us, and in our communities – that is, as *psychologically close* –

will necessarily increase people's willingness to accept the reality and implications of climate change.

The complexity of an issue like climate change means that psychological distance, and myriad other factors (e.g., ideology, values and group norms toward climate change) will likely interact to influence behavior. Our review hence explores and provides insight into this potentially complex interaction.

We begin with some preliminaries to acknowledge the scope and limitations of our review. First, we focus only on the four dimensions of psychological distance specified in the literature grounded in construal level theory: spatial, social, temporal and hypothetical (Liberman, Trope, & Stephan, 2007). These dimensions represent the ways in which an object can be distanced from the self in the here and now. Though additional dimensions have been suggested, these four dimensions are at the core of most discussions of psychological distance. Given this focus, we do not review literature on related, but distinct constructs that are not considered dimensions of psychological distance (such as place attachment and place identity¹; cf. Devine-Wright, 2013). However, when applying any conclusions from the study of the effects of psychological distance, especially in the spatial domain, it is important to also consider these additional influences on concern about and willingness to act on climate change.

Second, we acknowledge that when considering the effects of psychological distance in the climate domain the complexity of climate change means that people's perceptions and experiences of climate change are likely to vary much more than when considering the psychological distance of more specific and well-defined events (e.g., the psychological distance of a talk one has promised to deliver next month; cf. Weber, 2006). Given this additional complexity, it is clear that the existing research examining specific instantiations of distance from specific climate change impacts or related experiences among specific populations needs to be broadened considerably. That is, we cannot assume for example, that the effects of manipulating perceptions of the temporal distance of sea level rise will be identical in the American Midwest and in the Pacific Islands (or even Florida). That said, the reactions that have been documented are informative for the populations and behaviors they target, and this review provides a summary of this emerging, and we argue critical, area of research.

Our review first examines the literature on personal experience of events that may be attributable to climate change, and how this relates to climate change belief, concern and action. In the next section we review research examining the effects of psychological distance on each of the four dimensions (temporal, hypothetical, spatial, and social). Finally, we attempt to reconcile the sometimes inconsistent conclusions of research in these areas. We provide suggestions for potentially useful ways to frame the psychological distance of climate change to promote ameliorative action, as well as identify key areas for future research.

3. Personal experience of weather and climate-change related events

In this section we briefly review research implying a link between belief, concern and willingness to act on climate change and

¹ Place attachment and place identity theories focus on “emotional bonds that arise from familiarity, a sense of belonging or ideology that play a role in motivating individuals to attend to, care for and take actions on behalf of particular places” (Devine-Wright, 2013, p.1). These bonds, at both the global and local level, are related to taking action on climate change and other environmental issues. The application of psychological distancing to climate change has been critiqued from this perspective on the basis that it implies global depictions of climate change are necessarily ‘distanced’ and ‘un-situated’ from individuals’ mental worlds.

the personal experience of weather and/or events perceived to be related to climate-change. The aim is to make clear that direct experience of an event – which, under our framework is equivalent to that event being psychologically *close* on all four dimensions – can have positive impacts on accepting the reality of and need for action on climate change.

For example, recent research shows that people accurately perceive changes in climate (Akerlof et al., 2013; Howe, Markowitz, Lee, Ko, & Leiserowitz, 2012), and individuals' perceptions of relatively minor events that may be attributable to climate change, such as weather or temperature anomalies, correlate with a range of measures such as increased perception that climate change is a risk (Akerlof et al., 2013), worry about climate change (Donner & McDaniels, 2013), and belief in anthropogenic climate change (Borick & Rabe, 2012; Egan & Mullin, 2012; Hamilton & Stampone, 2013; Joireman, Barnes Truelove, & Duell, 2010; Li et al., 2011). In a rather different domain, priming of heat-related cognitions has also been shown to increase belief in climate change (Joireman et al., 2010), supporting the assertion that there is a *causal* relationship between personal experience of events associated with climate change, and acceptance of anthropogenic climate change.

The influence of personal experience is, however, not equivalent across the political spectrum. For example, some studies suggest that the effects of personal experience are stronger among (Egan & Mullin, 2012), or unique to (Hamilton & Stampone, 2013), political moderates or independents. This is not surprising given the relatively innocuous nature of the experiences of climate impacts examined in these studies. Presumably, among those who might have an ideological opposition to the acceptance of anthropogenic climate change (cf. Dunlap & McCright, 2008), only extremely serious and salient personal experience would have the potential to influence their views. Similarly, among those already largely convinced about the existence of climate change, weather fluctuations are unlikely to significantly shift their levels of acceptance (Myers, Maibach, Roser-Renouf, Akerlof, & Leiserowitz, 2012).

Other studies have looked at more specific experiences of climate change or related weather events. For example, farmers who perceived greater changes in water availability reported greater belief in and concern about global climate change (Haden, Niles, Lubell, Perlman, & Jackson, 2012). Exposure to hurricanes was associated with a reversal in implicit attitudes toward a "green" politician (Rudman, McLean, & Bunzl, 2013), and those who report flood experience are more concerned about climate change and see it as less uncertain than those who do not (Spence et al., 2011). More broadly, perceived exposure to climate change impacts has been associated with increased belief in, and distress about, climate change (Reser, Bradley, Glendon, Ellul, & Callaghan, 2012). Though in many of these studies, participants reported on experiences such as severe weather without explicitly linking them to climate change, the observed link between these reports and belief and concern about climate change suggests that many are interpreting these experiences in terms of climate change.

3.1. Personal experience and willingness to act

These influences of personal experience extend beyond concern, to willingness to act to combat climate change. For example, farmers who perceived water shortages were more willing to engage in both mitigation and adaptation behaviors, but this was specific to water shortages; there was no relationship between willingness to engage in these behaviors and experience of temperature change (Haden et al., 2012). Interestingly, willingness to adopt mitigation behaviors and willingness to adopt

adaptation behaviors were mediated by global concern about climate change, and concern about local impacts, respectively. These findings suggest that the utility of emphasizing psychological distance versus proximity may vary as a function of the target behavior, and how distant from the self that behavior is perceived. Other studies have found evidence of increased willingness to act in slightly more indirect or abstract circumstances. For example, in a study of donation behavior to environmental groups, people were more likely to make donations when outdoor temperatures at the time the study was conducted were perceived to be warmer, relative to cooler, than usual (Li et al., 2011). Considering more severe climate-related events, those who reported flood experience were more willing to engage in energy conservation to mitigate climate change (Spence et al., 2011). Perceived exposure to climate change impacts was also associated with behavior aimed at reducing one's carbon footprint, such as recycling (Reser et al., 2012); however, given the correlational nature of this data, the direction of the causal link (if one exists) between experience and action is unknown.

The picture that emerges from these studies is that personal experience of weather and climate change related phenomena appears to have an important relationship with climate change beliefs and actions. Clearly more work needs to be done, and heed must be paid to the psychometric properties of the measures used, and the strength of the conclusions drawn (Reser, Bradley, & Ellul, 2014). Nevertheless, people appear to be accurate in encoding changes in climate and perceiving changing patterns in temperature in their local geographic area (Howe et al., 2012). Moreover, these perceptions seem to feed into a process whereby personal experience influences belief in climate change, which reciprocally influences the encoding of personal experience with climate change-related events (Myers et al., 2012).

This emerging pattern is encouraging from both a mitigation and adaptation perspective. It suggests that as climate change impacts are increasingly felt – thus inevitably reducing people's ability to psychologically distance themselves from climate change – acceptance of the urgency for action will intensify. These studies, however, also point to the potential utility of attempting to *decrease* the perceived psychological distance of 'faraway climate change' via the framing of information for the (many) people who may not yet be experiencing salient climate change impacts, or perhaps more crucially, who may not believe that felt impacts are attributable to climate change (cf. Weber, 2006).

4. The psychological distance of climate change

In this section we briefly review studies that have aimed to assess how people perceive the psychological distance of climate change, and/or have attempted to manipulate the different dimensions of distance – hypothetical, temporal, spatial, social – and examined the impact on attitudes and behaviors. The aim is to highlight that 1) although psychological distance has often been singled out as an important barrier to encouraging action on climate change (e.g., Gattig & Hendrickx, 2007; Lorenzoni & Pidgeon, 2006; Milfont, 2010; Rayner & Malone, 1997; Swim et al., 2009; Weber, 2006, 2010), relatively little research has examined how people perceive the psychological distance of climate change; and 2) that although the manipulation of some dimensions of the psychological distance of climate change appear to affect concern and action, there are no studies systematically examining the effects of distance across all dimensions. Nor are there studies examining the effects of psychological distance across a range of different mitigation and adaptation actions. As we note in our conclusion section, these are prime topics for future research to address.

4.1. Hypothetical distance

Hypothetical distance refers to the perceived certainty associated with a future event. Given the complexity of climate change, hypothetical distance can manifest in various ways: it may reflect perceptions about whether climate change is occurring (or will occur), and/or it may reflect perceptions about the extent of climate change impacts, given that it is occurring (or will occur).

One of the few studies that has examined the perceived psychological distance of climate change is that of [Spence, Poortinga, and Pidgeon \(2012\)](#). With regard to hypothetical distance, the majority of their British sample was certain that climate change is happening, but there were higher levels of uncertainty about the extent to which the problem is exaggerated, and what the impacts of climate change will be (i.e., people are more uncertain about severe impacts of climate change). Thus, it appears that people may perceive climate change differently when considering different climate impacts. For example, when experiencing a warmer than usual summer, we may accept that it is caused by climate change, as our personal experience is in line with the warming trends predicted by scientists. In contrast, scientists predict sea level rises of a meter or more, which we are likely to perceive as distal from ourselves, given that current sea level rises (in the range of only millimeters per year) are generally imperceptible. Thus people may perceive more severe climate impacts as being more distal and improbable.

Though Spence and colleagues show that a majority of people in their sample are certain that climate change is occurring, many large scale surveys have shown decreases in belief and concern about climate change in recent years ([Leiserowitz, Maibach, Roser-Renouf, Smith, & Dawson, 2013](#); [Weber & Stern, 2011](#)). Related work has shown that when participants felt that there was widespread disagreement among climate scientists, they were less likely to engage in climate change mitigation actions, or accept the existence of anthropogenic global warming ([Ding, Maibach, Zhao, Roser-Renouf, & Leiserowitz, 2011](#); [Lewandowsky, Gignac, & Vaughan, 2012](#)).

Perceptions of certainty about the very existence of climate change (anthropogenic or otherwise) may be influenced by high profile skepticism in the media. This “manufacture of doubt” appears to underlie decreases in belief and concern about climate change (e.g., [Dunlap, 2013](#); [Jacques, Dunlap, & Freeman, 2008](#); [McCright & Dunlap, 2011](#); [Oreskes & Conway, 2010](#)). Manufactured uncertainty over climate change may contribute to inaction by causing the problem to be seen as more distal, and thus unthreatening, and the global nature of the problem itself may also cause it to be seen as far away, and less certain. These two influences can thus work in concert, with the distal nature of the problem fueling speculation over its certainty, and “manufacture of doubt” contributing to the problem being perceived in a more distal way. In essence, the availability of arguments about the very existence of a problem facilitates psychologically distancing oneself from climate change along the hypothetical dimension (see [Lewandowsky, Oreskes, Risbey, Newell, & Smithson, 2015](#) for a related discussion).

A further challenge for reducing hypothetical distance in terms of climate impacts is that people routinely misunderstand climate change predictions, often misinterpreting probabilities ([Budescu, Por, & Broomell, 2012](#)). This misinterpretation appears to diverge along political lines. Those who tend to believe more strongly that climate change is occurring, such as Democrats, interpret climate change predictions as reflecting higher probabilities than those who identify strongly with the Republican Party. These findings suggest that people may be motivated to make divergent interpretations of a given statement as suggesting climate change is

certain or uncertain in order to maintain consistency with their existing ideology and beliefs ([Kahan, Jenkins-Smith, & Braman, 2011](#)). This processing of information about hypothetical distance in motivationally consistent ways thus influences the likelihood with which individuals believe climate change will result in negative impacts. Thus, while the primary driver of inaction here may be motivated reasoning along ideological lines (cf. [Feygina, Jost, & Goldsmith, 2010](#)), motivated perceptions of hypothetical distance may also give rise to perceived distance along other dimensions (e.g., if it is less likely, then if it will occur at all, it will be farther in the future), with further implications for support of climate action.

The idea that people psychologically distance themselves on the hypothetical dimension is particularly alarming when it comes to the extent of climate change impacts. This is because any uncertainty about impacts should *increase*, rather than decrease, the urgency of ameliorative action ([Lewandowsky, Risbey, Smithson, & Newell, 2014](#)). Though this conclusion might seem counter-intuitive, it simply refers to the fact that uncertainty cuts both ways. One cannot only focus on the lower end of predictions; one has to consider the whole range. For instance, if you can predict with absolute certainty that sea levels will rise by 50 cm, then it is a simple matter to build a levee that can cope with this. But as soon as there is uncertainty around that estimate, it has a downstream effect for mitigating action. For example, a relatively small amount of uncertainty in estimates of sea level rise means building a levee almost twice as high as the one in the no-uncertainty scenario ([Lewandowsky, Risbey, Smithson, Newell, & Hunter, 2014](#)). The conclusion is that the more uncertainty there is about the evolution of the climate, the more urgently we should act. Thus efforts to reduce psychological distance by addressing the hypothetical dimension, or educating people about why ‘uncertainty does not equal reason for inaction’ are extremely important foci for future research.

4.2. Temporal distance

Even if one accepts that climate change is happening, and that the impacts will be severe, one might still feel psychologically distant from climate change because the potential impacts are a long way in the future. National polling data from the U.S. lends some support for this idea revealing that while people may perceive that impacts are occurring now, they tend to see *severe* impacts affecting a large number of people as occurring in the relatively distant future – after 2050 ([Leiserowitz, 2005](#)). More recent assessments, however, such as the [Spence et al. \(2012\)](#) study found that respondents most commonly reported that Britain is already experiencing the effects of climate change (41%) and less than 5% of respondents thought the effects were more than 50 years away. These differences could reflect the increase in climate-related weather events of the last few years (or those perceived to be climate-related), but the overall picture suggests that perceptions of the psychological distance of climate change on the temporal dimension may be moderated by the nature of the impacts being considered. Though the [Spence et al. \(2012\)](#) data does not discriminate between type of impacts, more severe impacts such as major sea level rise may tend to be perceived more distally as they are more distinct from the status quo, whereas minor impacts, such as local temperature increases, may be perceived to be nearer. Given that such variations already occur on a seasonal basis, it might allow people to relate them more easily to their existing experience. Though for many severe climate change impacts actually *are* more distant, these perceptions could still contribute to severe, relative to more moderate, effects of climate change being seen as both hypothetically and

temporally far away.

One relevant study from the temporal domain manipulated the perceived time until the onset of climate change impacts, and examined the extent to which distant future impacts were discounted when considering potential mitigating behaviors (Nicolaij & Hendrickx, 2003). Perhaps surprisingly, the willingness to change relevant environmental behaviors only depended on outcome delay for about half of the participants. That is, fifty percent of the sample reported lower willingness to change when impacts were further away, whereas the other half were unaffected by the timing of the impact. This finding is only partially consistent with standard results in the temporal discounting literature (i.e., that people tend to show a 'present bias' by valuing outcomes occurring in the future less than outcomes occurring immediately) – a pattern often captured via a hyperbolic discount function (e.g., Kirby, 1997). Other studies examining environmental outcomes have found more typical patterns of discounting. For example, Hardisty and Weber (2009) showed that people prefer a small environmental benefit now (e.g., 21 days of improved air quality) to a larger one in the future (35 days of improved air quality one year from now). But others, for example Böhm and Pfister (2005), have only found weak evidence for temporal discounting in (non-climate change-related) environmental risk scenarios (e.g., oil leaking into the sea) (see also Hendrickx & Nicolaij, 2004).

While psychological distance is not necessarily invoked to explain such effects, some research has implicated subjective distortion in the perception of time (i.e., temporal distance) as playing a role in determining the shape of the hyperbolic function that describes inter-temporal choice (e.g., Zauberman, Kim, Malkoc, & Bettman, 2009). In other words, one reason why we sometimes show a 'present bias' is because like most other psychological variables such as perceived size or weight, time may be perceived in a manner that is non-linearly related to actual time. In consequence, differences between temporally proximal events may be perceived as being disproportionately greater than physically equal differences between temporally distant events. Such an account predicts that attempts to manipulate perceptions of temporal distance will impact the degree of present bias observed (e.g., Zauberman et al., 2009). To date, this idea has not been tested with environmental outcomes, but these initial findings suggest a possible avenue for manipulating or priming temporal distance in an effort to reduce the psychological distance of climate change impacts along the temporal dimension. Such research may also shed light on apparent inconsistencies in temporal discounting across domains (e.g., monetary and environmental).

4.3. Spatial distance

One might be prepared to accept that climate change is a) happening, and b) happening now, but still perceive it as psychologically distant because its impacts are elsewhere. For example, people tend to perceive the impacts of climate change to be geographically *close*, but also that the effects will be more serious in geographically *distant* areas (Spence et al., 2012). Moreover, people perceive that future environmental conditions will be worst in geographically distant areas (Gifford et al., 2009). Similarly, individuals show a moderate tendency to perceive the impacts of climate change to be more serious in the developing world than in their local area (Reser et al., 2012), and environmental problems as more serious at the global rather than local level (Uzzell, 2000).

This asymmetry may arise due to a motivated desire to avoid threatening information (cf., Shepherd & Kay, 2012). That is, confronted by evidence for a serious threat such as climate change, people may be motivated to see the location of impacts as far from

themselves, without explicitly denying the veracity of the science behind such predictions. However, these asymmetries may also reflect the likely reality that developing countries with poorer infrastructure will be more severely impacted by changing climates (Jamieson, 2010). These results again suggest that people may see more benign aspects of climate change (such as warmer summers) as psychologically close, but perceive the threat of severe impacts (like major sea level rise) as relatively distant. The possibility of simultaneously perceiving the psychological distance of an attitude object (climate change) in divergent ways suggests an important opportunity for careful framing to promote perceptions congruent with taking action on climate change.

Spence and Pidgeon (2010) examined the effects of framing climate change impacts as occurring at local versus distant locations. Their results indicated that, independent of whether they were framed in terms of gains or losses, climate change impacts are perceived as more severe when occurring in distant, as opposed to local areas. This is in line with survey findings about perceptions of spatial distance, and the suggestion that people may be motivated to perceive more severe impacts of climate change in more distal ways. However, it is important to note that this finding refers to *perceptions* of climate change. Participants were significantly more positive in their attitudes toward climate change mitigation when the effects were framed as occurring locally. Other research has also shown that perceptions of spatial distance may be linked to different types of climate action. Brügger (2013) demonstrated that perceptions of global risk were linked to support for climate change policy, whereas the perception of local climate risk was associated with individual behavior intentions in samples of the public in the UK and Switzerland.

These findings may indicate that distance or proximity in one dimension of psychological distance influences perceptions of psychological distance in other dimensions. That is, people may see more spatially distant impacts as more severe, but be more willing to support mitigation when effects are near, not only for self-serving reasons, but also because these impacts also appear psychologically close on other dimensions such as hypotheticality and temporal distance. As well as differing as a function of severity, there is evidence that perceptions of psychological distance may have divergent implications for concern and action (Spence et al., 2012), with more spatially distal impacts linked to behavioral willingness to engage in mitigation actions, and more spatially proximal impacts linked to concern about climate change.

4.4. Social distance

Turning to the final dimension, if one accepts the reality, imminence and relative locality of climate change impacts, one might still distance oneself personally from those impacts – i.e., treat them as *socially distant*. In contrast to this view, the Spence et al. (2012) study showed that in their sample there was a perception that people believe that people like themselves *will* be affected by climate change. Although social and spatial distance are often confounded, and thus difficult to disentangle, this research suggests that people may perceive distance on these dimensions in distinct ways. Given that effects of climate change are perceived as more serious in the developing world and geographically distant areas (Gifford et al., 2009; Reser et al., 2012; Spence et al., 2012), in terms of severe impacts, more extreme climate change might still be perceived as *socially distant* from the self. That is, people may accept that they will be affected by climate change to an extent, but may socially distance the phenomenon when considering more severe, threatening consequences.

Hart and Nisbet (2012) manipulated the social distance (from the participant) of potential victims of climate change impacts.

They presented a news article about health impacts of climate change that affected socially near victims (fellow upstate New York residents), or socially distant victims (residents of the state of Georgia, or of France). Greater social distance was associated with greater polarization in support for climate change mitigation – with Democrats supporting climate action more when exposed to socially distant victims, and Republicans expressing more support for action when exposed to socially near victims. The results suggest a promising method of encouraging support for action among some political conservatives, by highlighting the potential impacts on those who are socially close to them. However, it must be noted that although the pattern of effects was consistent irrespective of whether the socially distant victim was from France or Georgia, spatial distance is still confounded with this manipulation of social distance.

More research is needed in order to identify why these effects emerged, and indeed whether such effects would occur across different forms of social distance (e.g., ethnicity, nationality, socioeconomic status). For example, to further investigate the effects of different forms of social distance, and to eliminate the spatial confound, it would be interesting to manipulate the social distance of a victim in terms of their socioeconomic status or ethnicity, while keeping the geographic location constant. In addition, investigating why these disparities emerge along ideological lines will help to inform the optimal framing of climate change outcomes – an issue to which we return later.

4.5. Mutual influences between dimensions of psychological distance

Analyzing the influence of each dimension of psychological distance in *isolation* is illustrative, but of course simplistic given that the dimensions themselves overlap. For example, an event that is temporally distant is necessarily hypothetically distant because there is always a chance that the event will not happen. Similarly, spatial and social distance can often be intertwined (e.g., socially close people tend to be people spatially close to us, and spatial closeness causes social closeness; Priest & Sawyer, 1967). Several findings point to this mutual influence between dimensions. For example, finding that people perceive the effects of climate change to be more severe in geographically distant areas suggests that spatial and social dimensions can act in concert to increase perceived psychological distance. Moreover, because these severe climate change impacts are statistically less probable than minor impacts, they are likely to be perceived as more hypothetically distant thereby again increasing the overall psychological distance from the self.

The findings of research specifically examining psychological distance in the domain of environmental problems (Gifford et al., 2009; Spence et al., 2012; Uzzell, 2000) support the idea that hypothetical distance may feed into perceptions of greater spatial, social and temporal distance for these outcomes. That is, severe impacts, which are less probable, are consistently perceived as occurring in distant locations in these studies. As uncertainty is inherent any discussion of climate change (Newell & Pitman, 2010), it may lead to inaction both because climate change may be perceived as too distant to be linked to local mitigation actions, and because it reinforces perceptions of greater temporal, social and spatial distance.

5. Reconciling personal experience and psychological distance

Our review of the literature on the effects of *personal experience* of weather and climate change-related events suggests that one

way to potentially increase support for climate action is to decrease perceived psychological distance. In contrast, the results of studies *measuring and manipulating psychological distance* present a more nuanced picture. Psychological proximity does not always lead to increases in belief, concern and action. To shed light on this contrasting pattern of findings, in this section we identify several important differences between studies of psychological distance and the effects of personally experiencing extreme weather and climate-change related events. Then, we discuss when alignment is found and identify potential moderators that may explain discrepancies that arise. We conclude that the key drivers of these discrepancies appear to be existing beliefs, values and group norms. We identify other key considerations for framing the psychological distance of climate change, including the potential for reduced distance to provoke emotional reactions.

5.1. How personal experience and psychological distance diverge

When comparing studies of personal experience and psychological distance, one key dimension that may influence decisions is motivational relevance. When the distance of a decision or outcome is manipulated in the lab (e.g., Fujita, Eyal, Chaiken, Trope, & Liberman, 2008), the distance is likely to be chosen to be far enough to induce different ways of perceiving the event, yet near enough for the choice to remain relevant. Yet with climate change, temporal distance can extend well beyond one's lifetime. Thus, in contrast to deciding, for example, about an item you will purchase now versus in three months, climate change impacts may be perceived at such a distance that they may become irrelevant to 'present-biased' decision making. If one believes that sea levels will rise, inundating coastal cities, but not for hundreds of years, concern about climate change and sea level rise may not be a relevant factor in one's (current) decision making. Other dimensions of psychological distance can be positively associated with willingness to act on climate change, with greater perceptions of spatial distance linked to greater willingness to act (Spence et al., 2012).

Comparing how the emerging literature on the psychological distance of climate change diverges from classic work on psychological distance may also help to illuminate relationships between distance, concern and action. In typical studies of psychological distance it is often the distance of the *decision*, rather than the *outcome* that is manipulated (e.g., Liberman & Trope, 1998). In contrast, when making a choice today about how to travel to work it is the distance of the salient *outcome* (e.g., the immediate convenience of taking the car versus the long term health and environmental benefits of riding a bicycle) and not the *decision* (e.g., a decision you make today vs. in three months), that varies. Investigating how the psychological distance of *outcomes*, and the psychological distance of *decisions* themselves, may differentially affect choices and motivation appears fruitful for delineating the role that psychological distance and personal experience play in influencing concern and action on climate change (cf. Hardisty & Weber, 2009).

In research considering the psychological distance of climate change the omnipresence of uncertainty also makes the nature of distance on any other dimension distinct from that usually studied in other research. Studies of psychological distance typically manipulate distances that can be objectively known, for example measuring people's preferences about objects or events at a given distance from their house, or a specific number of months away, or to people at a given position in their social network (e.g., Maglio, Trope, & Liberman, 2012). In contrast, in the context of climate change almost all information about the distance of climate change in temporal, spatial and social domains is imbued with uncertainty, and often not objectively quantifiable uncertainty. For example,

how socially distant is a villager in Bangladesh versus a person from another state in my country whom I have never met? The effects of distance in such contexts may be distinct from the effects of objectively known distances, and only carefully controlled experimental approaches to manipulating and measuring distance will allow us to find out.

Furthermore, in classic studies of psychological distance, decisions and outcomes tend to be framed at the individual level (e.g., Trope, Liberman, & Wakslak, 2007). In contrast, when decisions are made in the context of an issue such as climate change, the *collective* nature of the outcomes and actions required of many people means that very different and complex effects of psychological distance may emerge. The impacts of distance on motivational relevance may change when the collective nature of required actions means that the efficacy of an individual action may be easily undermined (Bandura, 2000; McDonald, Fielding, & Louis, 2013). Indeed, a sense that one's own actions are not contributing to solving a collective problem could act as an additional source of psychological distance in this domain. Thus, the effects of psychological distance on individual decisions where individual efficacy is high (e.g., purchasing a pro-environmental product) may be straightforward, but more nuanced effects may emerge when decisions are made in the context of a complex collective problem such as climate change, where individual efficacy may be low (e.g., voting for a tax designed to reduce carbon emissions).

Another important consideration when comparing the findings of research on personal experience and psychological distance is the distinction between perceived psychological distance, and the motivated process of *psychological distancing*. As we have noted earlier in our review, at times distance perceptions may be driven by a motivated desire to avoid the issue of climate change. When considering the effects of personal experience, it is important to recognize that they may be qualitatively different due in part to the fact that there is less scope for engaging in motivated psychological distancing when one has actually experienced (or perceived that one has experienced) a climate change-related event. Future research examining the motivational processes underlying perceptions of psychological distance could thus shed light on more effective ways to frame the psychological distance of climate change.

5.2. The utility of (sometimes) keeping climate change at Arm's length

When examining divergences between studies of personal experience and psychological distance manipulations, values, beliefs and group norms emerge as key moderators of the effects of psychological distance. For example, as we have discussed, some surveys suggest that people are more willing to act on climate change when impacts are severe and distant (Reser et al., 2012; Spence et al., 2012), indicating that decreasing psychological distance in spatial and social domains may be counterproductive. However, some experimental research shows that these effects are moderated by values and political beliefs, such that conservatives tend to express more support for action when exposed to socially near victims, whereas the opposite tends to be true for liberals (Hart & Nisbet, 2012). This is in keeping with the observation from moral foundations theory that liberals and conservatives tend to emphasize different values, with liberals valuing harm and fairness more (increasing the importance of helping those in need including distant victims), and conservatives giving equal weight to harm and fairness along with purity, authority and loyalty (increasing the relative importance of those closer to home; Graham, Haidt, & Nosek, 2009). This finding suggests that emphasizing climate change impacts that vary in spatial and social distance may be

necessary to achieve bipartisan support for actions. Indeed, there are potential benefits of framing climate change to be congruent with the dominant moral concerns of various ideological groups (Feinberg & Willer, 2013; Markowitz & Shariff, 2012).

To increase willingness to act on climate change among conservatives, it may be beneficial to decrease the perceived social distance of climate change by focusing on impacts on similar others. Indeed, there is empirical support for the notion that framing climate change impacts in terms of increasing consideration for others, is associated with increased willingness to act pro-environmentally among climate change deniers (Bain, Hornsey, Bongiorno, & Jeffries, 2012).

This focus on similar others is in contrast to imagery often observed in campaigns of environmental organizations. These campaigns tend to highlight the plight of people in developing nations using images designed to be emotive, yet depicting spatially and socially distant victims. However, emphasizing serious impacts in distant developing nations is only likely to encourage increased support for action among liberals, and not among conservatives. There is evidence for motivated denial of climate-change information independent of its psychological distance or proximity (e.g., Feygina et al., 2010). However, the observed differences in willingness on near versus distant victims as a function of ideology suggest that there is merit to the idea of tailoring framing of the psychological distance of climate change according to the political leanings of the audience.

5.3. Can climate change get too close?

A final consideration when decreasing the psychological distance of climate change is the potential for people to disengage with the issue if it becomes too close. Research on personal experience suggests that decreasing psychological distance may increase *concern*; however *increased* distance paired with *high severity* may be more effective in promoting *action*. This asymmetry may arise from emotional reactions increasing or decreasing with changes in psychological distance. Experimentally manipulating emotional intensity influences perceptions of psychological distance (Van Boven, Kane, McGraw, & Dale, 2010). When people described a range of events emotionally (versus neutrally), they perceived the events as being less psychologically distant. Therefore, it is also possible that the psychological closeness of perceived climate change may give rise to intense emotional experiences, which may either prompt increased concern and action on climate change, or motivate people to deny and distance themselves from climate change to reduce unpleasant emotions such as fear. Thus, one way in which psychological distance may stymie motivation to take *action* on climate change may be by reducing emotional reactions that help to motivate behavior (Kollmuss & Agyeman, 2002). If climate change is too psychologically close, however, it is likely to be associated with intense emotional reactions, which have the potential to provoke avoidance (see work on fear appeals, e.g., Brügger, 2013; O'Neill & Nicholson-Cole, 2009; Ruiter, Abraham, & Kok, 2001). This may explain why severe, distant effects appear to be somewhat optimal for promoting action: their severity prompts emotional reactions that help to motivate behavior, but their psychological distance prevents fear-induced avoidance.

5.4. Framing climate change as close in the absence of salient experience

Much of our review is aimed at highlighting the potential for developing strategies (framings) that can optimize the perceived psychological distance of climate change, when actual impacts may

not yet have been experienced, or impacts have not have been attributed to climate change. As noted earlier, there are relatively few studies that shed light on ways to traverse this psychological distance. Two notable exceptions, however, have both invoked forms of perspective taking in an attempt to reduce distance and motivate action. For example, taking the perspective of a future person experiencing climate change, relative to considering the objective facts of the same scenario, increased pro-environmental behaviors such as the number of environmental brochures picked up by participants (e.g., Pahl & Bauer, 2013). In a similar vein, Zaval, Markowitz, and Weber (2015) demonstrated that making salient individuals' concern for their own legacy was a powerful strategy for increasing action on climate change. Specifically, participants who were primed to think about ways in which they would have a positive impact on future generations (e.g., "think about skills or knowledge you will teach others") subsequently increased donations to an environmental charity, showed greater pro-environmental intentions, and stronger belief in climate change, relative to those in a control prime condition. Perspective taking may therefore be a powerful tool for communicators in reducing the psychological distance of climate change. However, as noted above, it is possible that if more severe climate impacts were emphasized, this strategy could backfire (O'Neill & Nicholson-Cole, 2009; Ruiter et al., 2001).

6. Psychological distance and construal level

We have focused on comparing personal experience and psychological distance of climate change and related weather events. However, it is important to acknowledge a key construct associated with psychological distance, which may have relevance for how people respond to the challenges of climate change. As we noted at the outset of our review, according to the construal level theory of psychological distance, greater psychological distance tends to be associated with more abstract, high-level construals of objects and events, whereas psychological proximity is associated with more concrete, low-level construals (Trope & Liberman, 2010).

While there is a large literature documenting the behavioral consequences of construal level, studies in the climate change context have not yet examined the level at which people construe climate change. It is possible that perceptions of the psychological distance of climate change and its impacts may be associated with more abstract construals of the problem (which could either promote or prevent action, depending on a number of other factors), however the current literature does not speak directly to this issue. There is initial evidence that construal level is linked to willingness to act on climate change (Rabinovich, Morton, Postmes, & Verplanken, 2009), however future research should examine the links between the perceived or manipulated psychological distance of climate change, construal level, and willingness to act.

7. Future directions

Our review has drawn attention to several important avenues for future research. Existing studies have manipulated one or two dimensions of psychological distance at a time (e.g., Nicolaij & Hendrickx, 2003; Spence & Pidgeon, 2010) but in order to test how the dimensions of psychological distance interact, future research should examine the effects of manipulating distance on the four dimensions simultaneously. This approach would allow us to observe the optimal framing of climate change to promote willingness to take action on climate change, such as by supporting regulation of carbon emissions, paying for carbon offsets, and adopting low-carbon lifestyles.

The existing research has tended to rely on reports about a single behavior, or a small range of behaviors. Previous research has demonstrated that different environmental behaviors are differentially impacted by framing manipulations (McDonald, Newell, & Denson, 2014). For example, in an exclusion mindset (i.e., considering behaviors one would *not* be prepared to do), the perceived effort associated with a behavior is more related to behavioral willingness. In contrast, in an inclusion mindset (considering what one *would* do), the opportunity to engage in a behavior is more related to willingness (McDonald et al., 2014). Future research should systematically examine whether the nature of behaviors influences the manner in which they are affected by psychological distance, and likewise whether psychological distance has distinct influences on different behaviors. For instance, future work could test whether individual versus collective behaviors, or mitigation versus adaptation behaviors, are differentially influenced by distance framing. Research could also specifically examine the different implications of distancing decisions versus distancing their outcomes. Furthermore, the relatively small existing literature provides a variety of studies, focusing on either perceptions (e.g., of severity) or behaviors (e.g., energy saving) related to climate change. Echoing our previous call for larger, more systematic examinations of the link between psychological distance and action on climate change, future research should examine the interrelationships between these perceptions and behaviors.

Future work could also examine the moderating effects of ideology on responses to psychological distance in a more systematic way, as well as examine what drives different patterns of responses by ideology. For example, studies could test our suggestion that divergent moral concerns explain the effectiveness of framing the social distance of climate change as psychologically close among conservatives, and far among liberals.

8. Conclusion

People may, at times, psychologically distance themselves from the very existence of climate change or of its potential impacts in a manner that precludes support for ameliorative action. Our review suggests that approaches aimed at reducing this distance may not be universally beneficial. While personal experience of weather and climate-change related events may promote concern and action, the optimal framing of psychological distance depends on 1) the values, beliefs and norms of the audience, and 2) the need to avoid provoking fear and resulting avoidant emotional reactions. A carefully tailored approach to framing the psychological distance of climate change is necessary if it is to provide an important and useful framework for designing more effective behavior change interventions. Future research should focus on exploring the relations between the four dimensions of psychological distance, and examining the effects of distance across a range of mitigation and adaptation actions. This will allow researchers to establish optimal framings for ensuring that messages about climate change are heard and heeded.

Acknowledgement

This research was supported by an Australian Research Council Linkage Project Grant (LP120100224). BRN received salary support from an Australian Research Council Future Fellowship (FT110100151) and acknowledges support of the ARC Centre of Excellence for Climate System Science (CE110001028). We would like to thank Michael Slepian and three anonymous reviewers for providing helpful feedback on an earlier version of this manuscript.

References

- Akerlof, K., Maibach, E. W., Fitzgerald, D., Ceden, A. Y., & Neuman, A. (2013). Do people "personally experience" global warming, and if so how, and does it matter? *Global Environmental Change*, 23, 81–91.
- Bain, P. G., Hornsey, M. J., Bongiorno, R., & Jeffries, C. (2012). Promoting pro-environmental action in climate change deniers. *Nature Climate Change*, 2, 600–603.
- Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science*, 9, 75–78.
- Böhm, G., & Pfister, H. (2005). Consequences, morality, and time in environmental risk evaluation. *Journal of Risk Research*, 8, 461–479.
- Borick, C., & Rabe, B. (2012). Weather or not? Examining the impact of meteorological conditions on public opinion regarding climate change. *Weather, Climate, and Society*, 6, 413–424.
- Brügger, A. (2013). *Fear appeals and localising climate change: Neither is a panacea to motivate action on climate change: A social psychological perspective*. Doctoral dissertation. University of Exeter.
- Budescu, D. V., Por, H. H., & Broomell, S. B. (2012). Effective communication of uncertainty in the IPCC reports. *Climatic Change*, 113, 181–200.
- Devine-Wright, P. (2013). Think global, act local? The relevance of place attachments and place identities in a climate changed world. *Global Environmental Change*, 23, 61–69.
- Ding, D., Maibach, E. W., Zhao, X., Roser-Renouf, C., & Leiserowitz, A. (2011). Support for climate policy and societal action are linked to perceptions about scientific agreement. *Nature Climate Change*, 1, 462–466.
- Donner, S. D., & McDaniels, J. (2013). The influence of national temperature fluctuations on opinions about climate change in the U.S. since 1990. *Climatic Change*, 1–14.
- Dunlap, R. E. (2013). Climate change skepticism and denial: an introduction. *American Behavioral Scientist*, 57, 691–698.
- Dunlap, R. E., & McCright, A. M. (2008). A widening gap: republican and democratic views on climate change. *Environment: Science and Policy for Sustainable Development*, 50, 26–35.
- Egan, P. J., & Mullin, M. (2012). Turning personal experience into political attitudes: the effect of local weather on Americans' perceptions about global warming. *The Journal of Politics*, 74, 796–809.
- Feinberg, M., & Willer, R. (2013). The moral roots of environmental attitudes. *Psychological Science*, 24, 56–62.
- Feygina, I., Jost, J. T., & Goldsmith, R. E. (2010). System justification, the denial of global warming, and the possibility of "system-sanctioned change". *Personality and Social Psychology Bulletin*, 36, 326–338.
- Fujita, K., Eyal, T., Chaiken, S., Trope, Y., & Liberman, N. (2008). Influencing attitudes toward near and distant objects. *Journal of Experimental Social Psychology*, 44, 562–572.
- Gattig, A., & Hendrickx, L. (2007). Judgmental discounting and environmental risk perception: dimensional similarities, domain differences, and implications for sustainability. *Journal of Social Issues*, 63, 21–39.
- Gifford, R., Scannell, L., Kormos, C., Smolova, L., Biel, A., Boncu, S., ... Uzzell, D. (2009). Temporal pessimism and spatial optimism in environmental assessments: an 18-nation study. *Journal of Environmental Psychology*, 29, 1–12.
- Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, 96, 1029–1046.
- Haden, V. R., Niles, M. T., Lubell, M., Perlman, J., & Jackson, L. E. (2012). Global and local concerns: what attitudes and beliefs motivate farmers to mitigate and adapt to climate change? *PLoS one*, 7, e25882.
- Hamilton, L. C., & Stampton, M. D. (2013). Blowin' in the wind: short-term weather and belief in anthropogenic climate change. *Weather, Climate, and Society*, 5, 112–119.
- Hardisty, D. J., & Weber, E. U. (2009). Discounting future green: money versus the environment. *Journal of Experimental Psychology: General*, 138, 329.
- Hart, P. S., & Nisbet, E. C. (2012). Boomerang effects in science communication: how motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Communication Research*, 39(6), 701–723.
- Hendrickx, L., & Nicolaij, S. (2004). Temporal discounting and environmental risks: the role of ethical and loss-related concerns. *Journal of Environmental Psychology*, 24, 409–422.
- Howe, P. D., Markowitz, E. M., Lee, T. M., Ko, C.-Y., & Leiserowitz, A. (2012). Global perceptions of local temperature change. *Nature Climate Change*, 3, 352–356.
- Jacques, P. J., Dunlap, R. E., & Freeman, M. (2008). The organisation of denial: conservative think tanks and environmental scepticism. *Environmental Politics*, 17, 349–385.
- Jamieson, D. (2010). Adaptation, mitigation, and justice. *Climate Ethics: Essential Readings*, 263–283.
- Joireman, J., Barnes Truelove, H., & Duell, B. (2010). Effect of outdoor temperature, heat primes and anchoring on belief in global warming. *Journal of Environmental Psychology*, 30, 358–367.
- Kahan, D. M., Jenkins-Smith, H., & Braman, D. (2011). Cultural cognition of scientific consensus. *Journal of Risk Research*, 14, 147–174.
- Kirby, K. N. (1997). Bidding on the future: evidence against normative discounting of delayed rewards. *Journal of Experimental Psychology-General*, 126, 54–70.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8, 239–260.
- Leiserowitz, A. A. (2005). American risk perceptions: is climate change dangerous? *Risk Analysis*, 25, 1433–1442.
- Leiserowitz, A. A., Maibach, E. W., Roser-Renouf, C., Smith, N., & Dawson, E. (2013). Climategate, public opinion, and the loss of trust. *American Behavioral Scientist*, 57, 818–837.
- Lewandowsky, S., Gignac, G. E., & Vaughan, S. (2012). The pivotal role of perceived scientific consensus in acceptance of science. *Nature Climate Change*, 3, 399–404.
- Lewandowsky, S., Oreskes, N., Risbey, J. S., Newell, B. R., & Smithson, M. (2015). Seepage: climate change denial and its effect on the scientific community. *Global Environmental Change*, 33, 1–13.
- Lewandowsky, S., Risbey, J. S., Smithson, M., & Newell, B. R. (2014). Scientific uncertainty and climate change: part II. Uncertainty and mitigation. *Climatic Change*, 124, 39–52.
- Lewandowsky, S., Risbey, J. S., Smithson, M., Newell, B. R., & Hunter, J. (2014). Scientific uncertainty and climate change: part I. Uncertainty and unabated emissions. *Climatic Change*, 124, 21–37.
- Liberman, N., & Trope, Y. (1998). The role of feasibility and desirability considerations in near and distant future decisions: a test of temporal construal theory. *Journal of Personality and Social Psychology*, 75, 5.
- Liberman, N., Trope, Y., & Stephan, E. (2007). Psychological distance. *Social psychology: Handbook of Basic Principles*, 2, 353–383.
- Li, Y., Johnson, E. J., & Zaval, L. (2011). Local warming: daily temperature change influences belief in global warming. *Psychological Science*, 22, 454–459.
- Lorenzoni, I., & Pidgeon, N. F. (2006). Public views on climate change: European and USA perspectives. *Climatic Change*, 77, 73–95.
- Maglio, S. J., Trope, Y., & Liberman, N. (2012). Distance from a distance: psychological distance reduces sensitivity to any further psychological distance. *Journal of Experimental Psychology: General*, 142, 644.
- Markowitz, E. M., & Shariff, A. F. (2012). Climate change and moral judgement. *Nature Climate Change*, 2, 243–247.
- McCright, A. M., & Dunlap, R. E. (2011). Cool dudes: the denial of climate change among conservative white males in the United States. *Global Environmental Change*, 21, 1163–1172.
- McDonald, R. I., Fielding, K. S., & Louis, W. R. (2013). Energizing and de-motivating effects of norm-conflict. *Personality and Social Psychology Bulletin*, 39(1), 57–72.
- McDonald, R. I., Newell, B. R., & Denson, T. F. (2014). Would you rule out going green? The effect of inclusion versus exclusion mindset on pro-environmental willingness. *European Journal of Social Psychology*, 44, 507–513.
- Milfont, T. L. (2010). Global warming, climate change and human psychology. *Psychological approaches to Sustainability: Current Trends in Theory, Research and Practice*, 19–42.
- Myers, T. A., Maibach, E. W., Roser-Renouf, C., Akerlof, K., & Leiserowitz, A. A. (2012). The relationship between personal experience and belief in the reality of global warming. *Nature Climate Change*, 3, 343–347.
- Newell, B. R., McDonald, R. I., Brewer, M., & Hayes, B. K. (2014). The psychology of environmental decisions. *Annual Review of Environment and Resources*, 39, 443–467.
- Newell, B. R., & Pitman, A. J. (2010). The psychology of global warming: improving the fit between the science and the message. *Bulletin of the American Meteorological Society*, 91, 1003–1014.
- Nicolaij, S., & Hendrickx, L. (2003). The influence of temporal distance of negative consequences on the evaluation of environmental risks. In L. Hendrickx, W. Jager, & L. Steg (Eds.), *Human decision making and environmental perception: Understanding and assisting human decision making in real-life situations* (pp. 47–67). Groningen: University of Groningen.
- O'Neill, S., & Nicholson-Cole, S. (2009). "Fear Won't Do It" promoting positive engagement with climate change through visual and iconic representations. *Science Communication*, 30, 355–379.
- Oreskes, N., & Conway, E. M. (2010). *Merchants of doubt: How a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. London: Bloomsbury Press.
- Pahl, S., & Bauer, J. (2013). Overcoming the distance: perspective taking with future humans improves environmental engagement. *Environment and Behavior*, 45, 155–169.
- Priest, R. F., & Sawyer, J. (1967). Proximity and peership: bases of balance in interpersonal attraction. *American Journal of Sociology*, 72, 633–649.
- Rabinovich, A., Morton, T. A., Postmes, T., & Verplanken, B. (2009). Think global, act local: The effect of goal and mindset specificity on willingness to donate to an environmental organization. *Journal of Environmental Psychology*, 29, 391–399.
- Rayner, S., & Malone, E. L. (1997). Zen and the art of climate maintenance. *Nature*, 390, 332–334.
- Reser, J. P., Bradley, G. L., & Ellul, M. C. (2014). Encountering climate change: 'seeing' is more than 'believing'. *Wiley Interdisciplinary Reviews: Climate Change*, 5, 521–537.
- Reser, J. P., Bradley, G. L., Glendon, A. I., Ellul, M. C., & Callaghan, R. (2012). *Public risk perceptions, understandings, and responses to climate change and natural disasters in Australia, 2010 and 2011* (p. 246) (Gold Coast: National Climate Change Adaptation Research Facility).
- Rudman, L. A., McLean, M. C., & Bunzl, M. (2013). When truth is personally inconvenient, attitudes change: the impact of extreme weather on implicit support for green politicians and explicit climate-change beliefs. *Psychological Science*, 24, 2290–2296.
- Ruiter, R. A. C., Abraham, C., & Kok, G. (2001). Scary warnings and rational

- precautions: a review of the psychology of fear appeals. *Psychology and Health*, 16, 613–630.
- Shepherd, S., & Kay, A. C. (2012). On the perpetuation of ignorance: system dependence, system justification, and the motivated avoidance of sociopolitical information. *Journal of Personality and Social Psychology*, 102, 264.
- Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: the effects of distance and outcome frame manipulations. *Global Environmental Change*, 20, 656–667.
- Spence, A., Poortinga, W., Butler, C., & Pidgeon, N. F. (2011). Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change*, 1, 46–49.
- Spence, A., Poortinga, W., & Pidgeon, N. (2012). The psychological distance of climate change. *Risk Analysis*, 32, 957–972.
- Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J. P. . . . Weber, E. U. (2009). *Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges. A report by the American psychological association's task force on the interface between psychology and global climate change*. Washington D.C: American Psychological Association.
- Trenberth, K. E. (2012). Framing the way to relate climate extremes to climate change. *Climatic Change*, 115, 283–290.
- Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, 117, 440–463.
- Trope, Y., Liberman, N., & Wakslak, C. (2007). Construal levels and psychological distance: effects on representation, prediction, evaluation, and behavior. *Journal of Consumer Psychology*, 17, 83.
- Uzzell, D. L. (2000). The psycho-spatial dimension of global environmental problems. *Journal of Environmental Psychology*, 20, 307–318.
- Van Boven, L., Kane, J., McGraw, A. P., & Dale, J. (2010). Feeling close: emotional intensity reduces perceived psychological distance. *Journal of Personality and Social Psychology*, 98, 872.
- Weber, E. U. (2006). Experience-based and description-based perceptions of long-term risk: why global warming does not scare us (Yet). *Climatic Change*, 77, 103–120.
- Weber, E. U. (2010). What shapes perceptions of climate change? *Wiley Interdisciplinary Reviews: Climate Change*, 1, 332–342.
- Weber, E. U., & Stern, P. C. (2011). Public understanding of climate change in the United States. *American Psychologist*, 66, 315.
- Zauberman, G., Kim, B. K., Malkoc, S. A., & Bettman, J. R. (2009). Discounting time and time discounting: subjective time perception and intertemporal preferences. *Journal of Marketing Research*, 46, 543–556.
- Zaval, L., Markowitz, E. M., & Weber, E. U. (2015). How will I be remembered? Conserving the environment for the sake of one's legacy. *Psychological Science*, 26, 231–236.