

## OPINION

# Terror Management Theory and mortality awareness: A missing link in climate response studies?

Sarah E. Wolfe<sup>1\*</sup>  | Amit Tubi<sup>2\*</sup> <sup>1</sup>School of Environment, Resources and Sustainability, University of Waterloo, Waterloo, Ontario, Canada<sup>2</sup>Department of Geography, Hebrew University of Jerusalem, Jerusalem, Israel**Correspondence**Amit Tubi, Department of Geography, Hebrew University of Jerusalem, Jerusalem, Israel.  
Email: amit.tubi@mail.huji.ac.il**Funding information**

Canada's Social Science and Humanities Research Council, Grant/Award Number: #430-2012-0264

Edited by Lorraine Whitmarsh, Domain Editor, and Mike Hulme, Editor-in-Chief

Adaptation and mitigation efforts are hampered by multiple obstacles and thus lag behind climate changes' speed and scope. Some of the most powerful obstacles to climate action are the social-psychological factors that influence human thought, preferences, and behaviors. These factors, including those articulated by environmental psychology generally, and Terror Management Theory (TMT) specifically, are neglected within climate response research. TMT underlies an extensive and well-established literature; researchers have shown that efforts to repress one's mortality awareness, triggered when people are explicitly or implicitly reminded of their unavoidable death, influences individuals' attitudes and behavior. These psychological defenses, including denial, distraction and worldview defense, sometimes produce counter-intuitive and potentially counter-productive outcomes. Meanwhile, the growing global awareness and media coverage of climate change, and much scholarly research, has skewed toward negative "disaster and death" narratives. Exposure to such stimuli, highlighting climate change's potentially life-threatening effects, may exacerbate counter-productive responses. In this thought experiment, we propose that mortality awareness could be a critical variable that helps explain climate action at the individual and societal levels. We survey TMT insights, focusing on the relationship between mortality reminders and human responses. We then identify how climate change may lead to increased mortality awareness and consider the psychological defenses triggered by this awareness. We argue that mortality defenses may both limit and advance climate action. Finally, we set out an agenda for TMT-climate response research and discuss the potential to advance several inquiry lines, including climate change communication, collective action and the capacity for transformational responses.

This article is categorized under:

Perceptions, Behavior, and Communication of Climate Change &gt; Behavior Change and Responses

**KEYWORDS**

adaptation, climate change, mortality awareness, mitigation, Terror Management Theory

## 1 | INTRODUCTION

Global climate change is one of the major challenges confronting humanity. Extensive action to mitigate climate change and adapt to inevitable impacts is urgently needed. However, even in highly adaptive communities, action lags behind the speed or scope of climate changes (Reckien et al., 2014).

\*These authors are equal co-authors.

Research on responses to climate change is largely focused on systems, not on individuals (Clayton et al., 2015). Yet environmental psychology has shown that some of the most powerful obstacles to climate action are the social-psychological factors that shape human thought, preferences, and behaviors (Gifford, 2011; Lorenzoni & Whitmarsh, 2014). These factors determine, for example, peoples' climate risk perceptions, their willingness to respond to those risks, and the extent to which they support or resist climate policies and initiatives (Brügger, Dessai, Devine-Wright, Morton, & Pidgeon, 2015). Yet these factors have received only limited attention in the climate response realm and further research is called for (Barnes Truelove, Carrico, & Thabrew, 2015; Klein et al., 2014). To increase the uptake and effectiveness of climate action, we must better understand the social-psychological factors that underpin adaptation and mitigation at the individual and societal levels.

One of the most problematic assumptions within climate response research is that of human rationality. We assume that human cognitive processing—including assessing and responding to climate change risks—is consistently information-driven, methodical, and logical (Gowdy, 2008; Leiserowitz, 2006). Yet research and practice confirm that this assumption is flawed, particularly in regards to the necessary shifts in fundamental belief systems, values, and attitudes (Ariely, 2008; Norgaard, 2011), elements that are critical to meaningful and durable climate action (Crompton, 2011; O'Brien & Sygna, 2013). But if we acknowledge that rationality-driven approaches are insufficient, what alternatives exist?

Psychology—with its multiscaled investigations of individual and social identity and behavior offers rich insights on how and why people and social groups respond to threats (Fritzsche, Barth, Jugert, Masson, & Resse, 2018; Jonas et al., 2014). While environmental psychology's research has focused on individuals' dis/incentives and social context (Schmuck & Schultz, 2012), social identities, emotions, and threat responses are increasingly considered a critical bridge between knowledge and behavior (Carmi, Arnon, & Orion, 2015; Salama & Aboukoura, 2018). Trust and fear, for example, in other people and in society's institutions, are both powerful behavioral influences (Fritzsche et al., 2018; Öhman, 2008), but it is often fear that is most widely employed in the public domain of climate change, with mixed results (O'Neill & Nicholson-Cole, 2009; Taylor, Dessai, & Bruine de Bruin, 2014; Witte & Allen, 2000). Some research has indicated that climate change denial or skepticism is a psychological coping response to the fears generated by worrisome climate information (Feinberg & Willer, 2010; Haltiner & Sarathchandra, 2018).

In this Opinion, we argue that mortality fear related to climate change could be a critical additional variable to help explain adaptation and mitigation behavior. Drawing from social and environmental psychology, we focus on the relationship between mortality awareness and possible responses to climate change. Thirty years of Terror Management Theory (TMT) studies have shown that mortality salience<sup>1</sup> predictably influences individuals' attitudes, identities and behavior as they try to repress this awareness and reestablish their cognitive equilibrium (Solomon, Greenberg, & Pyszczynski, 2015).

As we explore below, responses to mortality awareness can affect climate action negatively or positively, depending on individuals' and social groups' identities and salient norms or expectations (Fritzsche & Häfner, 2012; Vail & Juhl, 2015). Understanding these responses is essential because, over time, these responses may aggregate as support for, or rejection of, environmental protection, policies or institutions (Fritzsche & Häfner, 2012; Koole & Van den Berg, 2005). Research designs linking climate response with TMT represent a novel framework to test individual and societal action. These inquiries could help explain how and why we seek to reduce or deny our vulnerability to climate change, while avoiding or reallocating responsibility for the necessary responses.

This transdisciplinary research is timely as climate-related mortality reminders are bound to increase in both frequency and intensity. The American Psychological Association wrote that the “cumulative and interacting psychosocial effects of climate change...are likely to be profound” (Swim et al., 2009). The global media coverage of climate change has expanded dramatically (Schmidt, Ivanova, & Schäfer, 2013) and includes ever-greater information about potentially life-threatening impacts. Millions of people—connected via social media—will have direct experiences with intensified and more frequent extreme climatic events. Moreover, effective climate change action requires transformational, psychologically strenuous responses that may challenge people's fundamental values and worldviews, and hence are highly dependent on their threat appraisals and individual responses to the necessary changes (Jonas et al., 2014; O'Brien & Sygna, 2013). Finally, the collective aspect of climate change and the required pro-environmental actions necessitate a deep understanding of individuals' social identity because this identity can inform their “collective [threat] appraisals, goals and behavior tendencies” (Fritzsche et al., 2018, p. 246). To instigate substantial climate action, researchers and practitioners need to better understand these deep social-psychological responses.

To contribute to this understanding, we survey TMT's conceptual insights and behavioral implications for generalized environmental challenges. We then review the mortality defenses' potential effects on responses to climate change—both limiting and advancing—at the individual and societal levels. Finally, we set out a potential research program to harness TMT and advance our understanding of climate action.

## 2 | PSYCHOLOGY, TERROR MANAGEMENT THEORY, HUMAN BEHAVIOR, AND THE ENVIRONMENT

Environmental psychology researchers have a long history of investigating the human–nature interface and the environmental problems that ensue. In this way, their interest in climate change predates much of the research on the atmospheric aspects of such changes (Gifford, 2008). Yet environmental psychologists have been primarily occupied by “individual-level influences on environment-related behaviors: values, attitudes, motives, intentions, goals, social comparison, habits...” (Gifford, 2008, p. 2), rather than collective identities and engagement with larger-scale societal challenges such as climate change (Fritzsche et al., 2018). Social psychology researchers also offer valuable perspectives and expertise in threat appraisal and defense behaviors, including recent integrative models of threat and defense processes (Jonas et al., 2014). Threats may include “personal uncertainty, mortality salience, loss of control, perceptual surprise, and goal conflicts” with defensive responses inclusive of, for example, “heightened commitment to their goals, ideals, social relations, identifications, ideologies, and worldviews” (Jonas et al., 2014, p. 220). In this way, threats and responses operate at both the individual and societal levels.

It is beyond the scope of this Opinion to debate a hierarchy of threats. For our purposes, we build from the TMT premise that “the desire for survival is the most fundamental threat to the human self” (Jonas et al., 2014, p. 223), and that this desire underpins both one's perceived need for personal control and social validation, as well as the discomfort associated with neurobiological reactions such as anxiety (Juhl & Routledge, 2016). With this “fundamental threat” in mind—mortality as universal to the human condition, which exerts a strong influence on both our individual and group decisions—we use TMT to explore multiscaled responses to climate change. We highlight some of possible individual responses and their potential aggregation at the societal level.

### 2.1 | The influence of mortality awareness on human behavior

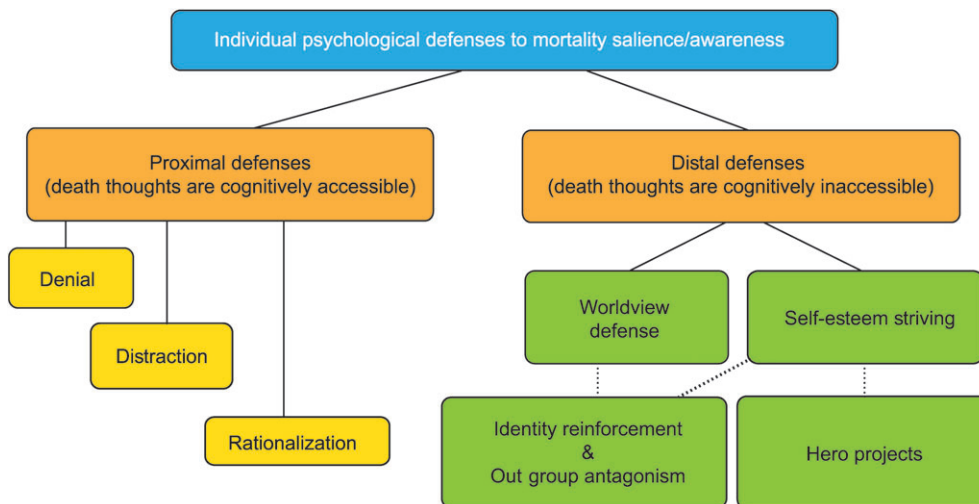
TMT is based on cultural anthropologist Becker's (1973) efforts to articulate the drivers of human behavior (Solomon, Greenberg, & Pyszczynski, 1991). As mere animals, humans instinctively want to survive and propagate. But we are unique in that our brains are capable of abstract and symbolic thought. This cognitive ability allows us to remember the past and plan for the future, be creative and anticipate what others may be thinking or feeling in response to our actions or belief systems. The cost of this vast cognitive ability is a self-awareness that allows for mortality awareness—the recognition of one's inevitable death at an unknown future time.

Becker proposed that mortality awareness creates an existential terror where “the idea of death, the fear of it, haunts the human animal like nothing else; it is a mainspring of human activity—efforts designed largely to avoid the fatality of death, to overcome it by denying in some way that it is the final destiny for man” (Becker, 1973, p. ix). All humans mitigate their existential fears by embracing distinct cultural worldviews that provide a sense of individual and group identity within a recognized sociocultural context. Worldviews provide social identities, values, standards of appropriate conduct and the illusion of “immortality” for those of us who successfully live within our cultural norms (Vail & Juhl, 2015). They also serve as guides as we seek out opportunities to generate positive self-esteem, that is, the sense that we are valuable contributors within our social milieu, and to reinforce our constructed identities through political affiliations or other group associations, for example, religion (Batson & Stocks, 2004). We are highly motivated to maintain our worldviews and, as a result, we respond with predictable, significant and replicable defenses when our sense of self-worth and identity, for example, our intrinsic values or political affiliation, are threatened.

Empirical support for TMT emerges from three primary lines of inquiry (Pyszczynski, Solomon, & Greenberg, 2015). First, the *anxiety buffer* hypothesis focuses on individuals' strong psychological buffers, for example, high self-esteem or life meaning, triggered in response to a threat. These buffering defenses are used to reduce physiological arousal and anxiety and increase a sense of well-being (Juhl & Routledge, 2016). Second, the *death-thought accessibility* hypothesis has shown that contesting participants' strongly-held beliefs makes implicit death-related thoughts become more cognitively accessible (Schimel, Hayes, Williams, & Jahrig, 2007). Third, investigations of the *mortality salience* hypothesis have shown that mortality reminders generate predictable proximal and distal defensive threat responses. According to Pyszczynski et al. (2000, p. 156), “death-related thoughts produce different effects on thought and behavior when they are in current focal attention [proximate, cognitively accessible] and when they are on the fringes of consciousness [distal, cognitively inaccessible].”

In this article we focus on the third line of inquiry.<sup>2</sup> The defensive responses articulated through TMT (Figure 1) correspond with the well-established literatures of cognitive, developmental, clinical, and social psychology insights on threats<sup>3</sup> (Jonas et al., 2014). But TMT defenses are distinct in that the trigger threat is specifically cognitively accessible or inaccessible death reminders.

Accessible death thoughts activate proximal defenses, for example, suppressing death-related thoughts via distraction or rationalization, or pushing the problem of death into the distant future and denying one's vulnerability. Cognitively



**FIGURE 1** Terror Management Theory's psychological defenses to mortality salience/awareness. (Reprinted with permission from Wolfe and Brooks (2017). Copyright 2017 Taylor & Francis)

inaccessible death thoughts activate distal defenses, for example, maintaining self-esteem and faith in one's cultural worldview. These defenses may include increased antagonism toward, or outright conflict with, other identity groups (Jonas & Fritzsche, 2013; Uhl, Klackl, Hansen, & Jonas, 2017) as well as pursuing culturally validated “hero projects.” These “hero projects” may include anything from philanthropy and fame to parenthood or policies, providing individuals with social recognition and a sense of importance that will extend beyond their biological existence. What TMT research has shown, in hundreds of published studies conducted in more than 25 countries, is that mortality salience influences a diverse range of human attitudes and behaviors (Burke, Martens, & Faucher, 2010) including political identities, ideologies and policy preferences; reactions to those perceived as “Other”; judicial decisions about sentencing; material consumption and resource capture (Pyszczynski et al., 2015).

However, TMT does not assume that the consequences of mortality defenses are necessarily negative. For example, Vail and Juhl (2015, p. 4) argued persuasively that “positive terror management occurs when people manage existential concerns in ways that minimize harm and foster physical, social and psychological well-being among themselves and others.” These positive outcomes may include changes to one's physical health, identification and involvement in social groups and communities, prosocial values and pro-environmental behaviors (Vail & Juhl, 2015).

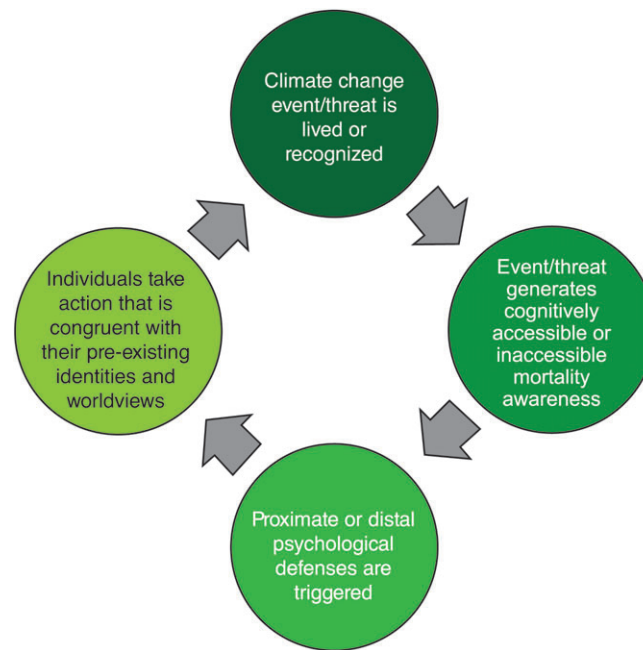
As a mechanism for exploring responses to climate change, TMT provides established insights that are both robust and replicable, and a universal threat that extends across diverse social subgroups and the interpersonal variability of individuals' worldviews. This combination presents an intriguing opportunity to gauge whether humanity's thus far modest response to environmental concerns and crises can also be partially explained by mortality awareness.

## 2.2 | The implications of terror management defenses for society–environment interactions

We highlight below the empirical TMT research on the relationship between mortality salience and the environment. We also consider the emerging research on the relationship between mortality salience and climate change perceptions and response intentions. Results have indicated that exposing individuals to information about climate change risks can generate mortality awareness and predictable cognitively accessible and inaccessible defenses that influenced environmental attitudes and behavior (Figure 2).

Yet more research is needed on how mortality awareness—outside of a laboratory context—can trigger psychological defenses (Adams, 2016) and influence threat appraisal across individuals' worldviews. But there is evidence that threatening climate change messages that are spatially defined and individually relevant have significant effects on behavior (Mitchell, Burch, & Driscoll, 2016; Skurka, Niederdeppe, Romero-Canyas, & Acup, 2018; Uhl et al., 2017). And there is no shortage of possible climate change mortality reminders from global to local scales: information about climate change-induced declines of food production (e.g., Springmann et al., 2016), projected deaths from unprecedented heat waves in specific regions and cities (e.g., Li, Ren, Kinney, Joyner, & Zhang, 2018; Petkova, Horton, Bader, & Kinney, 2013), limits to human physical adaptability (Pal & Eltahir, 2015) or general “doomsday” predictions (Wallace-Wells, 2017). We, along with our children and grandchildren, will endure climate changes' substantial costs and physical risks (Hansen et al., 2017).

Studies using TMT have shown that climate change threats and mortality defenses may generate both negative and positive environmental outcomes by influencing attitudes and behaviors (Fritzsche, Cohrs, Kessler, & Bauer, 2012; Fritzsche &



**FIGURE 2** Climate change, mortality awareness, and behavioral responses

Häfner, 2012; Fritsche, Jonas, Kayser, & Koranyi, 2010). These findings are supported by the broader TMT-environment literature.

Environment-focused TMT studies investigating proximal and distal defenses demonstrate or suggest that death reminders reliably increase humans' selfish exploitation of natural resources (Sheldon & McGregor, 2000), material consumption (Kasser & Sheldon, 2000) and our discomfort with wilderness landscapes (Koole & Van den Berg, 2005). Mortality reminders may also lower our perceived connection to other nonhuman life-forms (Goldenberg et al., 2001), influence our (un)willingness to protect species-at-risk (Dickinson, Crain, Yalowitz, & Cherry, 2013; Fritsche & Häfner, 2012), and prompt our likelihood of climate change denial (Dickinson, 2009). Research by Fritsche et al. (2012) also found that climate change threats increased preferences for authoritarian leadership and distancing of outgroups in areas unrelated to climate change.

Encouragingly, however, research has also shown that mortality salience may have positive outcomes for environmental behavior under certain conditions. As individuals, when pro-environmental norms are made salient and there is a personal mortality threat, indicators of pro-environmental conduct (attitudes and behaviors) increased (Fritsche et al., 2010). Vess and Arndt (2008) found that individuals who derived their self-esteem from pro-environmental action indicated greater environmental concern when mortality was made salient. The relationship between mortality salience, existing environmental values, “eco-guilt” and pro environmental behavior was explored by Harrison and Mallett (2013). They indicated that “mortality salience motivates individuals to act in line with important social values and to feel guilt when they failed to do so. Guilt, in turn motivates pro-environmental behavior” (Harrison & Mallett, 2013, p. 36). Other research by Pyszczynski et al. (2012, p. 354) showed that the universal threat of global climate change could potentially “short-circuit the increased support for violence that often occurs in response to existential threat and increased support for peaceful reconciliation.” The group-level mechanism for how this positive outcome could unfold was articulated by Barth, Masson, Fritsche, and Ziemer (2018, p. 497) in research showing how climate change threats could elicit “group-based defenses whose expression depends on which ingroup and which of its norms are salient,” including politically liberal norms.

Potentially negative effects from mortality salience may therefore arise from those individuals who do not define their identity or derive their self-esteem from pro-environmental norms, or belong to a group from which pro-environmental behavior is expected. TMT suggests that these people would be more likely to defend against climate change mortality reminders in ways that are counter-productive to climate response efforts. This defensive response is an urgent issue because of the nature of the climate change threat: like death, it is a threat that will affect everyone on the planet. Yet it is also unique because climate change is simultaneously personal and social, local and global, immediate and future, chronic and acute, known and unknowable. Even simple solutions will require changes to both our individual and group identities (Fritsche et al., 2018). And there is no time to waste: peoples' exposure to climate change mortality reminders, through experiences with intensified extreme weather events or media coverage of politicians' statements (e.g., Obama, 2015) and scientific and policy debates, will only increase as the impacts become more evident.



As researchers, we know that climate change poses significant challenges to individuals and societies worldwide and that both mitigation and adaptation may not eliminate climate change dangers (Dow, Berkhout, & Preston, 2013). Climate change events' increasing range, frequency and intensity, and the manner in which these events are represented in various spheres, could trigger mortality defenses that could undermine the effectiveness of adaptation and mitigation efforts. Yet the literature also shows us that it is also possible that proximate and distal mortality awareness could affect mitigation and adaptation responses positively, particularly when the potential implications of specific defenses to these responses are examined. We explore below how mortality defenses may influence adaptation and mitigation responses at the individual and societal levels—through accepting, rejecting or actively supporting or resisting action.

### 3 | CONSIDERING MORTALITY DEFENSES WITHIN RESPONSES TO CLIMATE CHANGE

In our assessment, we extend Dickinson's (2009) hypotheses about the defensive responses to climate change-induced mortality awareness. While the TMT research is richer in distal defense investigations, we attempt to articulate how proximal and distal defenses may influence adaptation and mitigation responses at both the individual and societal levels. Within this process we recognize the significant potential variability, for example, because of worldviews, salient norms, close-mindedness, ideology and group identity, that will require additional research (Agroskin, Jonas, Klackl, & Prentice, 2016; Fritsche et al., 2018; Jonas et al., 2014).

In Tables 1 and 2 we provide the results of our thought experiment on how mortality awareness—triggered by exposure to threatening climate change information—might influence adaptation and mitigation decisions at the individual and societal levels. The tables are not exhaustive but include what we consider to be the main predictions, responses, and potential implications.

The tables illustrate some of the possible implications of mortality awareness on climate action. Several key insights emerge. First, mortality defenses may affect various stages and aspects of climate action, ranging, for example, from individuals' receptivity to climate change information to the potential for societal-level collective and transformative action. Second, the defenses' overall potential effect on mitigation and adaptation is mixed. Many implications are negative in that they would delay meaningful climate action. However, some defenses, for example, self-esteem striving, may be more positive depending on an individual's worldview, culture and identity and could have significant and latent potential to advance mitigation and adaptation. Finally, the scalable nature of the defenses is manifest in multiple ways. Individual responses may aggregate to the societal level, for example, through the establishment of communities of action as a worldview defense. There are also implications for collective action through, for example, the possibilities of outgroup antagonism. Scaled defenses may also have

**TABLE 1** Proximal defenses against accessible mortality reminders and potential implications for mitigation and adaptation behavior

Defensive responses and predictions	Potential implications for adaptation and mitigation behavior
<i>Hypothesis: People will exhibit proximal defenses in response to information about climate change by</i>	
<i>Denial: Denying that the threat exists</i> <i>Prediction: Climate change trigger increases both the frequency and intensity of climate change denial</i>	People will be: Less willing to acknowledge the validity of climate change information relevant for mitigation and adaptation decisions Less willing to implement adaptation and/or mitigation actions; more willing to constrain the extent of action More likely to question and resist climate change policies and initiatives
<i>Distraction: Accepting that the climate is changing, but refuting that humans are responsible</i> <i>Prediction: Climate change trigger increases the frequency and intensity of denial that humans cause climate change</i>	People will be: More willing to understand changes as an "Act of God" or "Mother Nature" and suffer or react to the changes rather than implement longer-term adjustments, particularly mitigation More willing to distract oneself from perceived risk and vulnerability from, and responsibility for, climate change (e.g., via wealth accumulation and consumption in secular Western societies) Less willing to hold political systems accountable and hence less willing to demand action on climate change, particularly mitigation
<i>Rationalization: Accepting that the climate is changing, but pushing the timing of the threat far into the future</i> <i>Prediction: Climate change trigger increases estimates of the amount of time until the occurrence of climate change impacts or tipping points</i>	People will be: More likely to assume that climate change will not affect them during their lifetime or potentially even the lifetimes of their children or grandchildren Less willing to act at all, but particularly resistant to proactive adaptation or mitigation interventions that require substantial effort
<i>Rationalization: Accepting that the climate is changing, but minimizing the severity of the threat</i> <i>Prediction: Climate change trigger increases the frequency and intensity of denial that climate change may lead to severe impacts</i>	People will be: More likely to assume that climate change will not severely affect them More likely to limit the extent of action, preferring incremental responses over more strenuous transformative ones, if action is taken at all

**TABLE 2** Distal defenses against cognitively inaccessible mortality reminders and potential implications for mitigation and adaptation behavior

Defensive responses and predictions	Potential implications for adaptation and mitigation behavior
<i>Hypothesis: People will exhibit distal defenses in response to information about climate change by</i>	
<i>Self-esteem striving: Seeking out opportunities to build self-esteem</i> <i>Prediction: Climate change trigger increases striving for self-esteem within the context of the individual's worldview</i>	People will be: More likely to choose adaptation and mitigation actions that boost their sense of self-esteem. Some self-esteem actions will depend on external validation by providing positive public recognition (e.g., redesigning of one's garden with drought-tolerant plant species) while others will depend on internal validation (e.g., installing energy-efficient light bulbs)
<i>Worldview defense: Defending their worldviews (both pro-climate action or anticlimate action)</i> <i>Prediction: Climate change trigger increases the frequency and intensity of the worldview defense</i>	People will be: Less willing to consider responses that may necessitate changes in, or challenges to, their identities and worldviews (e.g., diversifying income sources to reduce dependency on climate-sensitive livelihoods—e.g., traditional farming); more willing to consider responses that are in accordance with salient cultural worldviews (e.g., commuting via public transport) More likely to join or support communities of action with other individuals sharing similar worldviews—both pro-climate action and resistant-to-climate action More willing to contribute to, or resist, adaptation and mitigation actions advanced by worldview leaders, depending on one's identity and worldview
<i>Outgroup antagonism: Showing antagonism toward outgroups</i> <i>Prediction: Climate change trigger increases the devaluation and marginalization of, and potential aggression and violence against, individuals and groups with alternative or opposing worldviews</i>	People will be: Less supportive of impact/vulnerability appraisals and climate action plans' justice and equity principles if those principles relate to groups that are perceived to have alternative or opposing worldviews Less willing to undertake cooperative climate action with groups that express alternative worldviews, particularly in local-to-national scale adaptations that, potentially, induce benefits beyond risk reduction for participating groups (outgroup distinctions may be made according to, e.g., socioeconomic, religious or political identities or ideologies)

implications for both individual and societal-level policy demand and support if, for example, distraction and denial were to limit the support for climate action.

Given our preliminary findings, and building from the literature reviewed above, we feel confident that mortality awareness—death as a threat that is common to all—has the potential to influence both mitigation and adaptation responses. We propose that to make climate change action more effective and sustained, mortality issues should be integrated in adaptation and mitigation research as a variable that impacts our responses to climate change. We offer some initial thoughts below to stimulate further discussion about new research opportunities for advancing this interdisciplinary agenda.

## 4 | TERROR MANAGEMENT THEORY AND CLIMATE RESPONSE: A RESEARCH AGENDA

Our starting position has been recognizing the needs of climate change adaptation and mitigation efforts. We see TMT as a potential tool to advance climate response research, policy and practice by helping scientists and practitioners recognize and understand when, and under what circumstances, mortality defenses could be triggered, and whether or how these defenses influence climate change adaptation and mitigation decisions. Our capacity, as individuals and as societies, to make the required and unprecedented shift in response to climate change will demand increased confrontation with our cultures and perceptions (Hulme, 2009) along with our psychology (Gifford, 2011) and reactions to mortality reminders (Fritzsche et al., 2012). The sheer scope of individual and societal reactions to mortality awareness—and understanding how this variability manifests in climate adaptation and mitigation behaviors—means that this is a rich line of inquiry. As such, the research “program” we articulate below should be considered exploratory with many scholarly connections, research and policy opportunities as of yet unarticulated.

### 4.1 | Selected TMT–climate response research inquiries

Our “thought-experiment” process—focused only on TMT's mortality defense hypothesis—showed the potential of linking TMT with climate adaptation and mitigation responses and guided the preliminary research suggestions below.

We recommend that early interdisciplinary research should prioritize assessing how climate-related mortality messages might be interpreted by varying worldviews, identities and social groups throughout the adaptation and mitigation process. Of the many opportunities to integrate TMT in adaptation and mitigation research—suggested through our tables and other climate-related research highlighted above—we present just four below: communication of climate change, collective action, transformational responses, and climate change-related “hero projects.” These are some of the most important aspects of

climate response and span the entire TMT–climate action interface—from the avoidance of inducing mortality defenses that may hamper mitigation and adaptation, to harnessing those defenses to instigate action.

#### 4.1.1 | Climate change communication

The climate change communication field contributes fundamental insights on whether and how climate change messages' imaging and delivery can be used to enhance action (Brügger et al., 2015; Moser, 2016; Wang, Corner, Chapman, & Markowitz, 2018). TMT complements this discussion and offers insights on how implicit/explicit mortality threats trigger defenses and influence the measures' adoption across different worldviews and/or identities.

There is already evidence of mortality threats' influence. Outright climate change denial can be triggered by “dire messages”: these messages reduce peoples' intentions to undertake pro-environmental behaviors (Feinberg & Willer, 2010) unless the messages are coupled with efficacy options to reduce risk (Xue et al., 2016). Psychological defenses to mortality awareness, particularly the proximal defenses of denial, distraction and rationalization, could increase apathy, divert resources, or create resistance to adaptation and mitigation initiatives (Hamilton & Kasser, 2009; O'Neill & Nicholson-Cole, 2009; Witte & Allen, 2000). Yet the story is not simple: other researchers have found that in situations of heightened mortality awareness, individuals who derive their self-esteem from environmental issues were more receptive to emotion-laden messages (Vess & Arndt, 2008). Given these findings it is critical that climate change adaptation and mitigation research consider and integrate the role of worldview variability (see Box 1).

Further research is needed on how adaptation and mitigation interventions can avoid and/or harness individuals' mortality awareness. Researchers could consider how to best frame climate change vulnerabilities and related impacts, as well as adaptation and mitigation strategies, to prevent sub-optimal or counter-productive outcomes. Achieving this objective requires culturally nuanced research, as mortality reminders may trigger varied responses across cultural settings or political ideologies (Capstick, Whitmarsh, Poortinga, Pidgeon, & Upham, 2015; Whitmarsh & Corner, 2017). Research on this topic could begin by focusing on Western countries, where many individuals hold a worldview associating material wealth and consumption with high self-esteem and success (Kasser & Sheldon, 2000), implying that a nonenvironmental worldview is both the baseline and validated social expectation.

#### 4.1.2 | Collective action

Collective action is one of the most fundamental aspects of adaptation and mitigation as the effectiveness of both responses depends on societies' ability to achieve common goals (Morrison et al., 2017; Tosun & Schoenefeld, 2017). Collective action is also likely to be affected by multiple mortality defenses (Tables 1 and 2), and thus where we anticipate some of the most certain and decisive effects of mortality awareness on climate action.

TMT has critical conceptual implications for climate response research because worldview strengthening and group identity defenses may help explain variations in collective action capacity across different societies. Some evidence suggests that mortality salience may reduce anti-group antagonism (Pyszczynski et al., 2012) and increase the tendency to act in line with perceived ingroup norms and goals (Barth et al., 2018). These inclinations could potentially increase the capacity for collective action: Fritzsche et al. (2018, p. 251) argued that “group-based emotion may motivate collective action, such as fear due to climate change, moral outrage about the fate of an outgroup or other species, or enthusiasm for a sustainable collective future.” However, the self-esteem striving and worldview defenses may also exacerbate outgroup hostility and social polarization. Perhaps the most important question is to what extent this polarization may lead to worldview-supported, socially divergent

#### BOX 1

##### FEAR AND HUMOR AS MOTIVATORS ACROSS CULTURAL SETTINGS

Two examples highlight how different cultures use humor or fear in climate response campaigns. In Canada, the Government of Ontario's Ministry of the Environment used a light-hearted online video series to encourage people to take simple actions to reduce their energy consumption. The series included videos that used humor (rather than threat) to personalize the impacts of climate change for Canadians: “Save the Pizza” (climate change implications for agricultural production of pizza ingredients), “Save the Ski Days” (Canadians' start-of-season snow anticipation) and “Save the Snowy Driveways” (Canadians' love/hate relationship with snow shoveling) (Government of Ontario, Ministry of Environment, 2017a, 2017b, 2017c). In contrast, Israel's Water Authority (2009) used mortality imaging—well-known celebrities' faces drying to dust, cracking, and blowing away—to warn citizens of impending droughts and encourage them to save water. The Canadian and Israeli cases are examples of how mortality reminders can be used (Israel)—or avoided (Canada)—in varied cultural contexts to direct public perceptions and responses to climate change.



climate action pathways? These forces could manifest as reduced capacity to reach agreement on, and carry out, mitigation measures. The potential implications for adaptation are even more problematic, as worldview-derived outgroup antagonism may limit the degree of inclusiveness in vulnerability appraisals and adaptation efforts, resulting in the widening of vulnerability gaps between socially dominant and socially marginalized groups or groups who are perceived as a “threat” to the broader collective. In this sense, research on mortality defenses’ influence on the adaptation of socially disadvantaged and highly vulnerable groups is of particular and timely importance.

#### 4.1.3 | Transformational action

The concept of transformation is gaining greater attention given the severity of projected climate change impacts and the urgent need to avoid dangerous anthropogenic interference with the climate system (Feola, 2015; Gillard, Gouldson, Paavola, & Van Alstine, 2016). Transformational action implies fundamental shifts in values; this could include changes to livelihoods, settlement patterns and high consumption lifestyles (Denton et al., 2014; O’Brien, 2012).

Incorporating TMT’s worldview defenses in climate response studies would enrich the evolving focus on norms, values and beliefs—core components of one’s worldview—as critical barriers for, or potential enablers of, positive transformational change. What TMT suggests is that transformative action depends on peoples’ worldviews and the desire to defend the integrity or “rightness” of one’s worldview. But the effect of TMT worldview defenses on mitigation and adaptation could vary. For example, mortality-induced defenses could restrict the range of acceptable responses to those incremental actions that do not challenge worldviews while existing pro-climate action intentions may also be reinforced if these norms are already tacit or explicit. Thus, incorporating mortality awareness in climate response research opens up many opportunities for analyses of TMT defenses in restricting/advancing transformational changes, in multiple scales and in various cultural and ecological contexts.

#### 4.1.4 | “Hero” projects

Finally, we argue that TMT and mortality awareness offer provocative and significant potential for advancing action. TMT can help us identify, empirically test, and possibly leverage opportunities to accelerate adaptation and mitigation processes. Some of the most promising opportunities relate to self-esteem striving as a mortality awareness defense. By bolstering our self-esteem we reassure ourselves that we are “a valuable contributor to a meaningful universe” (Solomon et al., 1991, p. 94). At its most basic, this mortality defense means that most people want to feel good about themselves and their place in the world. We propose that this insight should be more deeply explored—and possibly deployed—in climate response research and practice.

A focus on hero projects and self-esteem striving in the context of climate change reveals innumerable possibilities for policy-relevant research, with projects that could range across personalities and social positions. A promising research stream could examine the effect of self-esteem striving on the formation of communities-of-action (see Box 2) that may boost climate action at the individual and societal levels. Individuals’ willingness to undertake hero projects may be scalable to the societal level and conducive to long-term, more transformative actions. Hero projects could also support anticipatory action because they are based on societal incentives rather than climate threats. Thus, some of the most promising directions for research on social-psychological responses to climate change include advancing our understanding of which social environments are

#### BOX 2

##### UPSCALING HERO PROJECTS: THE GREEN BELT MOVEMENT

A prominent and recent example of hero projects’ potential to transform landscapes, improve socio-ecological resilience and upscale action is the “Green Belt Movement.” This movement was founded by Professor Wangari Maathai—a Kenyan woman who later won the Nobel Prize for her activities. The movement started as a women’s grassroots organization dedicated mainly to countering deforestation. Today the movement’s objectives include the advancement of water harvesting, improvement of livelihoods and gender equality, and climate change mitigation. Over the years, the movement has spread to 20 African countries, resulting in the planting of over 30 million trees (Green Belt Movement, 2017). The Green Belt Movement demonstrates not only the social upscaling of action but also the expansion of the project’s breadth of activities. As hero projects may vary considerably based on the characteristics of individuals, societies and ecological systems, studying and advancing such projects and their upscaling potential in various settings will necessitate interdisciplinary and potentially transdisciplinary work.

conducive for climate-related hero projects, understanding the mortality awareness factors that lead early adapters to take “heroic” action, and identifying the factors that enable the upscaling of individual hero projects to wider societal-level action.

## 5 | CONCLUSION

It is possible that the continuous barrage of climate change mortality reminders—and the psychological defenses triggered by these reminders—may exceed individuals' and societies' capacity to heed adaptation and mitigation messages and interventions. Given this concern, we encourage researchers to first, incorporate TMT insights on individuals' psychological responses to climate change threats in their work, and second, consider how these responses may aggregate at the societal level. TMT has considerable and immediate potential to contribute to our understanding of adaptation and mitigation processes. Recognizing this potential will open many avenues and opportunities for empirical research and may also help us advance adaptation and mitigation interventions that are both timely and socially acceptable.

To assist in this process, our article provides a preliminary list of hypotheses and predictions about the ways in which mortality defenses may affect climate action and sets out a research agenda to examine the effects of these defenses. We propose that TMT can do more than help us predict and overcome potential barriers to adaptation and mitigation. Insights from TMT can help advance a “heroic society,” where a greater diversity of people—and their varied worldviews—can build their self-esteem and strengthen their environmental identities by generating socially oriented climate action. Thus, considering TMT insights in climate response research is critical if we are to direct people and societies toward more proactive and more sustained responses.

## ACKNOWLEDGMENTS

This manuscript greatly benefited from comments on earlier versions by Drs Eran Feitelson and Sheldon Solomon. The authors thank Carmit Cohen-Gelberg for the preparation of the figures. This research was supported by Canada's Social Science and Humanities Research Council's Insight Development Grant (Wolfe 2012; #430-2012-0264).

## CONFLICT OF INTEREST

The authors have declared no conflicts of interest for this article.

## ENDNOTES

<sup>1</sup>In TMT research, mortality salience is intentionally triggered in multiple ways, within ethical research practice constraints. Researchers may have participants write about death, view graphic death images, or have the word “death” flash imperceptibly on a computer screen as a participant completes a task. Control participants are triggered by aversive but nonfatal reminders, for example, dental pain (Burke et al., 2010). Note that we refer to mortality “awareness” more generally when speaking about triggers that may occur outside of a clinical research context (S. Solomon, personal communication, June 2, 2017).

<sup>2</sup>TMT's three primary lines of inquiry offer an abundance of empirical and transdisciplinary research opportunities that we can only begin to highlight in this short Opinion.

<sup>3</sup>Social-psychological research on threat responses has “proliferated” (Jonas et al., 2014, p. 221) since Festinger's (1957) work on cognitive dissonance and has grown to include theories focused on the need for certainty, self-esteem, identity and control, as well as the maintenance of life meaning and coherence across one's individual and group goals, motivation and worldviews. For a comprehensive and insightful review, please see Jonas et al. (2014).

## RELATED WIREs ARTICLES

[The social amplification/attenuation of risk framework: Application to climate change](#)

[Place identity and climate change adaptation: A synthesis and framework for understanding](#)

[Developing a critical agenda to understand pro-environmental actions: Contributions from social representations and social practices theories](#)

## ORCID

Sarah E. Wolfe  <https://orcid.org/0000-0003-0304-8934>

Amit Tubi  <https://orcid.org/0000-0002-4523-9141>

## FURTHER READING

- Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., ... Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic Change*, 93(3–4), 335–354. <https://doi.org/10.1007/s10584-008-9520-z>
- Allo, M., & Loureiro, M. L. (2014). The role of social norms on preferences toward climate change policies: A meta-analysis. *Energy Policy*, 73, 563–574. <https://doi.org/10.1016/j.enpol.2014.04.042>
- Becker, E. (1985). *Escape from evil*. New York, NY: Free Press/Macmillan Publishing.

## REFERENCES

- Adams, M. (2016). *Ecological crisis, sustainability and the psychosocial subject: Beyond behaviour change*. London, England: Palgrave Macmillan.
- Agroskin, D., Jonas, E., Klackl, J., & Prentice, M. (2016). Inhibition underlies the effect of high need for closure on cultural closed-mindedness under mortality salience. *Frontiers in Psychology*, 7, 1583. <https://doi.org/10.3389/fpsyg.2016.01583>
- Ariely, D. (2008). *Predictably irrational: The hidden forces that shape our decisions*. New York, NY: Harper Collins.
- Barnes Truelove, H., Carrico, A. R., & Thabrew, L. (2015). A socio-psychological model for analyzing climate change adaptation: A case study of Sri Lankan paddy farmers. *Global Environmental Change*, 31, 85–97. <https://doi.org/10.1016/j.gloenvcha.2014.12.010>
- Barth, M., Masson, T., Fritsche, I., & Ziemer, C. T. (2018). Closing ranks: Ingroup norm conformity as a subtle response to threatening climate change. *Group Processes & Intergroup Relations*, 21(3), 497–512. <https://doi.org/10.1177/1368430217733119>
- Batson, C. D., & Stocks, E. L. (2004). Religion: Its core psychological functions. In J. Greenberg, S. L. Koole, & T. Pyszczynski (Eds.), *Handbook of experimental existential psychology* (pp. 141–155). New York, NY: Guilford Press.
- Becker, E. (1973). *The denial of death*. New York, NY: Simon & Schuster.
- Brügger, A., Dessai, S., Devine-Wright, P., Morton, T. A., & Pidgeon, N. F. (2015). Psychological responses to the proximity of climate change. *Nature Climate Change*, 5, 1031–1037.
- Burke, B. L., Martens, A., & Faucher, E. H. (2010). Two decades of terror management theory: A meta-analysis of mortality salience research. *Personality and Social Psychology Review*, 14(2), 155–195. <https://doi.org/10.1177/1088868309352321>
- Capstick, S., Whitmarsh, L., Poortinga, W., Pidgeon, N., & Upham, P. (2015). International trends in public perceptions of climate change over the past quarter century. *WIREs Climate Change*, 6(1), 35–61. <https://doi.org/10.1002/wcc.321>
- Carmi, N., Arnon, S., & Orion, N. (2015). Transforming environmental knowledge into behavior: The mediating role of environmental emotions. *Journal of Environmental Education*, 46(3), 183–201. <https://doi.org/10.1080/00958964.2015.1028517>
- Clayton, S., Devine-Wright, P., Stern, P. C., Whitmarsh, L., Carrico, A., Steg, L., ... Bonnes, M. (2015). Psychological research and global climate change. *Nature Climate Change*, 5, 640–646.
- Crompton, T. (2011). Finding cultural values that can transform the climate change debate. *Solutions*, 2(4), 56–63.
- Denton, F., Wilbanks, T. J., Abeyasinghe, A. C., Burton, I., Gao, Q., Lemos, M. C. T., ... Warner, K. (2014). Climate-resilient pathways: Adaptation, mitigation, and sustainable development. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, et al. (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of working group II to the fifth assessment report of the Intergovernmental Panel on Climate Change* (pp. 1101–1131). Cambridge, England: Cambridge University Press.
- Dickinson, J. (2009). The people paradox: Self-esteem striving, immortality ideologies, and human response to climate change. *Ecology and Society*, 14(1), 34.
- Dickinson, J., Crain, R., Yalowitz, S., & Cherry, T. M. (2013). How framing climate change influences citizen scientists' intentions to do something about it. *Journal of Environmental Education*, 44(3), 145–158. <https://doi.org/10.1080/00958964.2012.742032>
- Dow, K., Berkhout, F., & Preston, B. L. (2013). Limits to adaptation to climate change: A risk approach. *Current Opinion in Environmental Sustainability*, 5(3), 384–391. <https://doi.org/10.1016/j.cosust.2013.07.005>
- Feinberg, M., & Willer, R. (2010). Apocalypse soon? Dire messages reduce belief in global warming by contradicting just-world beliefs. *Psychological Science*, 22(1), 34–38. <https://doi.org/10.1177/0956797610391911>
- Feola, G. (2015). Societal transformation in response to global environmental change: A review of emerging concepts. *Ambio*, 44(5), 376–390. <https://doi.org/10.1007/s13280-014-0582-z>
- Festinger, I. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.
- Fritsche, I., Barth, M., Jugert, P., Masson, T., & Resse, G. (2018). A social identity model of pro-environmental action (SIMPEA). *Psychological Review*, 125(2), 245–269. <https://doi.org/10.1037/rev0000090>
- Fritsche, I., Cohrs, J. C., Kessler, T., & Bauer, J. (2012). Global warming is breeding social conflict: The subtle impact of climate change threat on authoritarian tendencies. *Journal of Environmental Psychology*, 32(1), 1–10. <https://doi.org/10.1016/j.jenvp.2011.10.002>
- Fritsche, I., & Häfner, K. (2012). The malicious effects of existential threat on motivation to protect the natural environment and the role of environmental identity as a moderator. *Environment and Behavior*, 44(4), 570–590. <https://doi.org/10.1177/0013916510397759>
- Fritsche, I., Jonas, E., Kayser, D. N., & Koranyi, N. (2010). Existential threat and compliance with pro-environmental norms. *Journal of Environmental Psychology*, 30(1), 67–79. <https://doi.org/10.1016/j.jenvp.2009.08.007>
- Gifford, R. (2008). Psychology's essential role in alleviating the impacts of climate change. *Canadian Psychology*, 49(4), 273–280. <https://doi.org/10.1037/a0013234>
- Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist*, 66(4), 290–302. <https://doi.org/10.1037/a0023566>
- Gillard, R., Gouldson, A., Paavola, J., & Van Alstine, J. (2016). Transformational responses to climate change: Beyond a systems perspective of social change in mitigation and adaptation. *WIREs Climate Change*, 7(2), 251–265. <https://doi.org/10.1002/wcc.384>
- Goldenberg, J. L., Pyszczynski, T., Greenberg, J., Solomon, S., Kluck, B., & Cornwell, R. (2001). I am not an animal: Mortality salience, disgust, and the denial of human creatureliness. *Journal of Experimental Psychology: General*, 130(3), 427–435. <https://doi.org/10.1037/0096-3445.130.3.427>
- Government of Ontario, Ministry of Environment. (2017a). *Climate change social media campaign via Youtube—“Save the Pizza”*. Retrieved from <https://adland.tv/commercials/ongov-save-pizza-2017-30-canada>
- Government of Ontario, Ministry of Environment. (2017b). *Climate change social media campaign via Youtube—“Save the Snowy Driveways”*. Retrieved from <https://adland.tv/commercials/ongov-save-snoy-driveways-2017-30-canada>
- Government of Ontario, Ministry of Environment. (2017c). *Climate change social media campaign via Youtube—“Save the Ski Days”*. Retrieved from <https://adland.tv/commercials/ongov-save-ski-days-2017-30-canada>
- Gowdy, J. M. (2008). Behavioral economics and climate change policy. *Journal of Economic Behavior & Organization*, 68(3), 632–644. <https://doi.org/10.1016/j.jebo.2008.06.011>
- Green Belt Movement. (2017). *Green Belt Movement website*. Retrieved from <http://www.greenbeltmovement.org/>

- Haltinner, K., & Sarathchandra, D. (2018). Climate change skepticism as a psychological coping strategy. *Sociology Compass*, 12(6), e12586. <https://doi.org/10.1111/soc4.12586>
- Hamilton, C., & Kasser, T. (2009, September). *Psychological Adaptation to the Threats and Stresses of a Four Degree World*. Paper presented at the Four Degrees and Beyond Conference, Oxford University, UK. Retrieved from <http://clivehamilton.com/psychological-adaptation-to-the-threats-and-stresses-of-a-four-degree-world/>
- Hansen, J., Sato, M., Kharecha, P., von Schuckmann, K., Beerling, D. J., Cao, J., ... Ruedy, R. (2017). Young people's burden: Requirement of negative CO<sub>2</sub> emissions. *Earth System Dynamics*, 8(3), 577–616. <https://doi.org/10.5194/esd-8-577-2017>
- Harrison, P. R., & Mallett, R. K. (2013). Mortality salience motivates the defense of environmental values and increases collective ecoguilt. *Ecopsychology*, 5(1), 36–43. <https://doi.org/10.1089/eco.2012.0070>
- Hulme, M. (2009). *Why we disagree about climate change: Understanding controversy, inaction and opportunity*. Cambridge, England: Cambridge University Press.
- Israel Water Authority. (2009, April 20). *Water saving campaign via national television—"Israel is drying"*. Retrieved from <https://www.youtube.com/watch?v=Xpalk5xb4gU>
- Jonas, E., & Fritzsche, I. (2013). Destined to die but not to wage war: How existential threat can contribute to escalation or de-escalation of violent intergroup conflict. *American Psychologist*, 68(7), 543–558. <https://doi.org/10.1037/a0033052>
- Jonas, E., McGregor, I., Klackl, J., Agroskin, D., Fritzsche, I., Holbrook, C., ... Quirin, M. (2014). Threat and defense: From anxiety to approach. In J. M. Olson & M. P. Zanna (Eds.), *Advances in experimental social psychology* (Vol. 49, pp. 219–286). Waltham, MA: Academic Press.
- Juhl, J., & Routledge, C. (2016). Putting the terror in Terror Management Theory: Evidence that the awareness of death does cause anxiety and undermine psychological well-being. *Current Directions in Psychological Science*, 25(2), 99–103. <https://doi.org/10.1177/0963721415625218>
- Kasser, T., & Sheldon, K. M. (2000). Of wealth and death: Materialism, mortality salience, and consumption behavior. *Psychological Science*, 11(4), 348–351. <https://doi.org/10.1111/1467-9280.00269>
- Klein, R. J. T., Midgley, G. F., Preston, B. L., Alam, M., Berkhout, F. G. H., Dow, K., & Shaw, M. R. (2014). Adaptation opportunities, constraints, and limits. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, et al. (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of working group II to the fifth assessment report of the Intergovernmental Panel on Climate Change* (pp. 899–943). Cambridge, England: Cambridge University Press.
- Koole, S. L., & Van den Berg, A. E. (2005). Lost in the wilderness: Terror management, action orientation, and nature evaluation. *Journal of Personality and Social Psychology*, 88(6), 1014–1028. <https://doi.org/10.1037/0022-3514.88.6.1014>
- Leiserowitz, A. (2006). Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change*, 77(1), 45–72. <https://doi.org/10.1007/s10584-006-9059-9>
- Li, Y., Ren, T., Kinney, P. L., Joyner, A., & Zhang, W. (2018). Projecting future climate change impacts on heat-related mortality in large urban areas in China. *Environmental Research*, 163, 171–185. <https://doi.org/10.1016/j.envres.2018.01.047>
- Lorenzoni, I., & Whitmarsh, L. (2014). Climate change and perceptions, behaviors, and communication research after the IPCC 5th assessment report—A WIREs Editorial. *WIREs Climate Change*, 5(6), 703–708. <https://doi.org/10.1002/wcc.319>
- Mitchell, C. L., Burch, S. L., & Driscoll, P. A. (2016). (Mis)communicating climate change? Why online adaptation databases may fail to catalyze adaptation action. *WIREs Climate Change*, 7(4), 600–613. <https://doi.org/10.1002/wcc.401>
- Morrison, T. H., Adger, W. N., Brown, K., Lemos, M. C., Huitema, D., & Hughes, T. P. (2017). Mitigation and adaptation in polycentric systems: Sources of power in the pursuit of collective goals. *WIREs Climate Change*, 8(5), e479. <https://doi.org/10.1002/wcc.479>
- Moser, S. C. (2016). Reflections on climate change communication research and practice in the second decade of the 21st century: What more is there to say? *WIREs Climate Change*, 7(3), 345–369. <https://doi.org/10.1002/wcc.403>
- Norgaard, K. M. (2011). *Living in denial: Climate change, emotions, and everyday life*. Cambridge, MA: MIT Press.
- Obama, B. (2015, January 21). *No greater threat to future than climate change*. Retrieved from <https://edition.cnn.com/2015/01/21/us/climate-change-us-obama/index.html>
- O'Brien, K. (2012). Global environmental change II: From adaptation to deliberate transformation. *Progress in Human Geography*, 36(5), 667–676. <https://doi.org/10.1177/0309132511425767>
- O'Brien, K., & Sygna, L. (2013). Responding to climate change: The three spheres of transformation. *Transformation in a Changing Climate Conference Proceedings*. University of Oslo, Norway (pp. 16–23).
- Öhman, A. (2008). Fear and anxiety: Overlaps and dissociations. In M. Lewis, J. M. Haviland-Jones, & L. Barrett (Eds.), *Handbook of emotions* (3rd ed.). New York, NY: Guilford Press.
- 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(3), 355–379. <https://doi.org/10.1177/1075547008329201>
- Pal, J. S., & Eltahir, E. A. B. (2015). Future temperature in southwest Asia projected to exceed a threshold for human adaptability. *Nature Climate Change*, 6, 197–200.
- Petkova, E. P., Horton, R. M., Bader, D. A., & Kinney, P. L. (2013). Projected heat-related mortality in the U.S. urban northeast. *International Journal of Environmental Research and Public Health*, 10(12), 6734–6747. <https://doi.org/10.3390/ijerph10126734>
- Pyszczynski, T., Greenberg, J., & Solomon, S. (2000). Proximal and distal defense: A new perspective on unconscious motivation. *Current Directions in Psychological Science*, 9(5), 156–160. <https://doi.org/10.1111/1467-8721.00083>
- Pyszczynski, T., Motyl, M., Vail, K. E., Hirschberger, G., Arndt, J., & Kesebir, P. (2012). Drawing attention to global climate change decreases support for war. *Peace and Conflict: Journal of Peace Psychology*, 18(4), 354–368. <https://doi.org/10.1037/a0030328>
- Pyszczynski, T., Solomon, S., & Greenberg, J. (2015). Thirty years of Terror Management Theory: From genesis to revelation. In J. M. Olson & M. P. Zanna (Eds.), *Advances in experimental social psychology* (Vol. 52, pp. 1–70). Waltham, MA: Academic Press.
- Reckien, D., Flacke, J., Dawson, R. J., Heidrich, O., Olazabal, M., Foley, A., ... Pietrapertosa, F. (2014). Climate change response in Europe: What's the reality? Analysis of adaptation and mitigation plans from 200 urban areas in 11 countries. *Climatic Change*, 122(1), 331–340. <https://doi.org/10.1007/s10584-013-0989-8>
- Salama, S., & Aboukoura, K. (2018). Role of emotions in climate change communication. In W. Leal Filho, E. Manolas, A. Azul, U. Azeiteiro, & H. McGhie (Eds.), *Handbook of climate change communication* (Vol. 1, pp. 137–150). Cham, Switzerland: Springer.
- Schimmel, J., Hayes, J., Williams, T., & Jahrig, J. (2007). Is death really the worm at the core? Converging evidence that worldview threat increases death-thought accessibility. *Journal of Personality and Social Psychology*, 92(5), 789–803. <https://doi.org/10.1037/0022-3514.92.5.789>
- Schmidt, A., Ivanova, A., & Schäfer, M. S. (2013). Media attention for climate change around the world: A comparative analysis of newspaper coverage in 27 countries. *Global Environmental Change*, 23(5), 1233–1248. <https://doi.org/10.1016/j.gloenvcha.2013.07.020>
- Schmuck, P., & Schultz, W. P. (2012). *Psychology of sustainable development*. New York, NY: Springer Science & Business Media.
- Sheldon, K. M., & McGregor, H. A. (2000). Extrinsic value orientation and "The tragedy of the commons". *Journal of Personality*, 68(2), 383–411. <https://doi.org/10.1111/1467-6494.00101>
- Skurka, C., Niederdeppe, J., Romero-Canyas, R., & Acup, D. (2018). Pathways of influence in emotional appeals: Benefits and tradeoffs of using fear or humor to promote climate change-related intentions and risk perceptions. *Journal of Communication*, 68(1), 169–193. <https://doi.org/10.1093/joc/jqx008>

- Solomon, S., Greenberg, J., & Pyszczynski, T. (1991). A Terror Management Theory of social behavior: The psychological functions of self-esteem and cultural worldviews. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 24, pp. 93–159). Waltham, MA: Academic Press.
- Solomon, S., Greenberg, J., & Pyszczynski, T. A. (2015). *The worm at the core: On the role of death in life*. New York, NY: Random House.
- Springmann, M., Mason-D'Croz, D., Robinson, S., Garnett, T., Godfray, H. C. J., Gollin, D., ... Scarborough, P. (2016). Global and regional health effects of future food production under climate change: A modelling study. *Lancet*, 387(10031), 1937–1946. [https://doi.org/10.1016/S0140-6736\(15\)01156-3](https://doi.org/10.1016/S0140-6736(15)01156-3)
- Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., ... Weber, E. (2009). Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges. Report of the American Psychological Association Task Force on the Interface between psychology and global climate change. Retrieved from <https://www.apa.org/science/about/publications/climate-change.aspx>
- Taylor, A. L., Dessai, S., & Bruine de Bruin, W. (2014). Public perception of climate risk and adaptation in the UK: A review of the literature. *Climate Risk Management*, 4-5, 1–16. <https://doi.org/10.1016/j.crm.2014.09.001>
- Tosun, J., & Schoenefeld, J. J. (2017). Collective climate action and networked climate governance. *WIREs Climate Change*, 8(1), e440. <https://doi.org/10.1002/wcc.440>
- Uhl, I., Klackl, J., Hansen, N., & Jonas, E. (2017). Undesirable effects of threatening climate change information: A cross-cultural study. *Group Processes & Intergroup Relations*, 21(3), 513–529. <https://doi.org/10.1177/1368430217735577>
- Vail, K. E., & Juhl, J. (2015). An appreciative view of the brighter side of terror management processes. *Social Sciences*, 4, 1020–1045. <https://doi.org/10.3390/socsci4041020>
- Vess, M., & Arndt, J. (2008). The nature of death and the death of nature: The impact of mortality salience on environmental concern. *Journal of Research in Personality*, 42(5), 1376–1380. <https://doi.org/10.1016/j.jrp.2008.04.007>
- Wallace-Wells, D. (2017, July 9). *The Uninhabitable Earth*. *New York Magazine*. Retrieved from <http://nymag.com/daily/intelligencer/2017/07/climate-change-earth-too-hot-for-humans.html>
- Wang, S., Corner, A., Chapman, D., & Markowitz, E. (2018). Public engagement with climate imagery in a changing digital landscape. *WIREs Climate Change*, 9(2), e509. <https://doi.org/10.1002/wcc.509>
- Whitmarsh, L., & Corner, A. (2017). Tools for a new climate conversation: A mixed-methods study of language for public engagement across the political spectrum. *Global Environmental Change*, 42, 122–135. <https://doi.org/10.1016/j.gloenvcha.2016.12.008>
- Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior*, 27(5), 591–615. <https://doi.org/10.1177/109019810002700506>
- Wolfe, S. E., & Brooks, D. B. (2017). Mortality awareness and water decisions: A social psychological analysis of supply-management, demand-management and soft-path paradigms. *Water International*, 42(1), 1–17. <https://doi.org/10.1080/02508060.2016.1248093>
- Xue, W., Hine, D. W., Marks, A. D. G., Phillips, W. J., Nunn, P., & Zhao, S. (2016). Combining threat and efficacy messaging to increase public engagement with climate change in Beijing, China. *Climatic Change*, 137(1), 43–55. <https://doi.org/10.1007/s10584-016-1678-1>

**How to cite this article:** Wolfe SE, Tubi A. Terror Management Theory and mortality awareness: A missing link in climate response studies? *WIREs Clim Change*. 2018;e566. <https://doi.org/10.1002/wcc.566>