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Climate Change Information's Impact on Death-Thought Accessibility and Global Climate Change Belief

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Abstract

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MA, Lesley University, 2003

BA, Excelsior College, 2000

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Global climate change is perhaps the greatest current existential threat to life on this planet. Despite the overwhelming scientific consensus for the existence of human-made global climate change, climate change skepticism continues to be a significant obstacle. The purpose of this experimental online study was to address research questions concerning the effect of climate change information on death-thought accessibility (DTA) and belief in global climate change and to investigate whether a relationship exists between DTA and belief certainty in global climate change. Terror management theory was the theoretical foundation for the study. The study sample consisted of 104 participants randomly assigned to two experimental groups and a control group. Group 1 read an essay about the environmental effects of climate change, Group 2 read an essay on the human causes of climate change, and Group 3 (control) read information about rainy weather. A 25-item word completion task was used to measure DTA and a 17-item Likert scale (Whitmarsh Skepticism Scale) measured belief certainty in global climate change. An ANOVA with planned contrasts and an ANCOVA were performed with nonsignificant results, indicating that climate change information alone does not necessarily increase DTA or belief certainty in global climate change, nor does it indicate a relationship between the 2 variables. The findings indicate that more than educational information on climate change may be needed to effect positive social change regarding the issue of global climate change.

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Chapter 1: Introduction

Introduction and Background

Global climate change is perhaps the greatest threat to the future well-being of humans and life on Earth (Swim et al., 2011). Nevertheless, there are certain psychological obstacles (e.g., denial, apathy) that either impede the acceptance of climate change as a reality or discourage the behavioral changes (e.g., reducing carbon emissions) necessary for addressing the human impact on global climate change (Doherty & Clayton, 2011; Gifford, 2011). According to terror management theory (TMT), much of human thinking and behavior is influenced by the unconscious awareness of and concern about death (Hayes, Schimel, Arndt, & Faucher, 2010). The terror of death is perhaps the main thing that drives human beings to stay busy (Becker, 1973). For example, terror management studies (e.g., Norenzayan, Dar-Nimrod, Hansen, & Proulx, 2009; Rutjens, van der Pligt, & van Harreveld, 2009) have shown that when mortality salience increases, participants' worldview defenses tend to strengthen and their striving for self-esteem increases. Although the uniquely human awareness of mortality induces uncomfortable anxiety to some degree, the mind has adaptive mechanisms that can bar thoughts or reminders of death (e.g., cancer) from conscious awareness (Hayes et al., 2010). Through the measurement of death-thought accessibility (DTA), a main concept in TMT, the functioning of these mechanisms can be observed and empirically tested for their "level of activation of death thoughts" (Hayes et al., 2010, p. 699).

Although awareness and concern have increased in recent years regarding the global issue of climate change, it is not always clear why people believe or doubt the

reality of global climate change. Borick and Rabe (2010) have pointed out a dearth of research examining the factors that influence belief or disbelief in climate change. In a correlational study using surveys to gather data concerning Americans' beliefs about global climate change, Borick and Rabe (2020) found that a combination of personal experience or observation, unusual weather events, physical changes to the Earth, and political affiliation were associated with views on climate change. In another correlational study (Deryugina, 2013), the formation and updating of people's beliefs about global climate change were investigated in a sample of U.S. adults. The results found that although short-term (1 day to 2 weeks) temperature fluctuations had no association with beliefs, long-term (1 month to 1 year) temperature fluctuations positively correlated with the belief that the effects of global climate change were being felt. However, Deryugina (2013) also found that people who identified as conservatives were significantly more likely to deny the effects of global climate change than people who identified as liberals. In other recent correlational studies (e.g., Li, Johnson, & Zavel, 2011), researchers found a basic relationship between personal experiences with local weather patterns (or temperature deviations) and Americans' beliefs concerning evidence of climate change, especially in extreme (hot or cold) weather (Egan & Mullin, 2012).

Gender, education, political ideology, and socioeconomic level are other factors associated with climate change belief. Results from recent studies (e.g., Clements, 2012; Davidson & Haan, 2012; Whitmarsh, 2011) conducted in Britain and Canada revealed differences in climate change beliefs when it came to gender and political ideology; women showed more awareness of climate change impact than men. Factors found to be

associated with climate change skepticism or denial are (a) being male, (b) having less education, (c) supporting the Conservative party, and (d) having a right-wing ideological worldview. In two different studies concerning political affiliation and belief in global climate change, McCright and Dunlap (2011) found that liberals and Democrats tended to agree with and show more concern for the scientific consensus on climate change than conservatives and Republicans; moreover; the authors discovered that conservative White males are more likely to deny the existence of climate change than any other group of U.S. adults.

The principal source of public information and awareness of global climate change has been the media. In a recent correlational study (Sampei & Aoyagi-Usui, 2009), researchers examined the relationship between media coverage of global climate change and public awareness over a 10-year period and found a positive correlation between media coverage and the public's concern about global climate change. In other words, concern for global climate change has increased along with the increase in media coverage of climate change issues.

In a recent experimental study (Corner, Whitmarsh, & Xenias, 2012), global climate change skepticism was measured before and after participants read two opposing newspaper editorials about global climate change that were chosen for the purpose of creating doubt. One purpose of the study (2012) was to find out whether participants with opposing views on climate change would incorporate contradictory information about global climate change in a way that is biased. The results of ANOVA testing suggest biased assimilation of the information, as participants who previously had a higher level

of skepticism about climate change judged the skeptical editorial as more veritable than the editorial in favor of climate change, and vice versa for those participants with less prior skepticism.

The present study contributes to existing DTA and TMT research by answering the question of whether climate change information increases both death awareness and belief certainty and whether a relationship exists between the two. The findings could have implications for any future studies on climate change using TMT as the theoretical framework. By shedding more light on what influences climate change belief, which includes doubt and denial, the findings of the study may help scientists, educators, or the media more effectively communicate information in ways that will better convince the public of the reality of global climate change. In this chapter, I briefly describe the study's purpose, research questions and hypotheses, theoretical foundation, nature, definition of terms, delimitations, limitations, assumptions, and significance.

Problem Statement and Purpose

Although many TA studies have been conducted (Hayes et al., 2010), the subject of global climate change has not yet been included in the body of DTA research (Dickinson, 2009). According to Dickinson (2009), there are certain details about global climate change that could be associated with human mortality—some more so than others. For example, information that reveals the potential increase in the severity of storm activity (due to climate change) might impact DTA more than information that points to the rise in global temperature (due to carbon emissions). The purpose of this quantitative study was to gain more insight into the psychological impact of climate

change information from a terror management perspective and to find out if a relationship exists between DTA and belief certainty in global climate change. I examined whether climate change information increases DTA and revealed how two types of climate change information (e.g., environmental impact and human causes of climate change) impact belief in global climate change.

Research Questions and Hypotheses

The study addressed the following research questions and hypotheses:

RQ1: Does climate change information affect belief certainty in global climate change?

Null hypothesis 1: Belief certainty in global climate change will not change after reading information about the human influence on climate change.

Research hypothesis 1: Belief certainty in global climate change will be greater after reading information about the human influence on climate change.

Null hypothesis 2: Belief certainty in global climate change will not change after reading information about the environmental impact of climate change.

Research hypothesis 2: Belief certainty in global climate change will be greater after reading information about the environmental impact of climate change.

RQ2: Does climate change information affect DTA?

Null hypothesis 3: After reading information about the human influence on global climate change, DTA will not change in research participants.

Research hypothesis 3: After reading information about the human influence on global climate change, DTA will be greater in research participants.

Null hypothesis 4: After reading information about the environmental impact of global climate change, DTA will not change in research participants.

Research hypothesis 4: After reading information about the environmental impact of global climate change, DTA will be greater in research participants.

RQ3: Does a relationship exist between DTA and belief certainty in global climate change?

Null hypothesis 5: There is not an association between DTA and belief certainty in global climate change when statistically controlling for the manipulation.

Research hypothesis 5: There is an association between DTA and belief certainty in global climate change when statistically controlling for the manipulation.

Theoretical Foundation

The theoretical framework for this study is TMT (Greenberg, Pyszczynski, & Solomon, 1986) including the concept of DTA. According to TMT, much of human behavior is influenced by persistent concerns about death that are kept mostly unconscious (Hayes, et al., 2010). Because conscious thoughts of death cause heightened anxiety, the mind has buffering mechanisms that manage this anxiety by keeping thoughts of death from consciousness. The main defensive structures (according to TMT) used or the management of death-thoughts consist of cultural worldviews and self-esteem. By effectively providing meaning, order, and value to one's environment, these buffering mechanisms work together to ease anxiety about death for occupied and distracted individuals who are busily pursuing their goals. Thanks to the TMT concept of DTA, the functioning of these mechanisms has been examined empirically through

methods that measure the level of activation of death thoughts (Hayes et al., 2010). Nevertheless, this study is perhaps the first to examine DTA in relation to the subject of climate change. A more detailed explanation of TMT is given in Chapter 2.

Nature of the Study

This study is quantitative in design. A randomized experiment (i.e., participants randomly assigned to conditions reflecting the independent variable) was necessary to address the causal hypotheses of the study based on the measurement of DTA (dependent variable), certainty in the belief in global climate change (dependent variable), and information on global climate change (independent variable). I used quantitative methods to determine whether information on global climate change increased DTA for two types (i.e., human causes and environmental consequences) of climate change information. This study assessed the impact of climate change information on belief in global climate change.

The study has an experimental design, and research participants (adults selected from the research participant pool at Walden University and from SurveyMonkey) were randomly assigned to three different conditions. One group read information that describes the environmental impact of global climate change, such as the rapid melting of polar ice, the increasing severity of storms, and rising sea levels. Another group read information pertaining to human behavior or activity that affects global climate change, such as greenhouse gas emissions and deforestation. A third group of participants that served as the control condition read negative information about rainy weather that excluded the subject of global climate change. The readings for each condition contained

approximately the same amount of information. Participants completed climate change skepticism and DTA measures only once immediately after reading the essays.

After participants read the information on global climate change and the control topic, DTA and climate change doubt were measured by a word completion task and a skepticism scale given respectively. For each of the first four hypotheses, a planned contrast between the control condition and the condition in the hypothesis was performed. Planned contrasts are appropriate for testing specific hypotheses that have been predetermined; moreover, they have more statistical power than unplanned contrasts in the prevention of Type II errors and can be used alternatively to ANOVA (Chatham, 1999). According to Chatham (1999), "Planned comparisons, however, are only required to account for the comparisons of interest, thereby increasing power against Type II errors" (p. 3); therefore, it was not deemed necessary to conduct an ANOVA on the three groups prior to performing the planned contrasts. ANCOVA was used to address the fifth hypothesis, with DTA functioning as the covariate. The total experiment and data collection were conducted online through a survey company; statistical analyses were carried out with SPSS software. By determining whether climate change information increases DTA and whether it influences certainty in global climate change belief, this quantitative analysis could possibly lay some of the groundwork for any future climate change research that uses a terror management theoretical framework.

Definition of Terms

Cultural worldview: A particular set of standards and values that provide meaning, order, and the possibility of immortality (literally and symbolically) to members of a common society (Hayes, Schimel, Faucher, & Williams, 2008).

Death-thought accessibility (DTA) hypothesis: States that the weakening of a psychological structure that provides protection from thoughts of death will tend toward making death thoughts more accessible to consciousness (Hayes et al., 2008).

Global climate change: A change in the world's climate patterns that is attributed mostly to the increasing levels of greenhouse gases (e.g., carbon dioxide) in the Earth's atmosphere caused by the burning of fossil fuels (Molnar, 2010).

Mortality salience: Reminders or thoughts of one's own inevitable death (Hayes et al., 2008).

Self-esteem: The belief that one is a valued (or valuable) member of society when successfully participating in accordance with the values of a meaningful cultural worldview (Hayes et al., 2008).

Terror management theory (TMT): A social psychological theory that posits that humans are uniquely aware of the inevitability of their own death. The existential anxiety created by mortality salience (or daily reminders of death) is managed through the development and continuance of a particular cultural worldview and is buffered by the self-esteem that comes from personally and collectively achieving the standards and values of a cultural worldview (Hayes et al., 2008).

Scope and Delimitations

This study was designed to specifically examine the effect of climate change information on DTA and global climate change belief in adult participants. The design of the study was similar to other published TMT studies in its use of informational essays, mortality salience induction, and word fragment completion tasks. Other instruments, used in previous climate change research, were implemented in this study to determine certainty or skepticism in global climate change. The main research problem was to determine whether certain types of climate change information significantly increase DTA and whether a relationship exists between DTA and belief certainty in global climate change. In this study, I used a web-based research design that drew from a university voluntary participant pool as well as participants from an online service (SurveyMonkey) that provided compensation to respondents for study completion. The population consisted of English-speaking adults from the United States, which may be a factor affecting potential generalizability or external validity regarding non-English-speaking populations in other countries.

Assumptions and Limitations

As in previous TMT research, the main assumption of this study was that mortality salience increases DTA. I also assumed that participants adequately comprehended the content of the essays they read on climate change and that they were not already familiar with word fragment completion tasks or their intended purpose. Although the design of the study is rooted in the scientific consensus on the reality of global climate change, it does not purposefully include the goal of convincing research

participants that climate change exists. With respect to future studies on global climate change using a similar design, it should be noted that the effects of information read by participants in this study may not generalize to other types of information related to global climate change.

Significance of the Study

This study is unique because it examines the human response to information on global climate change from a terror management perspective. In establishing whether the subject of global climate change impacts DTA and belief certainty, the results of this study could add to the body of terror management research by demonstrating that certain kinds of climate change information significantly increase mortality salience, which in turn influences readers' belief certainty in global climate change. These findings could also lay the groundwork for future studies concerned with the psychological impact of global climate change from a terror management perspective. For example, if information on global climate change is determined to be a significant death reminder, further terror management studies concerning mortality salience and its effect on the response to global climate change primes would be encouraged. Proximal or distal psychological defenses, such as denial, transference idealization, worldview defense, self-esteem striving, or antagonism toward out-groups, could be examined in studies where participants are asked to contemplate global climate change, and the findings could ultimately be used to inform the effective development and implementation of climate change education programs (Dickinson, 2009). For instance, one goal of an education program might be to increase belief in global climate change. The present study could provide more insight into what

kinds of information tend to increase or decrease belief in global climate change. Effective public climate change education is the first step toward bringing about the necessary social change that will actively and constructively address this global issue. The findings of this study could have important practical implications for the design of future terror management research on global climate change and for the development of educational programs.

Summary

In Chapter 1, I briefly discussed the research literature and suggested the need for a study that examines climate change information, DTA, and certainty in global climate change belief. The chapter also provided brief descriptions of TMT and the issue of climate change as a global threat. I gave a rationale for studying global climate change information and belief within a TMT framework. I presented the problem statement and purpose of the study and provided research questions, hypotheses, and the theoretical foundation of the study (i.e., TMT). I outlined the design of the study and provided operational definitions, limitations, and delimitations. Lastly, I discussed the significance of the study and its possible contributions to social change.

In Chapter 2, I present a review of the relevant literature and describe how that literature was collected. TMT (including the concept of DTA) as well as global climate change information and belief are discussed. In Chapter 3, I describe the research design, methodology, and data analysis of the study. Chapter 4 provides the results of the study, including an evaluation of the research hypotheses. Chapter 5 gives an overview and

interpretation of the findings, limitations of the study, recommendations for future research, and implications for social change.

Chapter 2: Literature Review

Introduction

Global climate change is perhaps the greatest threat to the well-being of life on Earth (Swim et al., 2011). In spite of the overwhelming scientific consensus supporting the reality of climate change, certain psychological barriers (e.g., denial, apathy) impede many people's acceptance of its reality and cause avoidance of behavioral changes (e.g., reduction of carbon emissions) necessary for addressing the ongoing anthropogenic impact on global climate change (Doherty & Clayton, 2011; Gifford, 2011). However, the potential consequences (e.g., drought, extreme weather patterns, increases in global temperature and sea levels) of unchecked global climate change could seriously threaten all life on this planet (Gifford, 2011; Swim et al., 2011).

TMT is concerned with the psychological impact of death-awareness in humans, especially when that awareness is heightened directly or indirectly by a death reminder (e.g., global warming and its various life-threatening consequences for the environment). According to TMT, much of human thinking and behavior is influenced by the unconscious awareness of inevitable death and concern for mortality (Hayes, et al., 2010). Moreover, the details of certain types of climate change information may have an impact on mortality salience (Dickinson, 2009). Terror management studies (e.g., Norenzayan, et al., 2009; Rutjens, et al., 2009) have shown that when mortality salience increases, people's worldview defenses are bolstered and their striving for self-esteem enhances. By measurement of DTA—a main concept in TMT—the level of activation of death thoughts can be studied and measured (Hayes et al., 2010). In this study, I

examined the relationships between climate change information, DTA, and belief in global climate change using TMT as the theoretical foundation. This chapter discusses the historical background of TMT, the concept of DTA in research, climate change information (e.g., the media), and other factors associated with belief in global climate change.

Literature Search Strategy

The literature cited and reviewed in this study was collected from several online databases including Academic Search Complete, Educational Resource Information Center (ERIC), Proquest Central, PsycARTICLES, PsycINFO, Science Direct, and socINDEX with Full Text. The keywords used to locate scholarly journal articles (from 2008 to 2013) were *climate change, global warming, belief, doubt, denial, skepticism, terror management theory*, and *death-thought accessibility*. No results were found for experimental studies using *climate change information* and *death-thought accessibility* as variables, which suggested a gap in the literature.

Terror Management Theory

TMT was formulated and developed in the 1980s primarily from the works of the cultural anthropologist Ernest Becker (Hayes et al., 2010). TMT is a social psychological theory that stems from existential, evolutionary, and psychodynamic influences (Arndt & Vess, 2008). According to Becker (as cited in Arndt & Vess, 2008), human beings possess the same basic drive or desire for self-preservation as other animals; however, unlike other animals, humans are uniquely self-conscious and aware that all living creatures eventually die (Arndt & Vess, 2008; Hayes et al., 2010). The knowledge of

inevitable death, combined with the desire for survival, creates a perpetual existential crisis that invokes various levels of anxiety (or terror) toward death; however, the thoughts and awareness of death (i.e., mortality salience), as well as the anxiety they induce, stay unconscious for the most part because of certain defenses developed by the human mind (Arndt & Vess, 2008; Hayes et al., 2010). Those mental defenses that act as daily buffers against mortality salience or death anxiety can be categorized mainly as cultural worldviews and self-esteem (Arndt & Vess, 2008; Hayes et al., 2010). Shared cultural worldviews provide meaning and purpose to existence within a framework of values that guide proper behavior and that point the way to death transcendence through feelings of symbolic (e.g., making a valuable contribution to one's community) or literal (e.g., religious belief in an afterlife) immortality (Arndt & Vess, 2008). Self-esteem, which acts as a buffer to existential anxiety, is heightened when people feel they are living up to the expectations or values of their respective cultures (Arndt & Vess, 2008).

Early TMT research focused on theoretically important cultural worldviews and self-esteem. This research demonstrated that people defended their cultural worldviews more strenuously and made more of an effort to achieve the expectations of their cultural values (i.e., boost self-esteem) when their awareness of mortality (i.e., mortality salience) was increased (Arndt & Vess, 2008). Other research has also demonstrated that people feel less threatened by death reminders when self-esteem levels are enhanced; moreover, when self-esteem levels are high or when personal beliefs are affirmed, research has shown that worldview defense diminishes in the face of mortality salience (Arndt &

Vess, 2008). In short, early TMT research has revealed the significance of self-esteem and cultural worldviews as protective buffers to death awareness in humans.

Because of the potential life-threatening consequences of global climate change, certain types of climate change information may arouse the fear of death or increase mortality salience in people. This increased death awareness may or may not have a significant effect on belief in global climate change. TMT is an appropriate theoretical foundation for this study, which not only sought to show whether climate change information increases DTA in participants but also whether a relationship exists between DTA and belief certainty in global climate change.

Death-Thought Accessibility

Over time, TMT studies shifted their focus from the manipulation of conscious death thoughts to research measuring unconscious accessibility of death-related thoughts (Arndt & Vess, 2008; Hayes et al., 2010). One of the most significant contributions of TMT research has been the ability to measure and demonstrate the potential influence that unconscious death awareness (or thoughts) can have on daily life (Hayes et al., 2010). According to TMT research, people employ two different psychological defense systems to manage the existential distress caused by self-relevant death thoughts (both conscious and unconscious; Arndt & Vess, 2008). Proximal defenses (e.g., denial) are used to diminish the threat of conscious death thoughts that remind of mortality (Arndt & Vess, 2008). The mind actively uses these defenses to suppress death-related thoughts and to avoid conscious thoughts of personal vulnerability to death; however, when proximal defenses eventually subside, accessibility to unconscious death thoughts can

increase below the level of one's awareness (Arndt & Vess, 2008). This can be measured empirically. For example, in TMT research, participants, who are not consciously thinking about mortality, might complete a word fragment that is death-related (e.g., GR_ _ _ with GRAVE instead of GREEN), which suggests that thoughts about death are present and influential outside of awareness (Arndt & Vess, 2008). These unconscious death-related thoughts can activate distal (i.e., symbolic) psychological defenses—usually worldview or self-esteem related—that augment adherence to cultural values or boost confidence in one's self-image; that is, unconscious death thoughts drive an individual to unconsciously focus on things that provide value and meaning to that individual (Arndt & Vess, 2008). Distal defenses function as a block against death anxiety and the fears that can be generated from thoughts of mortality (Arndt & Vess, 2008).

In order to better demonstrate that death thoughts are first suppressed following mortality salience and that they then become hyperaccessible after a brief delay, certain techniques were developed for measuring unconscious DTA (Hayes et al., 2010). One technique (already mentioned above) used often in TMT research to measure unconscious thoughts of death is word completion tasks (Hayes et al., 2010). With this instrument, research participants are asked to complete certain word fragments using the first word that comes to mind. The completed word fragments help to illuminate the type of thoughts that lie just below conscious awareness and that are on the brink of entering consciousness; moreover, the degree of DTA can be determined by the number of word fragments completed in a death-related way (Hayes et al., 2010).

According to the existential viewpoint of TMT, humans find repulsive stimuli threatening because such things make people more aware of their vulnerability to death (Cox, Goldenberg, Pyszczynski, & Weise, 2007). In order to test the hypothesis that the evocation of disgust increases DTA, Cox et al. (2007) investigated the relationship between disgust of an animal nature and death-related thoughts. In one of the experiments of the study, a sample of 67 male and female psychology students from the University of Colorado were randomly assigned to read one of two essays. The animal-nature essay (the creatureliness prime) highlighted the similarities between humans and other animals, while the humanistic essay (the disgust prime) highlighted the differences between the two. Participants were then assigned to look at pictures featuring bodily products (e.g., urination, vomiting) of humans in the disgust condition or neutral images (e.g., book, chair) in the control condition. A word completion task was used as the dependent measure. Scores were determined by the number of death-related completions [e.g., KI_ _ED (KILLED vs. KISSED)]. A 2 (essay: animal vs. humanistic) x 2 (pictures: disgust vs. neutral) ANOVA on DTA scores was used to test the hypothesis that the disgusting images would heighten DTA compared to the neutral ones. The results showed a main effect for pictures, but no main effect for essay. In comparison with the control condition for pictures, people in the disgust condition reported an increase in DTA by completing more death-related word fragments. However, no interaction between pictures and essay on accessibility scores was found, which indicates that disgusting images may increase DTA with or without priming thoughts of the similarities between humans and other animals.

In accordance with TMT, something such as news about terrorism can aggravate prejudice towards out-groups if it reminds readers (or viewers) of their own mortality (Das, Bushman, Bezemer, Kerkhof, & Vermeulen, 2009). In the first of three studies (Das et al., 2009) conducted in the Netherlands, death-related thoughts were examined partly in order to find out whether they mediated the effects of terrorism news on prejudice. In a 2 (terrorism news vs. Olympic game news) between-subjects factorial design, a diverse sample of 100 white European participants were randomly assigned to one of two groups. One group viewed news about Islamic terrorist attacks; the other (i.e., the control group) viewed news about the Olympic Games. News of the murder of filmmaker Theo Van Gogh, which was committed by an Islamic extremist at the time of the study, was also a factor in the design. Participants then completed a word completion task in addition to a measure of prejudice toward Arabs. A 2 x 2 ANOVA found a significant interaction between the murder of Van Gogh and news content. Prior to Van Gogh's murder, participants who viewed news about terrorism had more death-related words than those who saw Olympic Games news; however, both groups of participants had an equally high amount of death-related words following the murder of Van Gogh. The effects of terrorism news, Van Gogh's murder, and death-related thoughts on prejudice towards Arabs were tested through regression analysis using a mediation model. The results showed that prejudice was not significantly predicted by death-related thoughts; thus, a model in which death-related thoughts mediate the effects of terrorism news on prejudice against Arabs was not supported.

In the second study (Das et al., 2009), prejudice was examined further by testing the role of self-esteem from a TMT perspective. According to TMT, DTA should be positively associated with prejudice, and prejudice should be even greater for those with low self-esteem (i.e., self-esteem should act as a buffer to prejudice). After completing a measure of self-esteem, 101 White European participants were assigned to read news articles about Islamic terrorism or animal abuse (control). The participants then completed a word completion task (for DTA) and an implicit measure of prejudice against Arabs. The results of a one-way ANOVA showed that participants in the terrorism news group had completed more death words than did those in the control condition. In order to predict prejudice toward Arabs and to examine the mediating function of DTA, regression analysis was implemented. Results revealed a significant main effect for news content and a higher degree of prejudice in the terrorism news group of participants. As in the first study (Das et al., 2009), however, the conditions for DTA mediation were not achieved (i.e., prejudice was not significantly predicted by death-related thoughts). The results also showed a significant interaction between news content and self-esteem, and self-esteem was associated with reduced prejudice against Arabs in the terrorism news group. The relationship between self-esteem and prejudice was nonsignificant in the control condition, but there was a significant three-way interaction between news content, self-esteem, and death-related thoughts. Prejudice against Arabs increased with higher DTA only for participants who had low self-esteem and had been subjected to terrorism news. These findings show that terrorism news raised DTA, which promoted prejudiced attitudes toward Arabs, particularly in people with low self-esteem.

They also indicate that self-esteem can serve as a buffer against the effects of terrorism news and that terrorism news can increase prejudice, especially in viewers with low self-esteem.

In the last of their three studies, Das et al. (2009) tested the hypothesis (based on TMT) that terrorism news can increase prejudice against any out-group, even if the out-group is not an integral part of the news. The authors used a diverse sample of Muslim (n = 85) and non-Muslim (n = 94) male and female participants for the study in order to examine whether terrorism news increases prejudice against Europeans for Muslim participants, and whether terrorism news increases prejudice against Arabs for non-Muslim participants. A similar procedure to the second study (Das et al., 2009) was used, and the results of a 2 (news article: terrorism vs. control) x 2 (religious background: Muslim vs. non-Muslim) ANCOVA, with the covariate being attitudes toward a Dutch multicultural society, showed a main effect for background and a significant interaction between news article and religious background. Scores on the Implicit Association Test (a measure for prejudicial attitudes) revealed Muslim prejudice against Europeans, and non-Muslim prejudice against Arabs. Terrorism news increased division between groups of different backgrounds. Prejudiced attitudes toward out-groups were most distinct after reading news of terrorism but were much less so after reading control news. In short, terrorism news depicting a negative image of Arabs increased prejudice against Europeans for Muslims in addition to increased prejudice against Arabs for non-Muslims. These findings, in accordance with TMT, suggest that terrorism news can increase prejudice against any out-group when mortality is made salient in viewers.

From a TMT perspective, Dickinson (2009) makes several predictions regarding how human behavior might be affected when people are reminded of their own mortality in connection with climate change primes (e.g., visual or written information about global climate change). In particular, and relevant to the present study, the author cites the need for an investigation into the effect of climate change information on DTA. The results of such research may prove to be a useful foundation for future studies (e.g., in mediation or moderation models) that examine how mortality salience affects people's responses to climate change primes; moreover, the findings from those studies could possibly help shape the way climate change information is presented to the public in the future.

Global Climate Change: Belief and Information

In recent years, U.S. public awareness of and concern about global climate change have increased (Borick & Rabe, 2010). Most Americans now believe that the climate is changing around the world; however, it is not clear why they believe global climate change is occurring (Borick & Rabe, 2010). For example, the issue of whether the climate is changing as the direct result of human activities—chief of which is the burning of fossil fuels—is still being debated among climate change believers and disbelievers alike (Borick & Rabe, 2010). According to Borick and Rabe (2010), there has been a shortage of studies that closely examine the underlying determinants of the public's belief or disbelief in global climate change. Therefore, this section reviews the recent scholarly literature that focuses on the main factors of individual belief (and disbelief) in global climate change.

The general view of global climate change can be broken down into five main categories of belief: (a) belief that global climate change is occurring, (b) denial that climate change is a reality altogether, (c) belief that climate change is a natural phenomenon only, (d) belief that climate change is anthropogenic (i.e., human-made), and (e) that global climate change is due to both natural and human causes (Borick & Rabe, 2010; Joireman, Barnes, & Duell, 2013; Poortinga et al., 2011). Results from recent studies indicate that beliefs concerning global climate change are largely associated with individual experiences, unusual and extreme weather, and one's political influence or affiliation (e.g., liberal vs. conservative, Democrat vs. Republican). For example, Borick and Rabe (2010) examined the perceived causes and correlates of belief and disbelief in global climate change in the U.S. They used both national and state telephone surveys to gather data on the beliefs of American adults concerning global climate change and applied ordered logistical regression to measure the association of certain factors (e.g., melting glaciers and polar ice, warmer local temperatures, and changing weather patterns) with those beliefs. The authors found that a mixture of personal experiences/observations, unusual weather events (e.g., severe droughts and stronger hurricanes), and physical changes to the Earth (e.g., melting polar caps and rising sea levels) correlate with Americans' views on global climate change; furthermore, the overall association of these factors with belief in global climate change may be due to the influence of political affiliation (e.g., Democrats are much more likely than Republicans to claim most factors as substantially impacting their belief that climate change is occurring). However, because this is a correlational study, there may be other

explanations for this finding. In another study, Deryugina (2013), examined the formation and updating climate change beliefs. A multiyear survey and regression analysis were used on a large representative sample of U.S. adults to test how local temperature changes and abnormalities might impact beliefs regarding the effects of global climate change. Short-term (1 day to 2 weeks) temperature fluctuations appeared to have no association with beliefs whereas longer periods (1 month to 1 year) seemed to positively correlate with the belief that the effects of global climate change were occurring. The more extreme the temperature deviations were, the greater the changes were in beliefs. The author also acknowledged the possible influence of certain heuristics on belief formation such as representativeness (judging the frequency or likelihood of something by the extent to which it resembles an existing prototype in one's mind) and availability (e.g., individuals placing the most significance on local temperatures). Finally, the study found that conservatives are much more likely than liberals are to deny that the effects of global climate change can already be felt.

In three internet-based survey studies, Li, Johnson, and Zavel (2011) questioned residents of Australia and the United States about their belief in and concern for global climate change and whether they thought the day of the study was cooler or warmer than usual. Those who thought that day was colder than usual believed less in global warming and showed less concern for global climate change than did those who thought that day was warmer than usual. In other words, participants' belief in and concern for global climate change was contingent on their perception of the local temperature (e.g., colder or warmer than usual) during the time of the study. The correlational studies (Studies 1a and

1b) revealed a basic relationship between the perception of temperature deviations and attitudes regarding global climate change. However, one limitation of these studies is that participants' behavior following from their attitudes toward global climate change had not been observed; therefore, a third study (Study 2) was conducted in which 251 individuals participated in a web-based study using the same questions and methodology (i.e., instrumental variable regression, a technique used to support causality in observational data) while adding a behavioral measure that asked participants whether they would donate a portion of the fee they'd be given for completing the study to a charity concerned about global climate change. The results showed that there were higher donations to the charity when belief in and concern for global climate change increased. The authors attributed the results of these studies to attribute substitution (e.g., the current day's local temperature during the study was a more easily accessible judgment to participants than were global temperature trends).

Using telephone surveys on a nationally representative sample of Americans, Egan and Mullin (2012) found that personal experiences with local weather patterns significantly associated with Americans' beliefs regarding evidence for global climate change. The relationship between temperature and beliefs about the evidence for global climate change were examined, and the authors found a strong significant correlation: the percentage of Americans that believe global climate change is occurring increases with the above-normal rise of local temperatures. Moreover, the relationship between weather and climate change belief is even stronger in extreme weather, hot or cold. In an examination (from 2001 to 2010) of the political divide within the American public

concerning belief in global climate change, McCright and Dunlap (2011) found that liberals and Democrats more often have beliefs that concur with the scientific consensus on global climate change and showed more concern about global warming in general than did conservatives and Republicans. In a different study, McCright and Dunlap (2011) found that conservative White men in particular are significantly more likely to deny the reality of climate change than any other American adults (i.e., the conservative White male effect); furthermore, multivariate logistic regression models found that the attitudes of conservative white men may be significantly associated with the overall high degree of climate change denial in the U.S. even when controlling for each of the effects of variables such as gender, race, and political ideology. These results indicate that the intersection of the three variables, White, conservative, and male, is key for comprehending the division of climate change denial among Americans (McCright & Dunlap, 2011). The authors used the identity-protective cognition thesis (e.g., as a way of reinforcing identity, individuals interpret information in a way that supports beliefs associated with belonging to a certain group) and system justification theory (e.g., when individuals defend the status quo in society and fight against any changes to it) to explain the conservative White male tendency toward climate change denial.

Other factors found to be associated with belief in global climate change are age, gender, education, and socioeconomic level. In a recent study conducted in Alberta, Canada (a politically conservative area where greenhouse-gas emissions are quite high), Davidson and Haan (2012) gave a telephone survey was given to residents concerning their attitudes toward climate change. Descriptive analysis found a high level of

awareness, but significantly lower levels of perceived climate change impact. Results also showed noticeable differences in climate change beliefs when it came to gender, with women showing a significantly higher awareness of climate change (and its perceived impact) than men. Nevertheless, logistic regression analysis of the correlates of climate change attitudes revealed that those results were mainly due to the association of socioeconomic factors. Political ideology was the strongest predictor, and conservatives were less likely to believe in the societal impact of climate change or climate change caused by human activity. The most significant finding of the study was the strong association between gender differences in climate change beliefs and differences in political ideology, which means that men tend to be more conservative than women and that women demonstrate a greater awareness of climate change and its perceived impacts (Davidson & Hann, 2012). In another recent study, Clements (2012) investigated the British public's views on climate change. Using multivariate analysis of three nationally representative surveys, the author examined the social and attitudinal correlates of British citizens' attitudes towards climate change. The results showed a clear gender divide in climate change attitudes between men and women, as well as differences by level of education and political party affiliation. Similar to the research findings regarding climate change denial in the United States, the author found climate change skepticism in Britain to be associated with the following factors: being male, lower education, Conservative party support, and having a right-wing ideological worldview. In yet another study conducted in the UK, Whitmarsh (2011) used representative postal surveys and regression analysis to measure the public's skepticism and uncertainty about climate

change and to examine whether public skepticism stems from a lack of knowledge or from ideological differences. Results revealed that the demographic factors of age, gender, education, and income were significant bivariate determinants of skepticism and uncertainty about climate change, but these factors were also found to be mediated by political and environmental values. However, the key predictors of skepticism in the study were political affiliation and environmental values, which accounted for more than half the explained variance. Individuals with conservative political views and weak pro-environmental values were the most skeptical about the occurrence and degree of climate change. In addition to the strong association of climate change beliefs with values and worldviews, the findings showed that particular worldviews and values (e.g., those values attached to political objectives concerning the environment or the economy) may have influenced individuals' understanding of the validity and significance of evidence, and of the reliability of those who disseminate climate change information.

The media (e.g., newspapers, television) are the primary source for public information and awareness of global climate change (Liu, Vedlitz, & Alston, 2008; Bowen & Rodger, 2008; Boykoff, 2013; Sampei & Aoyagi-Usui, 2009). For example, Sampei and Aoyagi-Usui (2009) conducted a correlational study that examined media coverage of global climate change issues over a 10-year period (from 1998 to 2007). Using public opinion surveys, the authors focused on the relationship between media coverage of global climate change and public awareness. The surveys revealed a positive correlation between media coverage and public concern for global climate change; that is, concern for global climate change increased significantly with the increase in media

coverage of climate change issues. Furthermore, cross-correlation analysis showed a significant relationship between public concern and the number of front-page articles on global climate change as well as the total number of articles on climate change. In another study, Liu et al. (2008) used content analysis to analyze the news coverage of global climate change (from 1992 to 2005) by the largest regional newspaper in Texas. The authors collected, coded, and analyzed a sum of 795 articles on global climate change from the Houston Chronicle. Data analysis was centered around issue salience and attributes, use of science, and scientific information sources mentioned in the news articles. The results revealed that a large majority of articles portrayed the problem of global climate change as harmful and that media coverage of the issue increased in general over the years. The news articles also frequently portrayed climate change as a global issue (i.e., as a national or international problem as opposed to regional), and often tied to a variety of other societal issues rather than being treated as a standalone, environmental problem. The findings also indicated that the newspaper articles gathered scientific information on global climate change mostly from academic institutions. Although the results of the study illustrated how the issue of global climate change was featured in a regional newspaper, there were several limitations. For example, the study was purely descriptive, and it examined only one newspaper over a limited period.

In an experimental study using the biased assimilation and polarization paradigm, Corner, Whitmarsh, and Xenias (2012) measured participants' skepticism about global climate change before and after reading two newspaper editorials written with opposing views about climate change and for the purpose of creating doubt. Participants (173

undergraduate psychology students from Cardiff University) of the study were randomly assigned to two experimental conditions. In one of the experimental conditions, the two contradictory articles dealt with climate science in order to create scientific uncertainty. In the second condition, two differing articles dealt with the political or moral aspects of climate change in order to create political/moral uncertainty. The purpose of the study was twofold. First, the authors investigated whether participants with differing attitudes towards climate change would incorporate contradictory information on climate change in a biased manner, and whether their attitudes about climate change would become polarized. The authors then examined whether participants would react differently to different kinds of contradictory information about climate change (i.e., information generating scientific or political/moral uncertainty). The results of a repeated-measures ANOVA and a between-groups ANOVA showed that participants who already had a greater degree of skepticism about climate change assessed the skeptical editorial as more believable and more valid than the pro-climate change editorial, and vice versa for participants with less prior skepticism. This suggests biased assimilation of the information. Additionally, no evidence of polarization was seen, even though the attitudes of both groups towards climate change were significantly more skeptical after the participants read the editorials. However, the fact that the sample was solely comprised of psychology students and skewed towards the female gender was a noteworthy limitation of this experimental study.

Summary

In this literature review, I discussed TMT, DTA, and global climate change in relation to information and belief. Research based on TMT has examined how certain reminders of death influence human attitudes and behavior. In keeping with the main tenets of TMT, the literature has focused largely on cultural worldview and self-esteem. Based on the TMT concept of DTA, quantitative methods were developed to measure levels of activation of death-thoughts (i.e., mortality salience). Although TMT and DTA measurement have been applied to various topics of interest in the literature, the urgent global problem of climate change has not been substantially included; that is, the knowledge of global climate change has not been empirically tested to determine whether it is a significant death reminder for humans (Dickinson, 2009). The purpose of the present study was to investigate the relationships between climate change information, DTA, and belief in global climate change. In this study, I examined the problem of whether climate change information increased DTA and whether a relationship existed between DTA and belief certainty in global climate change from a random sample of participants. By revealing the psychological impact of climate change information from the unique perspective of TMT, the study contributes to the literature regarding belief in global climate change. In Chapter 3, I have described the research methodology used in the study.

Chapter 3: Research Method

The purpose of this study was to examine the psychological impact of climate change information on certainty in global climate belief from a terror management perspective. I examined whether global climate change information increased DTA in study participants and evaluated its effect on certainty in global climate change belief. This chapter provides a description of the research design and methodology used in the study. I also describe in detail the study participants, instruments, and procedures applied for data collection/analysis.

Research Design and Methodology

For this study, I chose an experimental design to determine whether climate change information influences DTA (i.e., whether it increases DTA) and belief certainty in global climate change. Three variables of interest were quantitatively assessed: (a) climate change information, (b) DTA, and (c) belief in global climate change. Research participants were randomly assigned to one of three separate conditions, and an independent variable was created for climate information. One group of participants read about the environmental impact of global climate change, while another group read about the human causes of global climate change. In the third condition (i.e., the control condition), participants read information about bad weather that excluded the subject of global climate change. Both DTA and belief in global climate change served as dependent variables. Although many experimental studies examining DTA have been conducted over the years (Hayes et al., 2010), none has examined the topic of global climate change and its effect on DTA (Dickinson, 2009). This experimental study was

specifically created to address the influence of the climate information on DTA and belief in global climate change. I designed the study to determine whether an association exists between DTA and belief certainty in climate change. The methodology used to carry out the study is also described in this chapter.

Procedures and Sample

After I obtained approval from the Walden University IRB [09-15-17-0201231] a sample of research participants was recruited from two separate sources: (a) SurveyMonkey, a paid service that provides compensation to respondents for completion of surveys or studies, and (b) the voluntary research participant pool at Walden University, which consists of both undergraduate and graduate students. The participants read a brief description of the study, which stated that the study's purpose was to "examine the psychological impact of climate information" and that participants will "read a brief essay about climate" and then "complete two separate study instruments followed by a demographics questionnaire, which should take no more than 30 minutes to complete." Walden participants were informed that their study participation was strictly voluntary, and that no additional compensation would be provided. SurveyMonkey respondents were reminded of the compensation they would receive for completing the study. In order to be included in the study (i.e., inclusion criteria), all research participants were required to be at least 18 years old with the ability to read and understand English. Using an online survey company (i.e., SurveyMonkey) and its randomization procedure, participants were randomized into one of the three conditions in the research design. Each study group was given access to separate online web pages

whose content (i.e., the essays) was specific to each of the three conditions. When participants logged on to the survey company website, they were greeted with a consent form that included background information, procedures, risks/benefits of participation, and confidentiality for the study. Instructions for completing the study are briefly outlined in the section on procedures.

After reading their respective essays on the subjects of climate change and weather (see Appendix A for essays), all three groups viewed and completed the same measurement instruments. A word completion task for the measurement of DTA was given first, followed by the administration of a skepticism scale as a measurement for climate change skepticism. The last page contained a debriefing statement that explained, in more detail, the purpose of the study (see Appendix B). The entire study was completed online within a single time block.

Selection of Alpha Level, Power, Effect Size, and Sample Size

In order to reduce the risk of Type I and Type II errors, I used an alpha level (significance criterion) of .05 and a power of .80 for this study. These are the standard values generally used in psychological research (Cohen, 1992). Because it was not clear what would be an expected effect size for the independent variable, a practical and economical medium effect size of $\omega 2 = .10$. Because the design of the study calls for more than two conditions (i.e., three separate conditions), the analysis of variance table was used to calculate the sample size needed for the study, which was 30 participants for each group ($N = 90$).

Demographic Information

In order to give a description of the sample, participants completed a questionnaire that consisted of questions on age, gender, ethnicity, religion, income (socioeconomic status), political affiliation, and education (see Appendix C). In order to avoid possible death reminders (e.g., age, religion) and the creation of confounding variables in the measurement of DTA, the demographic data were gathered at the end of the study rather than at the beginning.

Instruments

In addition to the demographics questionnaire used at the end of the study, three study instruments were used. Three essays (see Appendix A) concerning climate and climate change information were read by research participants. One group read an essay discussing the potentially destructive environmental impact and consequences of global climate change. Another essay, which was read by a second group of participants, focused on harmful human activity (e.g., the burning of fossil fuels) as the main cause of global climate change. The third essay, which was read by participants in the control condition, discussed the negative consequences of rainy weather, omitting the subject of global climate change altogether.

The word completion task, first used by Greenberg, Pyszczynski, Solomon, Simon, and Breus (1994) for the measurement of (DTA), is a questionnaire containing 25 word fragments (see Appendix D) for information on permission to use this instrument). Words are created by quickly filling in the blanks of each word fragment with the first word that comes to mind. The questionnaire is scored by adding up the number of death-

related word completions. The word completion task used for this study has six possible death-related words: buried, dead, grave, skull, killed, and coffin. The use of this measure and its variations has produced similar results across several studies, which indicates construct validity for this measurement procedure (Hayes et al., 2010).

Climate change skepticism was measured using a scale (Corner, Whitmarsh, & Xenias, 2012) that consists of 17 statements about climate change (e.g., "I do not believe climate change is a real problem"; "There is solid evidence that the Earth is warming because of human activities"; "The evidence for climate change is unreliable") on a 5-point Likert scale from –2 *strongly disagree* to +2 *strongly agree*. It is an expanded version of the skepticism scale developed by Whitmarsh (2011). High scores signify greater climate change skepticism. In Corner et al. (2012), the items on the skepticism scale created a reliable measure of climate change skepticism (Cronbach's $\alpha = 0.92$) on a convenience sample of 173 undergraduate psychology students (mostly female) from Cardiff University in the U.K. However, evidence of validity for this measure is not yet known (see Appendix D for information on permission to use this instrument).

Data Analysis

The analyses used for the data in this study were planned contrasts, which involved comparing the control condition with one other condition in each of the first four hypotheses, and ANCOVA with DTA as the covariate for the fifth hypothesis. SPSS software was utilized for conducting the analyses of variables and the determination of outliers. Descriptive statistics took the form of means, standard deviations, and the computation of effect sizes. Except for the last hypothesis, which was addressed by

conducting an ANCOVA, all planned contrasts were conducted within the one-way ANOVA program to address the research hypotheses restated below:

Null hypothesis 1: Belief certainty in global climate change will not change after reading information about the human influence on climate change.

Research hypothesis 1: Belief certainty in global climate change will be greater after reading information about the human influence on climate change.

Null hypothesis 2: Belief certainty in global climate change will not change after reading information about the environmental impact of climate change.

Research hypothesis 2: Belief certainty in global climate change will be greater after reading information about the environmental impact of climate change.

Null hypothesis 3: After reading information about the human influence on global climate change, DTA will not change in research participants.

Research hypothesis 3: After reading information about the human influence on global climate change, DTA will be greater in research participants.

Null hypothesis 4: After reading information about the environmental impact of global climate change, DTA will not change in research participants.

Research hypothesis 4: After reading information about the environmental impact of global climate change, DTA will be greater in research participants.

Null hypothesis 5: There is not an association between DTA and belief certainty in global climate change when statistically controlling for the manipulation.

Research hypothesis 5: There is an association between DTA and belief certainty in global climate change when statistically controlling for the manipulation.

Threats to Validity

There are particularly two kinds of threats to validity that are a persistent challenge to experimental research in general. Internal validity threats involve participants (e.g., regression, selection, and mortality), manipulated experimental treatments (e.g., diffusion), and experimental procedures (e.g., testing and instrumentation; Creswell, 2009). In this study, these threats were addressed by the selection of a large, randomized sample where participants had no interaction among themselves throughout the experiment. Also, all test instruments were administered to participants one time only; they were not repeated, which avoided any potential problems that might arise from the familiarization of test questions.

External validity threats can occur when researchers generalize to samples, settings, and past/future situations beyond those of their own experiments (Creswell, 2009). Because of the demand characteristics of the setting (also a threat to internal validity mentioned above) and sample selection in the experiment, generalizations concerning the results of this study were kept to a minimum. In order to make more valid generalizations, the results of this study would perhaps have to be replicated in other experiments using different samples and settings not necessarily web-based.

Ethical Concerns and Participants' Rights

Participants' rights were protected in accordance with the requirements of Walden University's Institutional Review Board. No data were collected that would allow for personal identification of the participants, and participants were reminded during the study that their responses were voluntary. Before taking part in the study, participants

read an informed consent statement that introduced the research project and included the study's background information, procedures, confidentiality, voluntary nature, risks and benefits, compensation, and contact list. For further protection of participants, their active involvement in the study began only after approval had been received from the Walden University IRB. To address any concerns or questions from participants, contact information was provided for the author of the study and the Walden University Office of Research Integrity and Compliance.

Summary

Chapter 3 described the research design and methodology of the study. I outlined the study procedures and described the instruments used for collecting data. I discussed threats to validity and the protection of participants' rights. The chapter also included a description of the data analysis for the study. I have presented the results of that analysis in Chapter 4.

Chapter 4: Results

Introduction

The purpose of this experimental study was to examine the psychological impact of climate change information within a terror management theoretical framework and to discover whether an association exists between DTA and belief certainty in global climate change. In this chapter, I reiterate the research questions and hypotheses, describe the data collection procedure and data analysis used to test the hypotheses, and provide results of the statistical analysis. The research questions and hypotheses I addressed for this study are listed below:

RQ1: Does climate change information affect belief certainty in global climate change?

Null hypothesis 1: Belief certainty in global climate change will not change after reading information about the human influence on climate change.

Research hypothesis 1: Belief certainty in global climate change will be greater after reading information about the human influence on climate change.

Null hypothesis 2: Belief certainty in global climate change will not change after reading information about the environmental impact of climate change.

Research hypothesis 2: Belief certainty in global climate change will be greater after reading information about the environmental impact of climate change.

RQ2: Does climate change information increase DTA?

Null hypothesis 3: After reading information about the human influence on global climate change, DTA will not change in research participants.

Research hypothesis 3: After reading information about the human influence on global climate change, DTA will be greater in research participants.

Null hypothesis 4: After reading information about the environmental impact of global climate change, DTA will not change in research participants.

Research hypothesis 4: After reading information about the environmental impact of global climate change, DTA will be greater in research participants.

RQ3: Does a relationship exist between DTA and belief certainty in global climate change?

Null hypothesis 5: There is not an association between DTA and belief certainty in global climate change when statistically controlling for the manipulation.

Research hypothesis 5: There is an association between DTA and belief certainty in global climate change when statistically controlling for the manipulation.

Data Collection

The sample of study participants was collected online from two separate sources: the Walden participant pool and the Survey Monkey audience. A total of 129 responses were collected over a period of approximately six months. A convenience sample of 37 participants were recruited from the Walden participant pool (made up of students, faculty, etc.) and a larger, somewhat more representative sample of 92 Survey Monkey audience participants was selected from various regions throughout the United States. Regarding the total amount of responses from both sources, 104 were complete and 25 were incomplete; only the completed responses were retained for analysis. Completed responses included those participants who began the study and finished with the

debriefing statement at the end of the study, albeit with some occasional skipped answers. Incomplete responses consisted of participants who apparently stopped before answering questions on the two measures (or beyond) of the study, as well as those who simply answered “no” after reading the statement of consent.

Condition 1 had a total of 42 respondents, of which 33 were considered complete. Condition 2 contained a total of 33 respondents with 30 complete, and Condition 3 had a total of 46 respondents out of which 41 were complete. Nevertheless, the amount of completed responses was enough to meet the minimum total number of participants required for the study sample (N = 90). Frequency statistics were used to evaluate the demographic data (see Table 1). The age of the study participants ranged from 18 to over 60. Most participants in the sample were Caucasian, female, Christian, and Democrat, with a graduate degree and an annual household income of $100,000 or greater.

Table 1

Frequency Statistics for Categorical Demographic Variables for Sample (N = 104)

Variable	Number	Percent
Age		
18–29	20	19.2
30–39	40	38.5
40–49	12	11.5
50–59	11	10.6
60 or over	21	20.2
Gender		
Male	39	37.9
Female	63	61.2
Gender non-conforming	1	1.0
Race/Ethnicity		
Caucasian	56	53.8
African American	11	10.6
Hispanic	6	5.8
Asian	27	26.0
Other/unknown	3	2.9
Education level		
High school	8	7.7
Some college	21	20.2
4-year degree	30	28.8
Graduate degree	45	43.3
Income		
Less than $12,000	30	28.8
$12,000–$24,999	8	7.7
$25,000–$49,999	11	10.6
$50,000–$74,999	16	15.4
$75,000–$99,999	9	8.7
$100,000 or more	30	28.8
Religious affiliation		
Christian	51	49.0
Muslim	6	5.8
Jewish	8	7.7
Buddhist	8	7.7
Hindu	1	1.0
Other/none	29	27.9
Political affiliation		
Democrat	43	41.3
Republican	18	17.3
Independent	23	22.1
None	19	18.3

Note. There was no response from one participant for gender, race/ethnicity, religious affiliation, or political affiliation. Data for both sources of respondents were each downloaded into separate files from the Survey Monkey website into SPSS Version 24. Data from the two files were subsequently merged into one file for analysis. Tests were manually scored and the ANOVA and ANCOVA features were used to analyze the data in order to address the hypotheses and research questions of the study.

Data Analysis and Results

Before analysis of the research hypotheses, the data were screened for missing data and outliers using SPSS. Missing data on the dependent variables and for demographics were analyzed using descriptive statistics and frequencies. No missing values were found for all 104 participants on the dependent variables; however, one participant had some missing values for demographics. For the purposes of conducting statistical tests, quantitative scales were created for each dependent variable. The visual inspection of stem-and-leaf plots and boxplots was used to screen the data for outliers. Cases with values between 1.5 and 3 box lengths in a boxplot are considered outliers (Mertler & Vannatta, 2010). No outliers were found on the variable for climate change skepticism; however, one outlier was identified from the second group on the DTA variable. Being part of a large sample, the single outlier was not considered extreme enough for removal; therefore, it was retained for analysis.

A view of histograms and normal Q-Q plots for the DTA and climate change skepticism variables appeared to be approximately normally distributed for the sample. Skewness and kurtosis statistics were used to evaluate non-normality for both dependent

variables, DTA (.214 skewness; −.217 kurtosis) and climate change skepticism (.532 skewness; −.582 kurtosis). Based on those statistics, the distributions for both dependent variables were not statistically non-normal; therefore, the assumption of normality was met.

DTA was measured using a 25-item word completion task that contained six death fragments. Scores were determined by the number of death-related word fragments that were completed by each participant. Condition 1 had 33 participants who read an essay concerning the environmental consequences of climate change, and who then completed the word completion task measuring DTA. Condition 2 had 30 respondents who read an essay discussing the human causes of climate change before completing the same DTA measure. Condition 3 (control group) was the largest group, consisting of 41 participants who read an essay about the general hazards of rainy weather before completing the measure. All participants completed a 17-item, 5-point Likert scale measuring climate change skepticism (Whitmarsh Skepticism Scale) immediately following the word completion task. Descriptive statistics for both dependent variables, DTA and climate change skepticism, are provided by group in Table 2.

Table 2

Descriptive Statistics for Dependent Variable by Group

Variable	*n*	*M*	*SD*	Range
DTA				
Environmental consequences (Essay 1)	33	2.03	1.31	5
Human causes (Essay 2)	30	1.80	.89	4
Rainy weather (Essay 3)	41	1.85	1.04	4
Climate				
Environmental consequences (Essay 1)	33	37.97	16.00	60
Human causes (Essay 2)	30	36.70	14.43	45
Rainy weather (Essay 3)	41	38.51	16.34	60

Levene's test was used to evaluate the assumption of homogeneity of variance for the research hypotheses concerning DTA and climate change skepticism. Levene's test was not significant for climate change skepticism [F (2, 101) = .13, p = .88], which indicates that the variance in climate-change skepticism for the three groups was not statistically different; therefore, the assumption of homogeneity of variance was met. However, the assumption of homogeneity of variance was not met for DTA [F (2, 101) = 3.09, p = .05].

One-way ANOVAs with planned contrasts were conducted to investigate the differences in DTA and in climate change skepticism among the three conditions. ANOVA results showed that there were no significant mean differences at the .05 level among the three groups for DTA, F (2, 101) = .12, p = .675 or for climate change skepticism, F (2, 101) = .40, p = .889; moreover, contrast test results did not reveal any significant results for the two experimental groups (Conditions 1 and 2) when compared to the control group (Condition 3) on both dependent variables: p = .913 (Condition 1 versus Condition 3) and p = .632 (Condition 2 versus Condition 3) on belief certainty in

global climate change; $p = .429$ (Condition 1 versus Condition 3) and $p = .816$ (Condition 2 versus Condition 3) on DTA. An ANCOVA using DTA as the covariate was conducted to examine the relationship between the two dependent variables when controlling for the manipulation. Results showed that the covariate of DTA did not significantly predict the dependent variable of climate change skepticism, $F(1, 100) = 3.49$, $p = .065$.

Summary

The results of the statistical tests and data analysis did not reveal statistically significant differences among the means of the three conditions of participants, and did not show a relationship between the two dependent variables (DTA and belief certainty in global climate change while statistically controlling for the manipulation); therefore, the null hypotheses could not be rejected. The findings seem to suggest that climate change information does not necessarily increase DTA or affect belief certainty in global climate change. In addition, no relationship seems to exist between DTA and belief certainty in global climate change. In Chapter 5, I discuss these findings in relation to the TMT and climate change literature. I also consider the limitations of the study, recommendations for further research, and the implications for positive social change in the next chapter.

Chapter 5: Findings, Recommendations, and Implications

Introduction

The purpose of this quantitative study was to examine the effect of climate change information on DTA and global climate change belief and to determine whether a relationship exists between DTA and belief certainty in global climate change. The theoretical foundation of the study was TMT. The intention of this study was to fill an existing gap in the literature concerning DTA and the subject of global climate change. The sample consisted of 104 participants, and the study was conducted completely online. I used SPSS software to analyze the collected data, and the results were reported in Chapter 4.

A 25-item word completion task was used to measure DTA after participants in three randomized groups read essays of equal length about climate and climate change. Group 1 read information on the environmental consequences of climate change, Group 2 read an essay concerning the human causes of climate change, and Group 3 (control group) read about the potential dangers of rainy weather in general. The Whitmarsh Skepticism Scale (a 17-item Likert scale) was used to measure belief certainty in global climate change immediately following the measurement of DTA. It was hypothesized that DTA and belief certainty in global climate change would increase in the experimental groups after reading the essays on climate change and that there would be a relationship between the two dependent variables. I conducted an ANOVA with planned contrasts to compare the means of the groups' scores from the measurements for DTA and belief certainty in global climate change. I performed an ANCOVA to determine

whether there was a correlation between DTA and belief certainty in global climate change. The results for all the statistical tests were nonsignificant, which means that the null hypotheses concerning DTA and belief certainty in global climate change could not be rejected. The findings of this study indicate that reading information on the negative impact of climate change does not necessarily increase death awareness or belief certainty in global climate change when compared to reading specific information about bad weather (e.g., rainy weather); moreover, the results do not point to an association between DTA and belief certainty in global climate change.

Interpretation of the Findings

In contrast to terror management studies examining other variables, such as terrorism news (e.g., Das et al., 2009) or images evoking disgust (e.g., Cox et al., 2007), the informational essays on climate change in this study did not significantly increase DTA in its sample of participants. This suggests that the subject of global climate change does not necessarily increase mortality salience in readers of climate change information. However, the nonsignificant findings on DTA may have been due to a delay not being implemented after the reading of the essays and before the word completion task. The exclusion of a delay task in the design of the study may have allowed for the suppression of death thoughts immediately following participants' reading of the essays. A delay before the measurement of DTA is typical of terror management studies and is a method for bypassing the suppression of death-related thoughts due to unconscious proximal defenses that might occur.

Another plausible explanation for the nonsignificant findings of this study may be due to the types of climate change information expressed in the essays given to the experimental groups. Those essays focus mostly on information concerning the human causes (e.g., burning of fossil fuels, increases in greenhouse gases and Earth's temperature) and environmental consequences (e.g., drought, flooding, unusually severe storms) of global climate change rather than the potential catastrophic impact and economic costs that global climate change can have directly on human life, such as increased deaths due to disease, refugee crises, water/food scarcity, catastrophic storms, wildfires, and coastal flooding of cities. Placing emphasis on the environmental impact while excluding the perhaps more potent (i.e., life-threatening) information on the direct human impact of global climate change in the essays may not have been enough to increase mortality salience, particularly in study participants who may not have physically experienced the environmental effects of climate change.

The nonsignificant findings may also suggest that belief certainty in global climate change can be more accurately examined when focusing on specific demographic factors such as age, gender, ethnicity, education, income, and political affiliation. For example, McCright and Dunlap (2011) found that Democrats and liberals (especially women) tend to believe in and show more concern for global climate change than Republicans and conservatives; moreover, the authors discovered a significant relationship between conservative White men and the high degree of climate change denial in the U.S. Other studies (e.g., Clements, 2012; Davidson & Hahn, 2012; Whitmarsh, 2011) showed age, gender, education, and socioeconomic level to be

significant factors associated with belief in global climate change. Results of those studies indicated that women show a higher awareness of climate change (and its impact) than men do, and that climate change skepticism is largely associated with low-educated conservative men. Finally, the nonsignificant effect of the independent variable may have been due to some groups having opposite effects on the dependent measures.

Limitations of the Study

This was a web-based study that recruited participants from two separate sources: a university research participant pool (a convenience sample) and an online service that provided compensation to respondents. Because the study participants were English-speaking men and women from the United States, the generalizability of study results and findings may be limited regarding populations in other geographical locations (i.e., other continents and countries) who may be experiencing different levels of climate change effects. In addition, the trustworthiness of responses from the compensated participants cannot be assured. Some participants may have simply rushed through their answers (without necessarily reading or assessing the questions) for the sole purpose of completing the study and gaining compensation.

Although both DTA and climate change belief have been well-researched separately, there were no published studies examining the effect of climate change information on DTA in the peer-reviewed literature when this study was designed. There could be various ways to manipulate the information for the independent variable that were not included in this study; therefore, there may have been limitations due to how the independent variable was manipulated. The informational essays (i.e., independent

variable) in the present study were concisely written. Providing more information on climate change in the essays, or presenting the information in a different way instead, for example, may have had an effect on the dependent measures.

Recommendations

Some recommendations for future terror management research concerning DTA and belief certainty in global climate change can be suggested. For example, two separate experimental studies examining climate change information, DTA, and belief certainty in global climate change could be conducted. One randomized study could examine the effect of climate change information on DTA using an experimental design. The experimental group would read an essay on the human impact of global climate change, and the control group would read an essay on a neutral subject (e.g., geography). Immediately after reading the essays, both groups of study participants would complete a neutral task before measurement of DTA. Including a delay in the design of the study might be more effective in measuring DTA than without it. Another randomized study could investigate the impact of climate change information on belief certainty in global climate change using an experimental design. Three groups (including a control) of study participants would read three different essays. The two experimental groups would read about climate change—one essay affirming anthropogenic climate change and the other denying it. The three groups could then be measured and compared for belief certainty in global climate change to find out whether there's a significant difference between information that affirms and information that denies anthropogenic climate change. The findings might reveal whether information denying human-caused climate change affects

belief certainty significantly more than information that affirms human-caused climate change. Finally, in addition to verbal information, future research on DTA and belief in global climate change might include visual information on climate change as an independent variable in some study models. Experimental studies could then examine comparisons between conditions exposed to verbal information only and groups exposed to visual information on global climate change.

Implications

The results of this study did not reveal an increase in DTA or belief certainty in global climate change after reading information about climate change; moreover, no association was found between those two dependent variables. The null hypotheses could not be rejected. Nevertheless, these findings may be helpful in the future for the effective dissemination of climate change information to the general public.

Because global climate change is a serious threat to the environment and the future survival of our species, effective political action is urgently needed to mitigate its ongoing effects both now and in the future. However, climate change denial (including that which is generated by the fossil fuel industry) continues to be a significant obstacle to social change and the political implementation of economic policies necessary to mitigate the effects of global climate change. The findings of this study indicate that more may be needed to increase the general public's belief in global climate change (or decrease skepticism) in addition to information meant to be educational. For example, it may be more effective for the general public to see and experience the effects of global climate change through daily reports from media outlets worldwide. The adage, "seeing

is believing" might have an added impact on belief certainty in global climate change, especially in conjunction with scientific information (verbal or written). Some climate change studies (e.g., Borick & Rabe, 2010; Deryugina, 2013; Egan & Mullin, 2012; Li, Johnson, & Zavel, 2011) have shown that, apart from political affiliation, belief in global climate change is strongly associated with individual experiences involving unusual or extreme weather. Seeing the actual effects of climate change consistently through the worldwide media might be the next most impactful way for people to experience the reality of global climate change.

Conclusion

This chapter provided an overview of the study, interpretation of the findings, implications for social change, and recommendations for further study. The results of this study were nonsignificant, which indicates that certain types of climate change information may not effectively increase mortality salience or belief certainty in global climate change. However, these findings make room for future studies to examine other types of climate change information that may be more impactful to DTA or climate change belief. Effective dissemination of climate change information could play an important role in reducing the barriers (e.g., skepticism, apathy, fear, politics) to the positive social change so urgently needed to address perhaps the greatest existential threat to our future—global climate change.

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Appendix A: Climate and Climate Change Essays

Please read the following essay. When you are done, click the button to go to the next page of the study.

Climate Essay 1

One of the most alarming issues facing the modern world is that of global climate change, which is also commonly referred to as "global warming." The increasing temperature of the Earth is having a devastating impact on our environment globally, and it can be witnessed already in countries worldwide in the form of droughts, flooding, and unusually severe storms. The consequences of "global warming" are expected to worsen as time goes on. For example, if the polar ice caps continue to melt and recede at their current rate, there will be greater chances of flooding along coastlines due to the inevitable rise in sea levels around the world. Drought is becoming more frequent and long-lasting; moreover, many areas around the globe are already experiencing its harmful effects on agricultural productivity and the availability of water. Tropical storms and hurricanes are also expected to increase in frequency and intensity as the Earth gets hotter. For our sake and for the well-being of future generations, urgent action must be taken now in order to prepare ourselves for these progressively detrimental changes to our environment caused by global climate change.

Climate Essay 2

One of the most alarming issues facing the modern world is that of global climate change, which is also known as "global warming." The fact that human activity is the primary cause of the ongoing rise in the Earth's temperature should be of concern to

everyone on the planet. As long as we humans continue reducing forests and burning fossil fuels (e.g., coal, oil, natural gas), greenhouse gases including mostly carbon dioxide and methane will continue to wreak havoc on the Earth's atmosphere. Decades of human activity are responsible for the increased amount of carbon dioxide in the atmosphere and the increase in the Earth's temperature as a consequence. As temperatures continue to rise worldwide, the adverse effects on climate will worsen across the globe. This man-made climate change could disrupt whole communities and devastate the economies of many countries or continents. Urgent action must be taken to reduce or eliminate carbon emissions that are the cause of global climate change. For the sake of future generations, will have to find alternative sources of energy and make necessary lifestyle changes.

Climate Essay 3

A certain amount of rain is important to the survival or well-being of most communities. It is especially necessary for maintaining adequate water supplies and agriculture (i.e., crops and food supplies). However, too much rain can cause serious, long-term problems for the environment and economy of affected communities. A severe rainstorm or even an unusually long stretch of rainy weather can cause serious damage to homes, businesses, and vehicles. Dark rainy days also negatively impact people's mood and ability to shop or attend outdoor activities, which can really hurt the local economy.

It is especially important to note, however, that excessive rain is most hazardous when it causes flooding or drenched roads. Under those conditions, people can lose their homes and vehicles to overwhelmingly high levels of water or increase their likelihood of getting into car accidents by driving on dangerously wet roads. Therefore, it is of

paramount importance for people to take flood warnings seriously, and to drive slowly (or not at all) during bad weather conditions.

Appendix B: Debriefing Statement

The purpose of this study is to address the effects of climate change information on beliefs about global climate change, and to determine whether death awareness increases in an individual after reading informational material on the subject of *climate change.* The study also examines the relationship between death-thought accessibility (i.e., death awareness) and belief in global climate change. The results of this study will be made available to participants upon request. Any questions, comments, or complaints are welcome and should be addressed to the author of this study (Troy Franklin), or to the Walden University Office of Research and Compliance. Thank you very much for your participation and contribution to this study!

Appendix C: Demographics Questionnaire

Please choose one response for each of the following questions:

1. What is your age? 18-29 30-39 40-49 50-59 60 or over
2. What is your gender? M F Gender Non-Conforming
3. What is your race/ethnicity? Caucasian African American Hispanic Asian Other/unknown
4. What is your highest education level achieved? high school some college 4-year degree graduate degree (e.g., Master's, Ph.D.)
5. What is your annual household income approximately? less than $12,000 $12,000 to $24,999 $25,000 to 49,999 $50,000 to $74,999 $75,000 to 99,999 $100,000 or greater
6. What is your religious affiliation? Christian Muslim Jewish Buddhist Hindu Other/none
7. What is your political affiliation? Democrat Republican Independent None

Appendix D: Permission to Use Measurement Instrument

The email correspondence below grants permission to the author of this study to use the *word completion task* as an instrument of measurement for DTA.

From: "Arndt, Jamie"
To:
Subject: RE: TMT Research Materials
Date: Jan 3, 2016 6:43 AM

Hi Troy – no special permission, please feel free and hope they are helpful. unfortunately though I don't know of essays on climate and climate change. a quick google search reveals that Janis Dickenson has done some stuff on this, so you might want to check that out (e.g., Dickinson, J. L. (2009). The people paradox: self-esteem striving, immortality ideologies, and human response to climate change. Ecology and Society, 14(1), 34.).

best of luck with your work,
Jamie

From:
Sent: Friday, January 01, 2016 7:08 PM
To: Arndt, Jamie
Subject: TMT Research Materials

Hi Jamie,

How are you? I haven't communicated with you for a while now, but I am still working on my PhD dissertation, which is about climate change information, DTA (as both dependent and mediation variable), and belief certainty in global climate change. I was on the TMT website and I noticed some word-fragment completion tests in the "research materials" section. Since I am going to be measuring DTA in my own study, I was wondering if I needed to get special permission to use any of those tests. Also, I need to locate essays on climate and climate change to use as the independent variable in my study. Would you be able to point me in the right direction to finding those? I'd greatly appreciate your response to these questions.

Thank you, and Happy New Year!

Troy Franklin
PhD General Psychology program
Walden University

The email correspondence below grants permission to the author of this study to use the Whitmarsh Skepticism Scale for climate change as an instrument of measurement for belief certainty in global climate change.

From: Lorraine Whitmarsh
To:
Subject: Re: Skepticism Scale for Climate Change
Date: Feb 5, 2016 4:26 AM
Attachments: Polarisation (published).pdf ATT00001.htm Behaviour article (published).pdf ATT00002.htm
Dear Troy

Thanks for your email. You're very welcome to use one of the scepticism scales I've developed. Please just cite the source. There are a couple of versions, the most recent (but longer) one can be found in the attached Corner et al paper. The previous one was in my 2009 paper, also attached.

Best wishes
Lorraine