EXAMINING THE ROLE OF ANXIETY IN INFORMATION SEEKING AND PROCESSING IN THE CONTEXTS OF ENVIRONMENTAL AND HEALTH RISKS

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ABSTRACT

The current studies aimed to understand the role of anxiety in information processing and management behaviors through the lens of the Risk Perception Attitude framework with two separate experiments. The first study aimed to examine the role of anxiety on information processing and management intention based on the RPA framework with the nationally representative sample. To further understand how anxious people pay attention and seek information, the laboratory experiment was conducted as the second study utilizing physiological measures with only the RPA's *anxious* segment - people with high perceived risk and low perceived efficacy for our study contexts of type 2 diabetes and energy blackouts. The findings from these studies reveal that anxiety, influenced by risk perception and efficacy beliefs, was associated with information processing (i.e., systematic processing and heuristic processing) and risk information seeking intentions for energy blackouts. However, no significant relationship was found between anxiety and the information seeking intention or processing variables in the context of type 2 diabetes. The findings from Study 2 indicated that people with high risk perception and low efficacy beliefs had tendency to prioritize risk information over information about preventive behaviors. Implications for risk communication and theory were addressed.

This dissertation is dedicated to the people who have been my guiding lights, my pillars of strengths, and my unwavering support through this academic journey.

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INTRODUCTION

For several decades, communication researchers have dedicated their efforts to deepening understanding about how people engage with and process health and risk information. Certain segments of the population are known to display a reluctance to seek or retain such information (Brashers et al., 2000; Myrick & Willoughby, 2019). Among the various communication theories designed to explain information seeking behavior, the Risk Perception Attitude (RPA) framework proposes that individuals with high levels of risk perception but weak efficacy beliefs (termed as the *anxious* segment in subsequent studies) tend to disproportionately avoid or struggle to process information effectively (Turner et al., 2006; Rimal & Real, 2003; Rimal & Turner, 2009).

Extant research on the anxious segment has yielded inconsistent and contradictory findings (e.g., Grasso & Bell, 2015; Rains et al., 2019; Real, 2008; Rimal & Real, 2003; Turner et al., 2006). One study, which measured emotional responses to risk information, showed that the anxious segment indeed actively sought out information due to their heightened level of anxiety (Turner et al., 2006). It was argued that this high level of anxiety motivated people to seek information, but it also debilitated their ability to effectively process that information. Results showed that participants in the anxious segment retained less information compared to other groups, despite spending more time seeking information (Turner et al., 2006). Although several studies suggested that a high level of anxiety can impede information processing (e.g., Alrefaei et al., 2022; Gudykunst & Nishida, 2001; Ingram & Kendall, 1987; Nabi, 1999), key

questions still remain about how anxiety functions in risk information processing and seeking, especially within the RPA framework.

Considering that anxiety is a common emotional response when individuals encounter environmental and health risks (e.g., Clayton, 2020; Grigsby et al., 2002; Hickman et al., 2021; Smith et al., 2013), it is crucial to understand its impact on both information management behaviors and information processing, including attention. Based on the RPA literature, it is expected that individuals' information management behaviors, such as information seeking and avoidance, will be influenced by their risk perception and efficacy beliefs through the mediating role of anxiety (Rimal & Real, 2003; Turner et al., 2006). Moreover, anxiety is further anticipated to mediate the relationship between risk perception/efficacy beliefs and information processing. Anxious individuals are motivated to process information that can alleviate their anxiety (Cialdini & Kenrick, 1976) but may tend to focus more on threat-related cues than neutral cues, which increases their anxiety levels in turn (e.g., Bar-Haim et al., 2007; Liu et al., 2019). As attention is an initial stage of information processing and a prerequisite for attitude changes (McGuire, 1968), understanding how anxiety influences one's attention to risk information is crucial when developing risk communication messages. It may be possible to enhance people in the anxious segment's capacity to process risk information and promote greater engagement in information seeking behaviors through carefully designed risk communication.

With these ideas in mind, the current paper aimed to: (1) test how risk perception and efficacy beliefs affect information processing and management behaviors through the mediating role of state anxiety, (2) investigate the type of information (i.e., efficacy information

vs. no efficacy information consistent with pre-existing efficacy) best processed by people in the RPA anxious segment, and (3) examine how people in the anxious segment process information when they were provided information which could enhance their efficacy beliefs. To achieve these goals, the current study consisted of two separate experiments. The first study was an online experiment testing the RPA framework with a nationally representative sample. The primary purpose of the first study was testing the RPA framework, including the mediating role of anxiety, and examining the effect of efficacy message for all RPA segments. The second study was a laboratory experiment specifically focused on people who have high perceived risk and low perceived efficacy beliefs (the anxious segment) to further investigate how anxious people pay attention to and process risk information.

In the following section, the relevant literature on the RPA framework was reviewed, and the role of anxiety in attention and information processing was discussed. Based on literature, two experimental studies were proposed to test the study hypotheses.

LITERATURE REVIEW

The Risk Perception Attitude Framework

The RPA framework predicts how audiences, segmented by perceived risk and efficacy beliefs, will seek out risk information (Rimal & Real, 2003) as well as the emotions that may mediate those relationships (Turner et al., 2006). Drawing from the extended parallel process model (EPPM, Witte, 1992), the RPA proposed that people can be categorized into four audience segments which have different information seeking tendencies based on their level of risk perception and efficacy (Rimal & Real, 2003). Although the RPA framework is informed by the EPPM, the RPA framework is distinct from the EPPM in that the EPPM is a theory about the outcomes of risk messages, particularly fear appeals, but the RPA focuses on segmenting groups based on their risk perceptions and efficacy beliefs.

Risk perception in the RPA is conceptualized as the perceived susceptibility and severity of a risk. Susceptibility refers to the extent to which one is vulnerable to a risk and severity refers to the seriousness of the consequences from a risk. Efficacy beliefs are the extent to which one believes they are able to adopt a behavior (self-efficacy) that effectively reduces or averts a threat (response efficacy). RPA studies have investigated the effect of one's risk perception on various preventive behaviors, but the original RPA framework was mainly focusing on behaviors related to risk information and knowledge (Rimal, 2001; Rimal & Real, 2003), including intention to seek information.

The RPA uses risk and efficacy beliefs as a method for segmenting potential audiences and predicting their attitudes toward information about risk. First, people who have both a high

level of risk perception and strong efficacy beliefs are categorized as the *responsive* segment. The responsive segment is the most motivated segment when it comes to seeking information related to the risk and adopting healthy behaviors because they are "aware of their risk status and believing [*sic*] they have the requisite skills to avert the threat of the disease" (Rimal & Real, 2003, p.372). Second, people who have low risk perceptions, but strong efficacy beliefs are considered as part of a *proactive* segment. The proactive segment tends to actively seek information like the responsive segment. Although their risk perception is low, they are motivated by "their desire to remain disease-free or be protected from the risk" (Rimal & Real, 2003, p.372). On the other hand, individuals who have both low levels of risk perception and weak efficacy beliefs are categorized as the *indifferent* segment. They are less motivated to seek information compared to other segments. Even if they are actually susceptible to the risk, they do not realize this, do not think they have the ability to deal with the risk, and therefore maintain an indifferent attitude toward risk information.

Lastly, people who have the combination of high-risk perception and weak efficacy beliefs are categorized as an *avoidant* (Rimal & Real, 2003) or *anxious* (Turner et al., 2006) segment. The anxious segment is likely to avoid seeking information related to the risk. People in the anxious segment instead choose to live with a level of uncertainty regarding the source of the threat (Brashers et al., 2000; Case et al., 2005). They tend to remain uncertain about a risk to protect themselves from a distressing situation (Brashers et al., 2000). Studies testing the RPA offer contradictory findings for the predictions derived from the framework, especially in regard to an anxious segment. Consistent with the RPA, some studies have shown the responsive segment was more motivated to seek information compared to the anxious

segment (Grasso & Bell, 2015; Mead et al., 2012; Real, 2008; Rimal & Real, 2003). In terms of protective behaviors other than information seeking behaviors, the responsive segment and proactive segment were also found to enact more the protective behavior (Lee & You, 2020; Rimal, Brown, et al., 2009) and had more knowledge of a risk compared to the anxious and indifferent segments (Rimal, Brown, et al., 2009).

Inconsistent with the framework, however, some RPA studies have indicated that there is not a difference in information seeking intentions or attitudes toward protective behaviors between the responsive segment and anxious segment (Liu-Lastres et al., 2019; Rains et al., 2019). One study found that the anxious segment was highly motivated to seek information related to a risk due to the participants' high level of anxiety (Turner et al., 2006). The anxious segment's information-seeking intention was found to be even higher than those of the proactive segment. Moreover, the anxious segment spent more time seeking information than the responsive segment but retained less information (i.e., less knowledge) than the responsive segment. Turner et al. (2006) suggested the anxious segment was not able to retain much information because anxiety might have inhibited some facet of message processing, however, this reasoning remains speculative in the absence of data related to information processing.

In short, anxious people may attend to and then process information differently from people in the other RPA segments. However, how much they process information has not been fully examined. To explain the role of anxiety in attention and cognitive processing, the following sections will review the literature related to state anxiety and its effect on attention and processing.

The Anxious Segment and State Anxiety

Anxiety, a future-oriented emotion resulting from anticipating a possible future risk (Ingram & Kendall, 1987; Lazarus, 1991), has been argued to motivate people to scrutinize information and engage in preventive behaviors as a defensive mechanism (LaBar, 2016; Lazarus, 1991). Consistent with this, cross-sectional data has shown that people report that they would pay more attention to risk information when feeling anxious compared to when feeling other emotions (Frijda et al., 1989) and that different types of anxiety exist.

Several types of anxiety have been identified in the literature, including: anxiety as a state (i.e., state anxiety), anxiety as an element of personality (i.e., trait anxiety), anxiety about anxiety (i.e., anxiety sensitivity), and anxiety as a clinical disease (i.e., anxiety disorder). State anxiety is defined as a temporal emotion associated with physiological arousal and feelings of worry as a reaction to a threat, whereas trait anxiety is defined as a personal tendency (i.e., individual difference) to respond to threat, which is more stable compared to state anxiety (Spielberger, 1985). Trait anxiety is associated with anxiety sensitivity, which is conceptualized as an individual's predisposition to fear about anxiety (Taylor et al., 1991). Lastly, anxiety disorder is a mental health condition characterized as excessive and intrusive worry involving the symptoms such as motor tension, autonomic hyperactivity, and increased vigilance (Gale & Oakley-Browne, 2000).

These concepts are interrelated but differentiated (e.g., Endler & Kocovski, 2001; Reiss, 1997; Spielberger, 1985; Taylor et al., 1991). It is likely that people with trait anxiety and/or anxiety disorder would feel greater state anxiety in response to a threatening stimulus. However, even though someone feels anxiety (i.e., state anxiety) about a specific issue, it does

not mean that they have trait anxiety and/or anxiety disorder. Although meta-analytic data suggests the effects of the state anxiety and anxiety disorder on one's cognitive processing are not very different (Bar-Haim et al., 2007), the interest of the current study is the role of state anxiety as induced by risk information, rather than trait anxiety, anxiety sensitivity, or disordered anxiety.

The original name of the anxious segment in the RPA was the *avoidant* segment, reflecting their tendency to avoid information (Rimal & Real, 2003). However, as the data showed no difference in information seeking behaviors between the *avoidant* segment and other RPA segments, Turner et al. (2006) re-labeled this group as the *anxious* segment to describe their distinction from other segments, which was a high level of state anxiety. It should be noted that they were not the only group who experienced a high level of anxiety in the Turner et al. experiments; the responsive segment was also found to experience a high level of anxiety due to the participants' high level of perceived risk. However, only the anxious segment had difficulty in retaining information (as measured by the ratio of the total score of knowledge quiz to the amount of time spent) due to their experience of state anxiety. The failure to retain information about a risk may be a function of attentional biases in information processing.

Anxiety, Attention, and Information Processing

People experiencing heightened levels of anxiety may have attentional biases; they prioritize information related to a threat over other types of information (e.g., Bar-Haim et al., 2007; Liu et al., 2019). That is, people who are anxious are likely to pay greater attention to cues related to a potential threat relative to neutral cues. This threat-related attentional bias, in turn, results in heightening peoples' level of anxiety (Liu et al., 2019). In other words, over time,

there is a feedback loop of anxiety and threat-related attentional bias. This is a vicious cycle for people who are anxious as anxiety can hinder information processing meaning that people remain anxious because they are unable to attend to or retain information that might ultimately reduce their anxiety (e.g., Derakshan & Eysenck, 2009; Eysenck et al., 2007; Eysenck & Derakshan, 2011).

Attention, an early stage of information processing (McGuire, 1968), is considered a necessary condition for attitude and ultimately behavior change in the persuasion literature (McGuire, 1968). McGuire's (1968) classic paradigm of information processing and persuasion followed Hovland et al.'s (1953) suggestion that people go through three information processing phases, including attention, comprehension, and acceptance. Adding more phases to these, McGuire (1968) proposed that people are persuaded through six information processing steps: (1) presentation, (2) attention, (3) comprehension, (4) yielding, (5) retention, and (6) behavior.

Attention and comprehension are often considered as "one general reception step" (p.173, McGuire, 1968) as the effects of attention and comprehension are difficult to differentiate, especially when these steps result in negative outcomes. For example, if one does not comprehend a message, it might be because one does not pay enough attention or simply fails to understand a message even though one attends to the message. Combining attention and comprehension as a single step of reception, McGuire (1968, 1972) proposed the reception-yielding model. According to the reception-yielding model, the effect of persuasion is determined by the multiplicative product of reception and its yielding (i.e., change in attitude). Interestingly, anxiety was regarded to produce the opposing effects for reception and yielding

in this model (McGuire, 1968). A high level of anxiety was found to negatively affect one's reception, but positively affect yielding. Due to this *compensation principle,* McGuire suggested that a moderate level of anxiety could produce the best persuasive effect as it could maximize the multiplicative product of reception and its yielding.

The importance of attention has been also stressed by other process theories such as the cognitive response model (Greenward, 1968) and the probabilogical model (Wyer, 1974). Going further than reception and yielding, the cognitive response model emphasizes the role of learning of information and persuasion. If a message recipient relates information to their existing beliefs, they are more likely to be persuaded. The probabilogical model also expanded the reception-yielding model by including refutation of arguments (i.e., counterarguing) and factors influencing persuasive effects other than reception or counterarguing.

Rather than focusing on persuasion, de la Fuente and Bix (2011) proposed a framework which combined concepts from the usability literature with information processing theories (e.g., McGuire, 1968) to identify ways to convey risk information effectively. Their combined framework suggested that four components of usability theory, including the characteristics of receivers, the types of tasks, the content and design of risk information, and the environment, might affect the information process steps.

Given the significance of attention in information processing, examining how one pays attention to information is a vital part of understanding risk-information processing. To measure attention to messages, researchers have used eye-tracking, which measures eye gaze, as a proxy for attention (e.g., Brigaud et al., 2021 for humor appeals). Several studies have used eye-tracking as a tool to examine the relationship between anxiety and cognitive processing.

For example, previous eye-tracking study showed that the fixation of more anxious people was less intense when reading survey questions about their health compared to less anxious people (Alrefaei et al., 2022).

Researchers have also investigated the attentional biases of anxious people using eye-tracking to better understand the extent to which people attend to threats. Interestingly, a meta-analysis of eye-tracking studies with young people (Lisk et al., 2020) showed that anxiety was not associated with attentional biases (i.e., anxious adolescents tended to avoid threat cues compared to non-anxious adolescents). Another meta-analysis of eye-tracking studies with adult samples (Clauss et al., 2022) found anxiety is positively related to threat-related attentional bias which means feeling anxious is associated with a tendency to pay more attention to threat cues. These contradicting findings indicate that the attentional bias of anxious people could be affected by age and their developmental stage. These studies, however, focused mainly on people with clinically diagnosed anxiety disorders and did not focus on risk messages.

Understanding the role of anxiety in attention is important, as it can significantly influence the entire process of information processing. Given anxiety may lead to heightened sensitivity to potential threats and increased vigilance towards negative or alarming information, anxious people may engage in different cognitive strategies and processing modes when evaluating risk information. Information processing, which refers to assessing the validity of information and its overall conclusion (Chaiken, 1980), consists of two modes according to the heuristic systematic model (HSM, Eagly & Chaiken, 1993): systematic and heuristic processing. Systematic processing involves comprehensive and detailed analysis of information

involving with cognitive effort, while heuristic processing involves a simplified analysis based on salient cues (Chaiken, 1980).

According to the HSM, people's ability and motivation are the primary determinants of how they process information (Chen et al., 1999; Eagly & Chaiken, 1993). Ability is defined as a cognitive capacity influenced by situational and individual difference factors, while motivation refers to "the desire to hold accurate attitudes" (p. 330, Eagly & Chiaken, 1993). Although people do engage in both systematic and heuristic processing simultaneously, people tend toward heuristic processing when people do not have ability or motivation to process information. When people have enough ability or are motivated to process information, however, they tend toward systematic processing.

The people who are anxious are believed to be motivated to process information related to the risk because they believe that they are susceptible to the risk and the risk is severe (LaBar, 2016). As the source of anxiety is often unknown and uncertain (Afifi & Weiner, 2004; Epstein, 1972; Gudykunst & Nishida, 2001; Lazarus, 1991), people may examine risk information closely when they are anxious to reduce uncertainty. However, because of their low level of efficacy, people in the anxious segment do not think that they can take steps to reduce the risk or minimize the likelihood that they will be impacted by it. This belief increases their level of anxiety, which hinders processing information related to the risk, even though they are highly motivated to do so (Turner et al., 2006).

In other words, even though anxiety heightens people's motivation to process information as it also decreases people's ability to process, as such, people with heightened levels of anxiety tend to engage in heuristic processing rather systematic processing. For

example, more anxious people find fewer logical errors in arguments (Jepson & Chaiken, 1990) and have fewer message-relevant thoughts compared to those with lower anxiety (Jepson & Chaiken, 1990; Sengupta & Johar, 2001) but these studies were not conducted measuring attention through eye gaze or fixation.

Information Seeking and Avoidance

The previous sections have reviewed how anxiety has an impact on the anxious segment's attention and information processing. As mentioned earlier, people in the anxious segment experience high anxiety because of high-risk perception but weak efficacy beliefs, thus, they might be more motivated to seek information to reduce the negative emotions they are likely to experience (Bauman et al., 1981; Witte, 1992) although they are likely to have difficulty processing information. Still, the findings in the RPA literature related to the anxious segment's information seeking behaviors are not consistent. This may be due, in part, to a failure to distinguish between information seeking and avoidance.

Although information seeking was not conceptually defined in the original RPA studies (Rimal & Real, 2003), the current study follows Brashers et al. (2000) and defines it as: behaviors searching and eliciting information from various sources for the purpose of information acquisition. Meanwhile, information avoidance is defined as "any behavior intended to prevent or delay the acquisition of available but potentially unwanted information" (p. 341, Sweeny et al., 2010). To avoid information, people must acknowledge the information that they are trying to avoid exists and that they have access to the information (Golman et al., 2017). They must also take steps to prevent being exposed to it, attending to it, or processing it.

People might avoid information due to dissonance and/or because they want to manage their level of uncertainty (Brashers, 2001).

Previous literature on the RPA framework has considered information avoidance as a part of information seeking behaviors. In other words, information avoidance was thought as the same conceptually as not seeking information. One of the reasons the original name of the anxious segment was the "avoidant" group because they were believed to be likely to avoid risk information, although most RPA studies measure only information seeking only (e.g., Liu-Lastres et al., 2019; Mead et al., 2012; Pask & Rawlins, 2016; Rimal & Real, 2003; Turner et al., 2006).

The nature of information seeking and avoidance is distinct (e.g., Case et al., 2005; Johnson, 2014): information seeking is active while information avoidance can be either active or passive (Sweeny et al., 2010). Even if people are not actively seeking risk information, it does not necessarily mean that they try to avoid risk information. People might even seek and avoid risk information simultaneously to achieve multiple goals; the types of information they try to seek and avoid might be different. For the avoidant segment specifically, they might try to seek information to alleviate their anxiety but avoid information that increases their anxiety.

To address the aforementioned issue, a recent study tested the RPA framework measuring both information seeking and avoidance in the context of COVID-19 prevention (Jang et al., 2021). The anxious segment was found to be more likely to *avoid risk information* compared to the proactive segment, however, there was no difference in *information seeking behaviors* between the avoidant and proactive groups. These findings suggest that individuals who are classified as anxious may have specific tendencies and preferences when it comes to

the type of risk information they are willing to engage with or avoid. Building upon these results, the present study aimed to further investigate the information seeking and avoidance behaviors of the anxious segment by examining two different risk issues.

Study Contexts: Energy Blackouts and Type 2 Diabetes

To test the RPA frameworks and replicate the previous findings, the current project used two different risk contexts related to anxiety. People who are susceptible to environmental and health risks commonly experience a high level of state anxiety (e.g., Clayton, 2020; Grigsby et al., 2002; Hickman et al., 2021; Smith et al., 2013). Given they need information to help them address a risk, it is critical to understand how anxiety plays a role in one's information processing and how to help anxious people to process health and environmental information better. To do so, the current paper aimed to test theoretically derived hypotheses in the context of two risks, *energy blackouts* and *type 2 diabetes*, which are known to be associated with anxiety.

Energy blackouts, the first risk examined in this study, are frequently caused by increased power demand. Energy backouts occur all over the United States. The prevalence and duration of blackouts are expected to further rise further due to the escalating occurrence of extreme weather events across the United States (Beard et al., 2010; Jufri et al., 2019; Schaeffer et al., 2012).

Type 2 diabetes, the second risk examined in the current study, is one of the most common health problems in the United States. According to the U.S. Centers for Disease Control and Prevention (2022), there are more than 37 million adults with type 2 diabetes in

the United States. Previous systematic reviews and meta-analyses indicated a correlation between diabetes diagnosis and anxiety (Grigsby et al., 2002; Smith et al., 2013, 2018).

The current study involved two experimental studies: The first study focused on information processing and the information seeking and avoiding outcomes of the RPA variables as mediated by anxiety. The second study specifically examined the attention and processing of efficacy information, with a specific focus on people who fall into the RPA anxious segment (i.e., high perceived risk, low perceived efficacy).

HYPOTHESES AND RESEARCH QUESTIONS FOR STUDY 1

Based on the RPA and the literature on state anxiety and information processing, it was predicted that the interplay of risk perception and efficacy beliefs result in anxiety, which in turn influences one's information seeking and avoiding intention. The RPA framework has been tested in two ways: examining how the RPA groups differ in terms of outcome variables such as intention to seek information or to engage in preventive/protective behaviors, knowledge, and attitudes toward preventive behaviors (e.g., Liu-Lastres et al., 2019; Mead et al., 2012; Rains et al., 2019; Rimal, Brown, et al., 2009; Rimal, Böse, et al., 2009; Rimal & Real, 2003; Sullivan et al., 2008; Turner et al., 2006). Studies have also examined how risk perception and efficacy beliefs affect outcome variables (e.g., Dillow & Labelle, 2014; Pask & Rawlins, 2016; Rimal & Juon, 2010; Shi & Kim, 2020).

The current paper tested the RPA framework in both ways. First, the current paper examined whether a high level of anxiety is a distinct characteristic of the anxious segment in the RPA framework. Second, the current study innovated research on the RPA by testing for the effect of anxiety on information seeking and avoidance using continuous variables. Treating the study dependent variables as continuous variables increases statistical power and is more parsimonious compared to treating them as categorical variables (Lazic, 2008). Given the RPA framework's hypotheses and the findings of Turner's study (2006), the following research question and hypotheses were posited for Study 1, the prediction being made *ceteris paribus*:

RQ1. How will the RPA groups differ in terms of their anxiety?

H1. Efficacy beliefs will function as a magnitude moderator of the risk perception-anxiety relationship such that as efficacy increases, the relationship between risk perception and anxiety will decrease.

H2. Anxiety will mediate the effect of risk perceptions and efficacy beliefs on information processing of websites including (a) self-reported processing, and (b) knowledge acquisition while efficacy beliefs moderate the effect of risk perception on anxiety and the effect of anxiety on information processing (Figure 1).

H3. Anxiety will mediate the effect of risk perception and efficacy beliefs on (a) information seeking intention and (b) information avoidance while efficacy beliefs moderate the effect of risk perception on anxiety and the effect of anxiety on information seeking intention and information avoidance (Figure 1).

STUDY 1 METHOD

Overview

Study 1 constructively replicated and extended Turner et al.'s (2006) study design using an online experiment to test the RPA framework with a nationally representative sample[1]. The design was a 2 (high vs. low-risk message) X 2 (strong vs. weak efficacy message) between-subjects posttest only control group experimental design; all dependent variables (e.g., anxiety, information seeking/avoidance intention, information processing) were measured via self-report. The primary purpose of the first study was testing the RPA framework and examining the role of state anxiety in information processing. As mentioned earlier, two risk contexts were used: energy blackouts and type 2 diabetes.

Study 1 Participants

Study 1 was an online experiment using a nationally representative sample. A power analysis was conducted to estimate the appropriate sample size for the first study using G*Power (Faul et al., 2007) with a medium-small effect size (Cohen's f = .26; average effect of the RPA membership on behavioral intention from prior online experiments and lab studies; Rains et al., 2019; Rimal & Real, 2003; Turner et al., 2006), and power (1-β) set at .95, two-

[1] Four types of replications exist according to the previous study (Kelly et al., 1979): literal replication, operational replication, instrumental replication, and constructive replication. A constructive replication indicates that a study attempts to duplicate a previous study but varies the experimental manipulations and measures used in the previous study to avoid its limitations. Study 1 was a constructive replication of Turner et al.'s (2006) study, as it duplicated Turner et al.'s (2006) study in terms of experimental designs and procedures but introduced variations in the sampling method (e.g., nationally representative sampling), an additional context (i.e., energy blackouts), operationalization of the independent variables (e.g., adding a diagram for efficacy induction and restricting the number of preventive behaviors across conditions), and additional variables measured (e.g., heuristic and systematic processing).

tailed, to determine the sample size. The required sample size was at least n = 259. To guard against potential problems with data quality and to increase statistical power, a larger sample was recruited, N = 400. Participants were recruited from a nationally representative panel maintained by the survey firm *Prolific*. Prolific stratified the sample based on participants' age, sex, and their ethnicity, using census data from the US Census Bureau. This ensured that the sample had the same proportion as the national population. Only people older than 18 years old and U.S. citizens were eligible to participants in the study.

A total of 403 participants initially completed the study. However, two participants were excluded from the final sample, one due to the failing the attention check and the other due to the exceptionally long completion time of 34 hours. Thus, the final sample size included in the analysis was 401 participants, including 201 participants for energy blackouts and 200 participants for type 2 diabetes. For the energy blackouts condition, the distribution of participants across the different conditions was as follows: 36 participants in the low risk and weak efficacy condition, 49 participants in the low risk and strong efficacy condition, 56 participants in the high risk but weak efficacy condition, and 59 participants in the high risk and strong efficacy condition. For the type 2 diabetes condition, the distribution of participants across the different conditions was as follows: 51 participants in the low risk and weak efficacy condition, 52 participants in the low risk and strong efficacy condition, 49 participants in the high risk but weak efficacy condition, and 49 participants in the high risk and strong efficacy condition.

More than half of participants (51%) identified as female. The average age of participants was 45.68 (SD = 15.95, *Min.* = 18, *Max.* = 93). In terms of racial and ethnic

background, the majority of the participants were European American (73.8%), followed by African American (12.7%), Asian (5.7%), Hispanic (4.0%) and individuals from other racial or ethnic backgrounds. Participants' educational attainment indicated that the largest proportion had obtained a bachelor's degree (36.9%), followed by some college without a degree (24.7%), and graduate or professional degree (15.7%) (see Table 1 for detailed information).

In the energy blackouts context, approximately 18% of participants reported owning a standby power generator. Additionally, around 24% of participants indicated that they had experienced an energy blackout within the past six months. Regarding type 2 diabetes, approximately 22% of participants reported being previously informed that they were a t risk of developing type 2 diabetes. Furthermore, around 8% of participants disclosed that they had been diagnosed with type 2 diabetes. Accordingly, these pre-existing factors were controlled during the manipulation check in order to account for potential influences on participants' risk perception and efficacy beliefs.

Procedures

The order of experimental procedures was as consistent as possible with those used by Turner et al. (2006) and Rimal and Real (2003). After being provided with informed consent, participants were asked to report their history, relevant behaviors, and attitudes toward a battery of risks including energy blackouts and diabetes. Participants were informed that their answers would be used to calculate their probability of having the risk happen to them, but participants were indeed randomly assigned to one of the four experimental conditions with two topics and then viewed the risk inductions followed by efficacy information (see Appendix A).

Once they were done viewing the information, their risk perception and efficacy beliefs were measured to check whether the manipulation was effective. Next, participants reported outcome variables including anxiety, information seeking and avoiding intentions. Then, participants were provided with the real CDC website related to risk and asked to browse it. Next, they were asked to complete a quiz to test their knowledge about the risk. Quiz questions were created from information presented to participants in the websites. Participants then reported how they processed the information while browsing the websites. Lastly, participants completed measures of the potential covariates including trait anxiety, topic relevance, and past information seeking/avoidance behaviors. An attention check appeared midway to ensure data quality. Participants were debriefed after the study that their risk and efficacy information were provided randomly.

Stimuli

The stimuli were modeled after those used in Tuner et al. (2006). The stimuli were mainly based on text including two images demonstrating their risk and efficacy.

Risk induction

After participants provided their history, relevant behaviors, and attitudes toward a battery of risks, they saw a screen with a thermometer-like diagram. In the high-risk condition, participants saw a diagram indicating that they were in the highest risk group, and they were informed that they were the top 10 % of people in the United States in terms of risk and they were more vulnerable to the risk compared to others. In the low-risk condition, participants saw the diagram indicating they were in the lowest risk group, and they were informed that

they were the bottom 10% of people in the United States in terms of risk and they were less vulnerable to risk compared to others (See Table 2).

Efficacy induction

Participants were exposed to the efficacy induction after the risk induction. In order to control possible confounds, the number of recommended behaviors were controlled across the conditions. Based on the previous literature (Prestin & Nabi, 2012), high efficacy condition messages focused on how to overcome possible barriers related to the recommended behaviors. Specifically, in the high efficacy condition, participants were told that the recommended behaviors could prevent the risk (e.g., a diagram indicating that the preventive measures would reduce the risk by 90%). It was also stressed that the recommended behaviors could be easier than participants think. Meanwhile, in the low efficacy condition, they were informed that the recommended behaviors could help to prevent the risk a little and it could be difficult and/or inconvenient to engage in recommended behaviors (See Table 2).

Measures

Unless otherwise specified, the study variables for study 1 measured on a 7-point Likert-type scale (from 1 = *Strongly Disagree* to 7 = *Strongly Agree*). Items were summed such that higher scores indicate greater risk perceptions, stronger efficacy belief, stronger emotional responses, and stronger behavior intention. Although prior studies have provided validity evidence most measures used in the current study, confirmatory factor analyses (CFA) were conducted for the measures with more than four items because the items were revised for the context of this study. The full version of measures can be found in Table 3.

Variables of Interest

Risk perception. Risk perception was calculated by multiplying participants' perceived susceptibility and severity (Rimal & Real, 2003). Four items adapted from prior research (Witte et al., 1996) and one item created for this project were used to measure perceived severity (a = .96). The example item included "I believe [risk] has serious negative consequences." The CFA showed that the data were consistent with the unidimensional factor model, χ^2 (5) = 57.46, p = .00, *CFI* = .98, *SRMR* = .017.

Another four adapted items (Witte et al., 2001) were used to measure perceived susceptibility with an additional item created for this project (a = .85). An example item included: "It is possible that [risk] impacts me." The CFA indicated that the data were consistent with the unidimensional factor model, χ^2 (5) = 27.26, p = .00, *CFI* = .98, *SRMR* = .043.

Efficacy beliefs. Efficacy beliefs were calculated by multiplying participants' self-efficacy and response efficacy beliefs (Rimal & Real, 2003). Self-efficacy beliefs were measured with five items (a = .87) adapted from Witte et al. (2001). As each topic provided two recommended behaviors, the measure consisted of three categories, two sets of two items for each behavior (i.e., four items to measure self-efficacy beliefs of two behaviors) and one item to measure one's general self-efficacy beliefs related to the topic. The second-order CFA was conducted, including the main construct (i.e., self-efficacy beliefs) and three sub-constructs (i.e., self-efficacy beliefs about the behavior 1 and behavior 2, and general self-efficacy beliefs). The results showed that the data fitted the hypothesized model well, χ^2 (3) = 12.13, p = .01, *CFI* = .99, *SRMR* = .010.

Response efficacy beliefs were measured with five items (a = .91) adapted from Witte et al. (2001). Consistent with self-efficacy beliefs measure, the response efficacy beliefs measure consisted of three categories. The second-order CFA also showed that the data fitted the hypothesized model well, χ^2 (3) = 87.38, p = .00, *CFI* = .95, *SRMR* = .028.

State Anxiety. Anxiety was measured with six items adapted from previous studies (Jang & Lapinski, 2021) (a = .97). An example item included "I feel uncomfortable about [risk]." The CFA indicated that the data were consistent with the unidimensional model, χ^2 (9) = 72.10, p = .00, *CFI* = .98, *SRMR* = .012.

Systematic processing. Systematic processing was measured with five items adapted from Kahlor et al. (2003) (a = .94). An example item included "I thought about what actions I myself might take based on what I read." The CFA revealed that the data were consistent with the unidimensional model, χ^2 (5) = 35.17, p = .00, *CFI* = .97, *SRMR* = .009.

Heuristic processing. Heuristic processing was measured with five items adapted from Kahlor et al. (2003). An example item included "I skimmed through the story." The CFA results were relatively poor compared to other measures, indicating that the data did not fit the unidimensional measurement model, χ^2 (5) = 68.40, p = .00, *CFI* = .93, *SRMR* = .050. After dropping one item which had less face validity than other items (see Table 3), the CFA results with the remaining four items indicated that the data were consistent with the unidimensional model, χ^2 (2) = 23.92, p = .00, *CFI* = .97, *SRMR* = .038. The scale was also reliable, a = .84.

Knowledge. Knowledge was measured with a set of true/false items. The questions only included materials discussed in the provided websites. Items were recoded so that correct

answers are given 1 and incorrect answers are given 0 and the items were summed to create a knowledge index.

Information seeking intention. Information seeking intention was measured with four items adapted from a previous study (Yang, Kahlor, & Li, 2014) (α = .98). An example item included "I intend to search for information about [risk] in the near future." The CFA results showed that the data were consistent with the unidimensional model, χ^2 (2) = 5.004, p = .082, *CFI* = .99, *SRMR* = .002.

Information avoidance intention. Information avoidance intention was measured with five items adapted from Miles et al. (2008) (α = .94). Example item included "I will avoid reading things about [risk]." The CFA results indicated that the data were consistent with the unidimensional model, χ^2 (5) = 90.54, p = .00, *CFI* = .95, *SRMR* = .029.

Potential Covariates

Fear. Fear was measured as a covariate with five items adapted from the previous study (Jang & Lapinski, 2021) (α = .98). The example item included "Thinking about the impact of [a risk] made me feel frightened." The CFA results indicated that the data were consistent with the unidimensional model, χ^2 (2) = 93.05, p = .00, *CFI* = .97, *SRMR* = .009. The previous study (Jang, 2021) tested the parallelism of fear and anxiety measurements and found they measured the different constructs.

Trait anxiety. Trait anxiety was measured as a covariate with five items adapted from the previous study (Zsido et al., 2020) (α = .92). The example item included "I worry too much over something that really does not matter." The CFA results suggested that the data were consistent with the unidimensional model, χ^2 (5) = 61.36, p = .00, *CFI* = .96, *SRMR* = .031.

Topic relevance. Topic relevance was measured with three items adapted from the previous study (Yang, Kahlor, & Griffin, 2014) as a covariate across the topics (α = .72). The sample item included, "To me, the topic of [a risk] is important."

Past information seeking behaviors. Past information seeking behaviors were measured as a covariate with a single yes/no item. Participants were asked to answer whether they looked for information about risk in the past or not.

Collective efficacy. Given preventing a risk of energy blackouts requires a collective action, collective efficacy was measured as a covariate for the context of energy blackouts. Five items were adapted from a previous study (Wang & Lin, 2007) (α = .93). The example item included: "I have confidence in the ability of my neighbors in saving energy by taking collective action." The CFA results showed that the data were consistent with the unidimensional model, χ^2 (5) = 38.14, p = .00, *CFI* = .97, *SRMR* = .029.

Demographic information*.* Demographic information including age, gender, race, education, income were requested from participants.

Preliminary Studies to Develop Stimulus Materials

To maximize the variance in risk perception and efficacy beliefs for Study 1, the risk and efficacy messages for each context were developed based on four preliminary studies (*N* ranging from 98 to 320). Participants were recruited from a panel run by *Prolific*, an online research company. Participants who participated in one pilot study were not eligible to participate in the other pilot studies or the main study. Due to the nature of the stimuli and to improve exposure to study messages, participants were required to use a laptop or personal computer (rather than a cell phone) to participate in the study. After agreeing to participate in

the study, participants were randomly assigned to the study conditions. Participants were asked to read the stimuli and then report their risk perception and efficacy beliefs. Then, they were requested to write down the thoughts they had while reading the messages.

One of the ways that Turner et al. (2006) manipulated participants' efficacy beliefs was varying the number of recommended preventive behaviors in their messages. Specifically, they presented an increased number of preventive behaviors in order to enhance participants' efficacy beliefs. While manipulating the number of recommended behaviors may effectively influence one's efficacy beliefs, we had concerns about the potential impact of suggesting more behavioral options for information seeking behaviors, a key dependent variable in this study. In other words, participants in the high efficacy condition, who were provided with more recommended behaviors compared to those in the low efficacy condition, may have engaged in more information seeking activities just because they had more options to browse, thereby introducing a potential confounding factor. But controlling the number of recommended behaviors could also result in a different problem, a failed manipulation.

To address this concern and evaluate the effectiveness of the efficacy manipulation while controlling for the number of recommended behaviors, the first pilot study was conducted with a between subjects factorial design, consisting of 2 (high vs. low risk messages) X 2 (strong vs. weak efficacy message) X 2 (no variance in the number of recommended behaviors X variance in the number of recommended behaviors) for two risk contexts (i.e., energy blackouts and type 2 diabetes). The risk induction worked across the contexts, but the findings related to the efficacy induction were not consistent. The efficacy induction with no variance in the number of recommended behaviors worked for energy blackouts, while it did

not work for type 2 diabetes. The findings related to the efficacy induction with variance in the number of recommended behaviors were also inconsistent across the conditions. The efficacy manipulation with variance in the number of recommended behaviors worked for type 2 diabetes, but it did not work for energy blackouts.

Due to inconsistent effectiveness in manipulating efficacy beliefs by varying the number of behavioral options, it was decided to control the number of recommended behaviors for the efficacy manipulation. In the second pilot test, a between-factorial design was employed, consisting of 2 (high vs. low risk messages) X 2 (strong vs. weak efficacy message) X 2 (energy blackouts X type 2 diabetes). While the risk induction yielded successful results, the efficacy induction did not produce the Intended effects.

To gain insights into participants' natural efficacy beliefs regarding each context, the third pilot study was conducted, introducing additional conditions that included a no efficacy message: 2 (high vs. low risk messages) X 3 (strong vs. weak vs. no efficacy messages) X 2 (energy blackouts X type 2 diabetes). The efficacy induction remained ineffective. The results revealed significant variations in participants' natural efficacy beliefs concerning both energy blackouts and type 2 diabetes, ranging from low to high.

Considering that participants were presented with risk messages first, it was plausible to assume that those in the low-risk condition may not have paid sufficient attention to the efficacy induction, leading to the unsuccessful manipulation. To explore this possibility, a fourth pilot study was conducted, incorporating a no risk conditions: 3 (high vs. low vs. no risk messages) X 3 (strong vs. weak vs. no efficacy messages) X 2 (energy blackouts X type 2 diabetes). While the risk manipulation yielded the intended results, the efficacy manipulation

was weak. As our goal was to maximize the variance in risk perception and efficacy beliefs through manipulation, the main study was conducted using a slightly modified version of the stimuli utilized in the fourth pilot test. Further details regarding the stimuli are provided below in the stimuli section.

Analysis Plan

Descriptive statistics were computed to evaluate general patterns in participants' responses and adherence of the variables to statistical assumptions. The RPA segments were created using a k-means clustering, following Turner et al. (2006). Using these clusters, RQ1 was examined by an analysis of covariance (ANCOVA) while controlling covariates. All hypotheses were evaluated through PROCESS (Model 1 for H1 and Model 8 for all others, Hayes, 2022). Prior to conducting the analyses, all independent variables (IVs) and covariates were mean-centered to enhance interpretability and mitigate the potential collinearity between the IVs (i.e., risk perception and efficacy beliefs) and their interaction term.

RESULTS OF STUDY 1

The Effect of Messages on Perceptions

A series of ANCOVAs were conducted to examine the effect of the messages on participants' perceptions. In the context of energy blackouts, the effect of risk induction on risk perception was found to be statistically significant, F (1, 199) = 78.48, $p < .001$, $\eta^2 = .28$. Participants in the high-risk condition reported higher levels of risk perception (M = 27.48, SD = 7.45) compared to those in the low-risk condition (M = 17.68, SD = 8.60). Additionally, the effect of efficacy induction on efficacy beliefs was also statistically significant but the effect size small, F (1, 199) = 7.86, $p < .01$, $\eta^2 = .03$, after adjusting for the covariate of collective efficacy. Participants in the strong efficacy condition reported stronger efficacy beliefs (M = 34.63, SD = 10.63), compared to those in the weak efficacy condition (M = 30.92, SD = 8.20).

In the context of type 2 diabetes, the effect of risk induction on risk perception was statistically significant, F (1, 200) = 73.50, $p < .001$, $\eta^2 = .25$, after adjusting for covariates including whether participants had previously been informed they were at risk of type 2 diabetes and whether they had been diagnosed with type 2 diabetes. Participants in the high-risk condition reported higher levels of risk perception (M = 29.40, SD = 8.06), compared to those in the low-risk condition (M = 19.38, SD = 8.88). Furthermore, the effect of efficacy induction on participants' efficacy beliefs was also statistically significant, F (1, 200) = 7.59, $p < .01$, $\eta^2 = .04$. Participants in the strong efficacy condition reported stronger efficacy beliefs (M = 33.03, SD = 8.68) compared to those in the weak efficacy condition (M = 29.24, SD = 10.29).

Thus, it was concluded that the messages successfully elicited variation in risk perception and efficacy beliefs as intended.

Descriptive Results and Identifying Covariates

Covariates were identified following Tabachnick and Fidell (2001). To maximize the power, only covariates associated with DVs were included in the analyses. If covariates are substantially related to each other, the covariate with the strongest correlation with DV was chosen, except when it was necessary to include all covariates due to the theoretical reasons[2] (see Tables 4 and 5 for the correlations between focal variables)[3]. The specific covariates included in the analyses can be found in the result tables due to page limitations.

Hypotheses Testing

RQ1 investigated whether the level of anxiety differed by the RPA segments. To examine RQ1, first, the RPA segments were created using k-cluster analysis and then differences in anxiety by cluster were tested using ANCOVA. For energy blackouts, the four-group solution converged after 5 iterations. Both risk perception, F (3, 196) = 149.98, $p < .001$, and efficacy beliefs, F (3, 196) = 122.80, $p < .001$, were statistically associated with the cluster classification. For type 2 diabetes, the four-group solution was created after 13 iterations. Both risk

[2] For instance, to examine the sole effect of state anxiety, trait anxiety, (state) anxiety, and fear were all included in the analyses although their correlations were relatively high, when they were all related to DVs.

[3] To examine the possible issue of multicollinearity resulting from the high correlation between state anxiety, fear, and trait anxiety, their correlation coefficients with the dependent variables and their corresponding standardized coefficients (Beta) in the regression equations were compared, following Cohen et al. (2003). However, no large or unexpected changes in either direction or magnitude of these coefficients were observed. Additionally, their VIF (Variance Inflation Factor) values were calculated. All VIF values for state anxiety, fear, and trait anxiety were found to be less than 5 for energy blackouts and less than 5.5 for type 2 diabetes. Therefore, it was concluded that no serious multicollinearity issue existed.

perception, F (3, 197) = 157.88, p < .001, and efficacy beliefs, F (3, 197) = 133.33, p < .001 were statistically significantly associated with the cluster classification (See Table 6).

An ANCOVA was conducted with a trait anxiety as a covariate. For energy blackouts, the effect of the RPA segments on anxiety was statistically significant, F (3, 199) = 21.20, p < .001, after adjusting for the covariate. The confidence interval showed that the responsive segment experienced the strongest anxiety, followed by the anxious and the proactive segments. For type 2 diabetes, the effect of the RPA segments on anxiety remained statistically significant, F (3, 199) = 11.15, p < .001, after adjustment by the covariate. The confidence interval indicated that the anxious and responsive segments experienced stronger anxiety compared to the indifferent or proactive segments (see Table 6 for the estimated mean and standard error for each segment).

H1 predicted that efficacy beliefs would moderate the effect of risk perception on anxiety such that stronger efficacy beliefs would reduce the effect of risk perception on anxiety. Multivariate regression was conducted using PROCESS 4.3 (Model 1, Hayes, 2022). Fear and trait anxiety were included as covariates for both contexts. In the context of energy blackouts, the results showed that the main effects of risk perception, B = .03, SE = .01, p < .001, and efficacy beliefs, B = .02, SE = .01, p < .01 were statistically significant. The interaction effect of risk perception and efficacy beliefs on anxiety, however, was not statistically significant (see Table 7).

In the context of type 2 diabetes, the main effect of risk perception on anxiety was found to be statistically significant after adjusting for the covariates, B = .02, SE = .01, p <. 01. However, the main effect of efficacy beliefs and the interaction effect of risk perception and

efficacy beliefs on anxiety were not statistically significant (see Table 7). Therefore, the data were not consistent with H1 in either context.

H2(a) predicted that anxiety would mediate the effect of risk perceptions and efficacy beliefs on self-reported information processing. Multivariate regression was conducted using PROCESS 4.3 (Model 8, Hayes, 2022). In the context of energy blackouts, the results showed that the main effects of risk perception, $B = .02$, $SE = .01$, $p < .01$, and efficacy beliefs on anxiety, $B = .02$, $SE = .01$, $p < .01$, were statistically significant, after adjusting for covariates.

When systematic processing was the dependent variable, the main effect of risk perception was not statistically significant, $p > .05$, while the main effect of efficacy beliefs was, $B = .03$, $SE = .01$, $p < .001$. The main effect of anxiety was found to be statistically significant, $B = .25$, $SE = .08$, $p < .001$ (See Table 8). The indirect effects of risk perception on systematic processing via anxiety were statistically significant only when the efficacy beliefs were weak or moderate, while the moderated mediation index of efficacy beliefs was not statistically significant which suggested the indirect effect of risk perception on systematic processing did not depend on efficacy beliefs (See Table 8).

When heuristic processing was the dependent variable, the main effects of both risk perception and efficacy beliefs were not statistically significant, $p > .05$. The main effect of anxiety on heuristic processing was also not statistically significant, $p > .05$ indicating that the indirect effect of risk perception on heuristic processing via anxiety was not statistically significant. Still, the interaction effect of risk perception and efficacy beliefs on heuristic processing was statistically significant, $B = .002$, $SE = .12$, $p < .05$ (See Figure 2).

In the context of type 2 diabetes, the main effect of risk perception on anxiety was statistically significant, B = .02, SE = .01, p < .05, while the main effect of efficacy beliefs and the interaction effect of risk perception and efficacy beliefs on anxiety were not statistically significant (See Table 8).

When systematic processing and heuristic processing were the dependent variables, the main effects of risk perception were not statistically significant, p > .05. The main effect of efficacy beliefs on systematic processing was statistically significant, B = .03, SE = .01, p < .01, while its main effect on heuristic processing was not, p > .05. The main effect of anxiety on both systematic processing and heuristic processing were not statistically significant, p > .05. As a result, the indirect effect of risk perception via anxiety on either systematic processing or heuristic processing were not statistically significant (See Table 9). Thus, the data were not consistent with H2(a) in both contexts.

H2(b) predicted that anxiety would mediate the effect of risk perceptions and efficacy beliefs on knowledge of the risk. In the context of energy blackouts, the regression model with anxiety as the dependent variable showed that the main effects of risk perception, B = .03, SE = .01, p < .001, and efficacy beliefs on anxiety, B = .02, SE = .01, p < .01, were statistically significant. When the knowledge was the dependent variable, the main effect of risk perception and efficacy beliefs were not statistically significant, p > .05. Still, the main effect of anxiety on knowledge was statistically significant, B = .25, SE = .10, p < .05 (See Table 10). The indirect effect of risk perception on knowledge was statistically significant when the level of efficacy beliefs was weak or moderate. Still, the moderated mediation index of efficacy beliefs was not

statistically significant, which suggested that the indirect effect of risk perception on knowledge via anxiety was not related to the level of efficacy beliefs. (See Table 11).

In the context of type 2 diabetes, the regression model with anxiety as the dependent variable indicated that the main effects of risk perception on anxiety was statistically significant, $B = .02$, $SE = .01$, $p < .01$, while the main effect of efficacy beliefs on anxiety was not statistically significant. However, the regression model with the knowledge was not statistically significant, $F(6, 193) = .79$, $p > .05$ (See Table 10). Therefore, the data were inconsistent with H2(b) in contexts.

H3(a) predicted that anxiety would mediate the effect of risk perception and efficacy beliefs on information seeking intention. To test the mediation effect, two multivariate regression analyses were performed by using PROCESS 4.3 for each context (Model 8, Hayes, 2022). In the context of energy blackouts, it was found that the main effects of risk perception, $B = .02$, $SE = .01$, $p < .01$, and efficacy beliefs on anxiety, $B = .02$, $SE = .01$, $p < .01$ were statistically significant after adjusting for covariates. The interaction effect of risk perception and efficacy beliefs on anxiety was not statistically significant (See Table 12).

The main effects of risk perception, $B = .03$, $SE = .01$, $p < .05$, and anxiety on seeking intention, $B = .45$, $SE = .10$, $p < .001$, were statistically significant, while the main effect of efficacy was not, $p > .05$. The indirect effect of risk perception via anxiety on seeking intention was statistically significant only when the efficacy beliefs were weak or moderate (Table 13). In other words, the anxiety mediated the relationship between risk perception and seeking intention when the efficacy beliefs were weak or moderate (see Table 13 for the detailed information related to conditional indirect effects). Still, the moderated mediation index of

efficacy beliefs was not statistically significant, showing the indirect effect of risk perception on seeking intention via anxiety did not depend on the level of efficacy beliefs.

In the context of type 2 diabetes, the main effect of risk perception on anxiety was statistically significant after adjusting for covariates, B = .02, SE= .01, p < .05. However, the main effect of efficacy beliefs and the interaction effect of risk perception and efficacy beliefs on anxiety were not statistically significant (See Table 12).

The main effects of risk perception, *B* = .04, *SE* = .01, *p* < .01, and efficacy beliefs on seeking intention, *B* = .03, *SE* = .01, *p* < .05, was statistically significant. However, the main effect of anxiety on seeking intention was not statistically significant. Consequently, the indirect effect of risk perception on seeking intention via anxiety was not statistically significant (See Table 13). The moderated mediation index of efficacy beliefs was also not statistically significant. As the indirect effect of risk perception on seeking intention via anxiety was not significant, the data were not consistent with H3(a) in both contexts.

H3(b) predicted that anxiety would mediate the effect of risk perception and efficacy beliefs on information avoidance. In the context of blackouts, the results show that the main effects of risk perception, *B* = .03, *SE* = .01, *p* < .05, and efficacy beliefs on anxiety, *B* = .02, *SE* = .01, *p* < .01, were statistically significant, while their interaction effect was not statistically significant (See Table 14).

The main effects of risk perception, *B* = -.02, *SE* = .01, *p* < .05, efficacy beliefs, *B* = -.02, *SE* = .01, *p* < .05, and anxiety on information avoidance, *B* = -.29, *SE* = .09, *p* < .01, were statistically significant. The results showed that the indirect effects of risk perception on information avoidance via anxiety were statistically significant only when efficacy beliefs were weak or

moderate (See Table 15). The moderated mediation index of efficacy beliefs, however, was not statistically significant, which showed the indirect effect of risk perception on information avoidance via anxiety was not related to the level of efficacy beliefs.

In the context of type 2 diabetes, the results showed that the main effect of risk perception on anxiety was statistically significant, $B = .02$, $SE = .01$, $p < .01$. The main effect of efficacy beliefs and the interaction effect of risk perception and efficacy beliefs on anxiety were not statistically significant (See Table 14).

Regarding the information avoidance as the dependent variable, the main effect of risk perception was statistically significant, $B = -.03$, $SE = .01$, $p < .01$, as well as the main effect of efficacy beliefs, $B = -.03$, $SE = .01$, $p < .01$. However, the main effect of anxiety on information avoidance was not statistically significant. As a result, the indirect effect of risk perception on information avoidance via anxiety was not statistically significant (See Table 15). Therefore, the data were not consistent with H3(b) in both contexts.

DISCUSSION FOR STUDY 1

One of the purposes of study 1 was to test whether anxiety was a function of the RPA segments. Findings from Study 1 indicated that the RPA memberships were related to anxiety. Specifically, our findings showed that individuals with a high level of risk perception tended to experience elevated anxiety, even when they held strong efficacy beliefs. In the context of type 2 diabetes, both the responsive and anxious groups reported higher levels of anxiety compared to other RPA groups, which aligns with previous research on the same topic (Turner et al., 2006). However, in the context of energy blackouts, the responsive group experienced higher anxiety relative to the anxious group. In other words, when it came to personal health issues, individuals with high risk perception experienced heightened anxiety regardless of their efficacy beliefs. On the other hand, for environmental issues like energy blackouts, efficacy beliefs amplified the level of anxiety alongside risk perception.

Similar results have been often obtained concerning the positive association between self-efficacy and anxiety related to environmental issues, particularly among adolescents (Maran & Begotti, 2021; Sarrasin et al., 2022) in part because people have not historically felt a sense of responsibility for helping to prevent collective risks such as energy blackouts. When it comes to personal health topics, people are accustomed to taking control and responsibility for their own health. However, with environmental issues including energy blackouts which are often caused by many individual behaviors, most people are not accustomed to taking such responsibility. Simply recognizing the possible actions they can or must take regarding this risk may induce feelings of anxiety.

The finding that the people in the responsive segment experience more or equal levels of anxiety with people in the anxious segment also raises questions about the labeling of the *anxious* group within the RPA framework. A high level of anxiety is not a distinctive characteristic of the anxious segment compared to other RPA groups, regardless of the topic being addressed. Therefore, this suggests that the labeling and conceptualization of the *anxious* group should be re-considered within the RPA framework. The original labeling of the *anxious* group was the *avoidant* group based on the assumption that individuals with high levels of risk perception and weak levels of efficacy beliefs would exhibit avoidance behaviors toward risk information. However, the findings of the current study related to information processing and management reveals that this labeling might also not fully capture the characteristics of individuals in this group. The post-hoc analyses suggested that people in this *anxious* segment were not more likely to avoid information than people in the other segments[4].

Based on Turner et al.'s findings (2006), the current study aimed to examine the moderated mediation effect of efficacy beliefs between the RPA variables and information processing as well as behavioral intentions to seek or avoid information, mediated by anxiety. Although our data showed that the indirect effect of risk perception on information related variables (such as systematic processing, seeking intention, and information avoidance in the context of energy blackouts, and knowledge in both contexts) varied depending on the level of efficacy beliefs, the moderated mediation index of efficacy beliefs was not found to be

[4] For energy blackouts, the main effect of the RPA cluster on information avoidance was statistically significant, F (3, 199) = 5.44, $p < .001$. However, the anxious segment's information avoidance was not different from any other RPA segments. For type 2 diabetes, the main effect of the RPA cluster on information avoidance was not statistically significant, F (3, 199) = 1.61, $p > .05$.

statistically significant in all hypotheses testing, which was inconsistent with the predictions of the current study. It is suspected that the lack of statistical significance in the moderated mediation effect of efficacy beliefs via anxiety may be attributed to the small effect size of the interaction term between risk perception and efficacy beliefs.

While we did not find the statistically significant moderated mediation effect, it was observed that anxiety, resulting from risk perception and efficacy beliefs, had a positive effect on systematic processing but did not show a statistical association with heuristic processing in the context of energy blackouts. This indicates that as anxiety increased, so participants engaged in more comprehensive processing of information about energy blackouts. That is, feeling more anxious was associated with a greater tendency to carefully process information. This finding aligns with previous literature suggesting that anxious individuals are more motivated to process information (Frijda et al., 1986; LaBar, 2016).

Interestingly, the interplay of risk perception and efficacy beliefs was positively related to heuristic processing in the context of energy blackouts. The graph (Figure 2) illustrated that the relationship between risk perception and simplified processing was negative when efficacy beliefs were weak, while this relationship became positive when efficacy beliefs were strong. In other words, when participants had weak efficacy beliefs, they tended to engage in more heuristic processing as their risk perception increased. When participants had strong efficacy beliefs, however, they engaged in less heuristic processing as their risk perception increased. Conversely, anxiety did not show any significant association with either systematic processing or heuristic processing for type 2 diabetes.

The findings showed that anxiety was positively associated with participants' knowledge in the context of energy blackouts. This is consistent with the findings related to the relationship between anxiety and systematic processing above. However, the current study could not yield a statistically significant model for predicting participants' knowledge in the context of type 2 diabetes. As a result, the effects of anxiety levels, and other RPA variables in determining the effectiveness of actual information processing remains uncertain for type 2 diabetes.

Regarding information management, both risk perception and anxiety were found to be positively associated with information seeking intention but negatively related to information avoidance in the context of energy blackouts. Efficacy beliefs, on the other hand, had a negative relationship only with information avoidance. The positive relationship between anxiety and seeking intention aligns with Turner et al.'s (2006) findings that anxious people (including both anxious group and responsive group) were more likely to seek risk information. Interestingly, in the context of type 2 diabetes, which was the same topic in Turner et al.'s study (2006), the findings diverged. For type 2 diabetes, anxiety was not associated with seeking intention nor information avoidance. Instead, risk perception and efficacy beliefs were positively associated with seeking intention while being negatively associated with information avoidance.

These findings also point to the differing role of emotional responses to risk in information seeking behaviors. In the context of energy blackouts, anxiety emerged as a primary variable influencing information seeking intention. On the other hand, fear, which was included as a covariate, played a more prominent role in determining information seeking intention in the context of type 2 diabetes. Anxiety was also found to influence information

processing in the context of energy blackouts, while its effect on information processing was not statistically significant in the context of type 2 diabetes. These distinct roles of anxiety and fear in influencing information behavior intention and processing in the respective topics are intriguing, particularly considering their high correlations. It suggests that although anxiety and fear may share some similarities, they have unique effects on individuals' information-seeking and processing behaviors depending on the type of topic.

Although these findings were not consistent with the hypothesized relationships, they offer valuable insight into the RPA framework and the role of anxiety in information processing and management behaviors. These findings suggests that the RPA segment with high risk perception and weak efficacy beliefs should not be labeled solely based on their emotional response to risks, as our data revealed that the anxious segment was not necessarily more anxious than other segments (consistent with Turner et al.'s (2006) findings). The original labeling of the *avoidant* segment also may not accurately represent their characteristics, as high-risk perception and weak efficacy beliefs did not lead to information avoidance. Instead, our data showed both risk perception and efficacy beliefs were negatively related to information avoidance in both contexts. In other words, when risk perception and efficacy beliefs increased, individual's tendency to avoid information increased as well.

Furthermore, our study highlighted the potential influence of statistical methods on testing the RPA framework. While we observed an interaction effect of risk perception and efficacy beliefs on anxiety when using k-cluster analysis to create the RPA segments (RQ1), this interaction effect was not statistically significant when employing multivariate regression, consistent with the previous studies found no interaction effects (Pask & Rawlins, 2016; Zhao &

Cai, 2009). These inconsistent findings underscore the importance of considering the methodological approach when examining the RPA framework.

Importantly, the current study demonstrated that the characteristics of the risk topics themselves could result in different outcomes when testing the RPA framework. By investigating two distinct topics, namely energy blackouts and type 2 diabetes, which differed in terms of the required collective actions to reduce or prevent risk, we identified divergent findings. This highlights the importance of understanding the boundary conditions and contextual factors that shape the relationships within the RPA framework, such as the role of anxiety in information processing and management.

In summary, anxiety has been identified as a significant factor influencing information processing and management behaviors, particularly in the context of environmental risks. Building on this understanding, the second study of our research retained the two risk topics and specifically focused on people who reported being anxious about type 2 diabetes or energy blackouts. Moreover, we extended our investigation by incorporating physiological indicators to gain deeper insights into information processing. By combining physiological data with self-report measures, we aimed to enhance our understanding of the underlying mechanisms and processes involved in information processing related to anxious individuals' responses to risks.

HYPOTHESES AND RESEARCH QUESTIONS FOR STUDY 2

The literature reviewed suggests that the RPA anxious segment's high level of anxiety will motivate people in that segment to examine information closely but deter them from adequately processing that information. However, providing people with information that helps them manage their anxiety, in this case, information that could either reduce their risk perception or enhance their efficacy beliefs, could help them to process information better. The RPA framework predicts that people with high-risk perception and strong efficacy beliefs (i.e., the responsive segment) will be most motivated to engage in preventive behaviors, but people with low-risk perception and weak efficacy belief (i.e., indifferent segment) will be least motivated to do so. Given this, providing information to reduce the anxious segment's risk perception might help decrease their anxiety level (and enhance their ability to process information), but this might be dysfunctional in that this could result in decreasing their motivation to engage in preventive behaviors because emotional responses to risks can be motivational. Therefore, the current study focused on testing the effect of information designed to enhance peoples' efficacy beliefs (i.e., beliefs about their ability to engage in and effectiveness of behaviors to reduce a risk) as a method for reducing anxiety for the anxious segment.

As anxious people are motivated to alleviate their anxiety (Cialdini & Kenrick, 1976), they might pay more attention to information designed to enhance efficacy beliefs. However, due to their high level of anxiety resulting in attentional bias (Clauss et al., 2022; Liu et al., 2019), it is plausible that anxious people might pay less attention to efficacy information. Study

2 included only people who self-reported as high perceived risk, low perceived efficacy, and anxious about one of the study's two risk contexts (energy blackouts and type 2 diabetes). As an indicator of attention, Study 2 measured participants' eye-gaze including time spent looking at the efficacy information and intensity of fixation. Thus, the following hypotheses were posited:

H1. Participants who receive efficacy information will differ in time spent on (a) efficacy content and (b) risk content, relative to a control.

H2. Participants who receive efficacy information will differ in the amount of fixation on (a) efficacy content and (b) risk content relative to a control.

RQ1. Will participants in the efficacy information condition differ in terms of the relative time spent on risk vs. efficacy information compared to a control?

RQ2. Will participants in the efficacy information condition differ in terms of the relative fixation on risk vs. efficacy information compared to a control?

Based on the RPA and the literature on anxiety, it is expected that enhancing participant's' efficacy beliefs would decrease their level of anxiety. Thus, the following hypotheses are posited for Study 2; anxiety will be measured with galvanic skin response and self-report.

H3. Participants who receive efficacy information will have higher efficacy beliefs compared to those in the control condition.

H4. Participants who receive efficacy information will report less (a) self-reported anxiety and (b) have less frequent galvanic skin responses relative to those in the control condition.

In order to test how reduced anxiety affects information seeking of the anxious segment, the simplified version of hypotheses tested in Study 1 (H2 and H3) were tested in Study 2.

H5. Participants who receive efficacy information will have greater knowledge of the risk relative to a control.

H5. Participants who receive efficacy information will more seek information compared to a control, such that (a) they will spend more time on the CDC website compared to a control, and (b) they will spend more time on Google.

STUDY 2 METHOD

Overview

The current study examined how people in the anxious segment process information using both self-report and physiological measures. It was a laboratory experiment with only those people who made up the anxious segment to further investigate how anxious people process information. The design was a 2 factorial (information enhancing efficacy beliefs vs. information consistent with participants' existing efficacy beliefs) between-subjects posttest experimental design. As the order of the information might influence the time looking at the certain information and/or the intensity of fixation, the infographics flipped the order of risk information and information about preventive behaviors were created. That is, four types of infographics were created per context: 2 (information enhancing efficacy beliefs vs. information consistent with participants' existing efficacy beliefs) X 2 (efficacy information in the left side vs. efficacy information in the right side). The experiment was conducted combining eye-tracker to measure attention and self-report data to measure the dependent variables.

Pilot Study

The second pilot study tested the lab procedures for the second study involving eye-trackers and GSR (imotion.com) (*N* = 4). A convenience sampling was used to recruit participants for the pilot study. Time for stimuli exposure (i.e., time to view the infographic) of the main study was determined based on this pilot study.

Participants

To determine the sample size, the power-analysis was conducted with a large effect (Cohen's *f* = .51; average effect size of the RPA membership on knowledge acquisition from the lab studies in the previous studies; Study 1, Rimal & Real, 2003; Turner et al., 2006) based on the study design with 4 number of groups [2 (information enhancing efficacy beliefs vs. information consistent with participants' existing efficacy beliefs) X 2 (energy blackouts vs. type 2 diabetes)], 1 numerator *df*, and 4 numbers of covariates. As there has not been an eye-tracking study of the RPA, previous non-eye tracking lab studies of the RPA (Rimal & Real, 2003; Turner et al., 2006) were used to determine the effect size. The analysis suggested recruiting at least 53 total participants; it was aimed to slightly over sample to guard against potential problems with data quality (*N* = 60).[5]

To recruit participants from the community, various channels were used including a community research pool at Michigan State University (which included both students and local community members), and the research pool's social media news website. The study was also promoted through the mailing list of the university work-life office; recruitment flyers were also distributed in various places around the local community such as cafeterias, bookstores, and barber shops.

In the pre-screening questionnaire, participants were asked to indicate whether they had any eye conditions (e.g., astigmatism or amblyopia), and to report their risk perception and

[5] There is no established norm regarding the sample size for eye-tracking studies but the sample size of eye-tracking studies published in communication and related fields range from 10 to 248 (Bol et al., 2016). The sample sizes of studies using stimuli similar to those used in the current study (e.g., websites or text stimuli) range from 16 to 77 (Bassett-Gunter et al., 2014; Pan et al., 2007).

efficacy beliefs about the topics. Based on the RPA framework, participants were categorized as the anxious segment when their risk perception scores were higher than 25 (*Min.* = 1, *Max.* = 49), but their efficacy beliefs scores were lower than 25 (*Min.* = 1, *Max.* = 49) for either topic[6]. Once participants were found to be the anxious segment and not to have any eye conditions, they were invited to the lab. The time span between when participants completed the pre-screening questionnaire and when they visited the lab was approximately a week.

The pre-screening questionnaire was completed by a total of 862 participants. From this initial pool, 71 individuals who met the inclusion criteria for the second study were invited to participate in the lab. Out of those invited, approximately 79% of participants (*n* = 56) attended the lab and took part in the main study. Participants were received an Amazon gift card as compensation for their participation and provided a parking pass if needed. After excluding one participant who did not respond to the first part of the questionnaire, the final sample size was 55.

The average age of participants was 34.58 (*SD* = 13.63, *Min.* = 18, *Max.* = .69). Approximately 76% of participants identified as female. In terms of racial/ethnic identity, the majority of participants identified themselves as European American (70.9%), followed by Asian (16.4%), and other racial/ethnic identities. Regarding educational attainment, the highest proportion of participants reported having graduate or professional degree (32.7%), followed by a bachelor's degree (30.9%), and some college without a degree (21.8%) (See Table 16).

[6] Participants were selected for inclusion in the study based on the levels of risk perception and efficacy beliefs, rather than their anxiety level. Therefore, it is important to acknowledge that the recruited participants may not necessarily exhibit high levels of anxiety. The average anxiety score among recruited participants was above the scale midpoint; for the energy blackouts context was 4.19 (*SD* = 1.62, *Min.* = 1, *Max.* = 7), while for the type 2 diabetes context, it was 4.17 (*SD* = 1.54, *Min.* = 1, *Max.* = 7).

Procedures

Upon arrival in the laboratory, informed consent was obtained and participants were instructed that they would view some information related to health or environmental topics and respond to questions about it. The topic was assigned based on participants' risk perception and efficacy beliefs scores in the prescreening questionnaire. The study followed the procedures for eye-tracking described by Turner et al. (2014); participants were calibrated for eye-tracking to maximize the accuracy of the tracking. Then, participants were randomly assigned to one of two conditions. Based on the results of the pilot test, during which participants spent an average time ranging from approximately 1 minute 20 seconds to 1 minute 50 seconds viewing the infographics, we decided to set the allotted time for viewing the infographic at 2 minutes. This duration was determined to provide participants with an adequate amount of time to engage with the infographic content and gather relevant information. After viewing the infographic for 2 minutes, participants reported their risk perception and efficacy beliefs about the topic, followed by measures of anxiety, information seeking, and avoiding intentions. While viewing the infographics, participants' eye-gaze and their galvanic skin response were measured using the *i-motion* package.

As a next step, participants were provided the actual CDC website related to type 2 diabetes (https://www.cdc.gov/diabetes/basics/type2.html) or energy blackouts (https://www.cdc.gov/disasters/poweroutage/needtoknow.html) based on the topic they were assigned. They could have time as much as they want to browse the website. The time participants spend to read the information on the website, participants' eye-gaze and their galvanic skin response were again measured using the *i-motion* package. After browsing the

website, participants were asked to complete a quiz to test knowledge about the risk. Then, participants completed a thought listing task, followed by measures of trait anxiety, topic relevance, and past information seeking behaviors. After completing the other study tasks and prior answering demographic information, participants were given the opportunity to seek out additional information about the risk using Google.[7]

Stimuli

Infographics were used as stimuli for Study 2 because they are visually rich relative to other forms of text stimuli (e.g., paragraphs or news articles, text posts, brochures, etc.). Infographics contains both graphic and text components, thus, likely to provide more variance in eye gaze than other text stimuli.

To ensure externally generalizable stimuli, the researchers examined infographics available online related to energy blackouts and type 2 diabetes and used these as models for the design process. A graphic artist and the researchers created infographics that incorporated two types of information: general risk information and how to prevent or manage the risk. The general risk information was consistent across the conditions and involved a brief explanation about the risk, statistics related to the risk, risk factors, and possible consequences associated with the risk. The information on how to prevent or manage the risk contained the efficacy induction, drawing from both the model infographics and the efficacy messages used in Study 1.

[7] Participants' additional information seeking behavior on Google may not have been a sensitive measure in this study. This is because participants had already answered all other questions related to information seeking and avoidance before engaging in the Google search task. Therefore, the measure of additional information seeking behavior on Google may not have accurately captured the full extent of participants' information seeking tendencies in this context.

Efficacy induction

Level of efficacy was varied in the information about preventive behaviors. In the information efficacy condition, the infographic included cues and messages to designed to enhance both self- and response efficacy beliefs. For instance, it was stressed that preventive behaviors could be easy and convenient (i.e., self-efficacy), and engaging in those behaviors could reduce the risk (i.e., response-efficacy) (See Figures 3 and 5). The efficacy messages were modeled after the messages created for Study 1.

In the information without efficacy information, the infographic included only factual information related to the preventive behaviors, without any cues or messages about how easy or effective the recommended response is at reducing or controlling the risk (See Figures 4 and 6).

Measures

All study measures were drawn from prior research where validity and reliability evidence were presented (see Table 3 for the detailed information). Other than the following main variables, risk perception, collective efficacy (for energy blackouts), fear, trait anxiety, and demographic information were measured consistent with Study 1.

Efficacy beliefs. Efficacy beliefs were measured with the same scale used in Study 1.

Attention to information. Attention to information were measured by using eye trackers (i.e., smart eye aurora). Eye trackers utilize near-infrared technology along with a high-resolution camera to track eye gaze direction (imotions.com). The underlying concept, commonly referred to as Pupil Center Corneal Reflection (PCCR), involves the camera tracking

the pupil center, and where light reflects from the cornea. Screen based eye-trackers require respondents to sit in front of a screen or close to the stimulus being used in the experiment.

The following eye-tracking metrics were measured and calculated: (a) dwell time [i.e., the amount time (in seconds) that participants spend looking at a particular area of interest (AOI)]; in this case, time spent on efficacy versus risk stimuli, and (b) the amount of fixation (i.e., the sum of all fixation durations inside an AOI in seconds), which indicates the extent to participants pay attention to the area of interest (i.e., the intensity of fixations). As a relative measure, the relative time and relative fixation indexes were calculated. The relative time was calculated by dividing time spent on efficacy content by time spent on risk content (dwell time on efficacy content/dwell time on risk content); The relative fixation was calculated by dividing the amount of fixation toward efficacy content by the amount of fixation toward risk content.

Two *a-priori* areas of interest were defined that cover risk information and efficacy information respectively – the AOI for efficacy information encompassed exactly half of the infographic, while the remaining half served as the AOI for risk information (see the Figures 3 to 6). The order of these two AOI were varied through random assignment.

Self-reported anxiety. Self-reported anxiety was measured with the same scale with Study 1.

Galvanic skin response. As another indicator of anxiety, galvanic skin sensor was used to measure participants' arousal (i.e., skin conductance). The galvanic skin sensor examines minor fluctuations in galvanic skin response, which occur when the autonomic nervous system is stimulated. An escalation in autonomic nervous system activation serves as an indicator of heightened arousal. Two electrodes were attached to participants' phalanx of their index and

middle fingers of their non-dominant hand. The count of peaks detected while participants viewed the infographic was captured for the main analysis.

Information seeking behavior. The amounts of time participants spent on browsing the designated website (CDC) was measured. The unit of time was minutes. The recording of time commenced when participants accessed the webpage, and it concluded when they exited the webpage.

Additional information seeking behavior. The amount of time participants spent on googling related to risk was measured as an indicator of additional information seeking behavior. It was measured in minutes.

Knowledge. Knowledge was assessed using the same set of true/false items employed in Study 1.

Analysis Plan

Descriptive statistics were computed to evaluate general patterns in participants' responses and adherence of the variables to statistical assumptions. Measurement analysis included confirmatory factor analysis for scales with more than four items and reliability estimates. All hypotheses and RQs were tested using independent t-tests. A significance level of .05 was set *apriori* as the threshold for statistical significance.

RESULTS OF STUDY 2

Preliminary Analyses

Prior to conducting the main analyses, a series of ANOVAs were performed to investigate potential effects of the placement of the efficacy and risk content in the infographics and its interaction effect with the efficacy condition. In both contexts, no significant main effects of the content placement were found in the relative amount of time participants spent viewing the efficacy content versus risk content based on where they were placed in the infographic; for energy blackouts, F (1, 27) = 1.73, p > .05, for type 2 diabetes, F (1, 26) = .63, p > .05. The interaction effects on the relative amount of time were not statistically significant, for energy blackouts, F (1, 27) = 2.15, p > .05, for type 2 diabetes, F (1, 26) = .91, p > .05. The main effects of the content placement on the relative amount of fixation participants spent viewing the efficacy versus risk content based on placement; for energy blackouts, F (1, 27) = .07, p > .05, for type 2 diabetes, F (1, 26) = .31, p > .05. The interaction effects on the relative amount of fixation were not significant as well, for energy blackouts, F (1, 27) = 3.44, p > .05, for type 2 diabetes, F (1, 26) = .58, p > .05. That is, the left to right placement of the information (efficacy versus risk) did not have an impact on the duration of time participants spent viewing the areas or the amount of fixation.

A series of independent t-tests were conducted to explore the potential effects of covariates on the study variables. The aim was to check that random assignment to conditions effectively eliminated any confounding variables. Specifically, the t-tests examined differences in risk perception, fear, trait anxiety, collective efficacy (only for the energy blackouts topic),

age, and education between the experimental and control conditions. The results of the t-tests indicated no statistically significant differences between the conditions for any of the examined variables across both topics, $p > .05$. This suggests that the random assignment successfully eliminated any pre-existing differences in these covariates between the experimental and control groups; therefore the hypotheses were tested without the inclusion of covariates in the analysis.

Descriptive Statistics

In the context of energy blackouts, participants spent an average of 68.13 seconds on risk information (*SD* = 7.62) and an average of 50.32 seconds on efficacy information (*SD* = 6.82). On average, participants' gaze entered the risk content 6.93 times (*SD* = 4.10) and the efficacy content 6.64 times (*SD* = 4.52). The average total time participants spent fixating at the risk content was 44.05 seconds (*SD* = 13.50) and on the efficacy content was 34.37 seconds (*SD* = 10.65). While browsing the infographic, participants experienced an average of 6.21 peaks in terms of arousals (*SD* = 6.30) (See Table 17).

In the context of type 2 diabetes, participants spent an average of 63.29 seconds on risk information (*SD* = 9.85) and an average of 54.98 seconds on efficacy information (*SD* = 8.90). The average count of how often the participants' gaze entered the risk content was 6.81 times (*SD* = 4.43) and the efficacy content was 5.81 times (*SD* = 4.43). The average total time participants spent fixating at the risk content was 43.37 seconds (SD = 13.29) and at the efficacy content was 36.74 seconds (SD = 10.73). Participants experienced an average 5.22 peaks in terms of arousals while browsing the infographic (*SD* = 6.34) (See Table 18).

Hypotheses Testing

H1(a) predicted that participants who received efficacy information would differ in time spent on efficacy content relative to a control. The independent t-tests showed that there was no statistical difference in time participants spent on efficacy content between conditions for energy blackouts, t (16.46) = -.25, $p > .05$. For type 2 diabetes, the results also indicated that there was no statistical difference in time participants spent on efficacy content between conditions, t (25) = -.35, $p > .05$ (See Table 19). Therefore, the data were not consistent with H1(a).

H1(b) predicted that participants who received efficacy information would differ in time spent on risk content relative to a control. The independent t-tests showed that there was no statistical difference in time participants spent on risk content between conditions for energy blackouts, t (26) = -.16, $p > .05$, as well as for type 2 diabetes, t (25) = .32, $p > .05$ (See Table 19). Thus, the data was inconsistent with H1(b).

H2(a) predicted that participants who received efficacy information would differ in the amount of fixation on efficacy content relative to a control. The independent t-tests indicated that there was no statistical difference in the amount of fixation on efficacy content between condition for energy blackouts, t (26) = .38, $p > .05$, as well as type 2 diabetes, t (25) = -.58, $p > .05$ (See Table 20). Thus, the data were not consistent with H2(a).

H2(b) predicted that participants who received efficacy information would differ in the amount of fixation on risk content relative to a control. The independent t-tests revealed that there was no statistical difference in the amount of fixation on risk content between conditions

for energy blackouts, t (26) = .43, p > .05, as well as type 2 diabetes, t (25) = -.98, p > .05 (See Table 20). Therefore, the data were not consistent with H2(b).

RQ1 asked whether participants in the efficacy information condition would differ in terms of the relative time spent on risk versus efficacy content compared to a control. The independent t-tests showed that there was no statistical difference in the relative time spent on risk versus efficacy content between conditions for energy blackouts, t (17.36) = .06, p > .05, and for type 2 diabetes, t (25) = -.49, p > .05 (See Table 21).

RQ2 was examining whether participants in the efficacy information condition would differ in terms of the relative fixation on risk versus efficacy information compared to a control. The independent t-tests indicated that there was no statistical difference in the relative amount of fixation on risk versus efficacy content between condition for energy blackouts, t (26) = -.51, p > .05, and for type 2 diabetes, t (25) = .37, p > .05 (See Table 21).

H3 predicted that participants who received efficacy information would report higher efficacy beliefs compared to those in the control condition. The independent t-test revealed that there was no statistical difference in efficacy beliefs either in the context of energy blackouts, t (26) = .42, p > .05, or in the context of type 2 diabetes, t (25) = -1.33, p > .05 (See Table 22). Thus, the data were not consistent with H3.

H4(a) predicted that participants who received efficacy information would report less self-reported anxiety relative to those in the control condition. The independent t-tests showed that there was no statistical difference in self-reported anxiety between conditions for energy blackouts, t (26) = 1.03, p > .05, while there was a statistical difference in self-reported anxiety between conditions for type 2 diabetes, t (25) = -2.00, p < .05. However, inconsistent with the

prediction, participants received efficacy information reported stronger level of anxiety (*M* = 4.02, *SD* = 1.51) compared to those in the control condition (*M* = 2.94, *SD* = 1.30) in the context of type 2 diabetes (See Table 23). Therefore, the data were not consistent with H4(a).

H4(b) predicted that participants who received efficacy information would have less frequent galvanic skin response relative to those in the control condition. The independent t-tests showed that there was no statistical difference in the count of peaks detected while participants viewed the infographic between conditions for energy blackouts, t (26) = 1.45, p > .05, as well as for type 2 diabetes, t (25) = .43, p > .05 (See Table 23). Thus, the data were inconsistent with H4(b).

H5 predicted that participants who received efficacy information would have greater knowledge of the risk relative to a control. The independent t-test showed that there was no statistical difference in the knowledge quiz score between conditions for energy blackouts, t (21.76) = 1.85, p > .05. However, the results indicated that there was a statistical difference in the knowledge quiz score between conditions for type 2 diabetes, t (25) = 1.99, p < .05. Participants received efficacy information had lower quiz score (*M* = 8.64, *SD* = 1.22) compared to a control (*M* = 9.46, *SD* = .88) (See Table 24). The data were not consistent with H5.

H6(a) predicted that participants who received efficacy information would seek out more information compared to a control, such that they would spend more time on the CDC website compared to a control. For energy blackouts, the independent t-test showed that there was no statistical difference in time participants spent on the CDC website between conditions, t (26) = -.59, p > .05. For type 2 diabetes, however, the results showed that there was a statistical difference in time participants spent on the CDC website, t (25) = 1.77, p < .05.

Participants received efficacy information spent less time on the CDC website (M = 2.39, SD = 1.17) compared to a control (M = 3.31, SD = 1.52) (See Table 25). Therefore, the data were not consistent with H6(a).

H6(b) predicted that participants who received efficacy information would spend more time on Google compared to a control. The independent t-tests indicated that there was no statistical difference in time participants spent on Google between conditions for energy blackouts, t (26) = -.84, p > .05, while there was a statistical difference between conditions for type 2 diabetes, t (25) = 1.89, p < .05. Again, participants received efficacy information spent less time on googling (M = 1.99, SD = 1.36) compared to a control (M = 4.22, SD = 4.07) (See Table 25). Therefore, the data were not consistent with H6(b).

Post-hoc Analysis

To further explore participants' attention on risk content versus efficacy content, additional paired t-tests were performed. In the context of energy blackouts, participants with efficacy information significantly spent more time browsing risk information (M = 68.28, SD = 4.75) compared to efficacy information (M = 50.63, SD = 5.12), t (15) = 7.20, p < .001, d = 1.80. Participants in the control condition (with no efficacy information) showed the same pattern, t (11) = 3.99, p < .01, d = 1.15. That is, participants with information aligning with their efficacy beliefs spent more time browsing risk information (M = 67.93, SD = 7.00) compared to other information (i.e., a list of preventive behaviors) (M = 49.90, SD = 8.84).

In the context of type 2 diabetes, there was no difference in the amount of time participants browsing risk information versus efficacy information when provided efficacy information, t (13) = 1.29, p > .05. The paired t-test also showed that there was no difference in

the amount of time participants spent browsing risk versus efficacy information for those without efficacy information, t (12) = 2.04, p > .05 (See Table 26).

DISCUSSION FOR STUDY 2

This study was designed to examine the information processing and management of people in the risk perception attitude framework's anxious segment using a combination of eye-tracking and self-report. The data were largely inconsistent with the study predictions. Nonetheless, several interesting issues emerge from the data. The findings from Study 2 indicated no significant difference in attention between participants who received efficacy information and those who did not. This contradicted the initial predictions, suggesting that exposure to efficacy information does not immediately impact individuals' attention. That is, providing efficacy information to people with low efficacy beliefs did not lead to increased attention to the messages. Similarly, not providing efficacy information (i.e., no efficacy information to align with participants' pre-existing efficacy beliefs) did not elicit heightened attention.

The post-hoc analysis revealed that, overall, participants paid more attention to risk information compared to efficacy information across both topics. For example, participants in the energy blackouts context spent more time exploring risk information regardless of the presence of efficacy information. Similarly, in the type 2 diabetes context, participants spent more time on risk information rather than efficacy information, although the difference was not statistically significant. This is the despite the fact that in the pre-tests, the participants reported high risk perception about the risks and were selected to be part of the study because of high risk perception and low efficacy perception. The difference in findings between the two topics could potentially be attributed to varying levels of familiarity associated with each risk.

Given that energy blackouts are a relatively unfamiliar risk compared to type 2 diabetes, it is conceivable that people need to acquire a better understanding of how the risk might occur before they can determine appropriate actions to address it. Overall, these findings suggest that people in the *anxious* segment, tend to prioritize their attention towards risk information (i.e., threat) over other types of information, which is consistent with previous research on anxiety and attentional bias (Clauss et al., 2022; Liu et al., 2019).

However, these results are inconsistent with the propositions of the EPPM (Witte, 1992), which suggested in threat appeals, people first evaluate the risk, and then assess the efficacy of recommended behaviors as a subsequent step when the risk is perceived as moderate or high. In Study 2, participants were specifically recruited based on their high-risk perception. According to the EPPM, these people were expected to pay more attention to information related to their efficacy beliefs as they already had a pre-existing evaluation of the risks as severe and probable. Still, our data indicate a different pattern of results. It suggests that evaluating a risk itself might have been a more crucial factor people, as they tended to spend more time processing risk information as opposed to the efficacy information, even when they had previously evaluated the risk.

The RPA framework posits that stronger efficacy beliefs, in conjunction with high risk perception, should lead to increased engagement in preventive behaviors, such as information seeking. In other words, increase in efficacy beliefs should result in greater preventive behaviors when accompanied with high level of risk perception according to the RPA framework. Still, our findings suggest that people with high risk perception and low efficacy beliefs prioritize their attention towards risk information rather than efficacy information,

particularly in the context of relatively unfamiliar risks. This indicates it may be challenging to shift peoples efficacy beliefs and their feelings of anxiety.

The results from the study on the effect of the experimental manipulations on anxiety indicate that despite our thinking that providing people with efficacy information would reduce their anxiety, the data do not support this. There was no significant difference between the experimental conditions in self-reported anxiety levels and arousal (measured by galvanic skin sensors) for energy blackouts. For type 2 diabetes, however, there was a statistically significant difference in self-reported anxiety between conditions. Interestingly, participants who did not receive efficacy information reported lower levels of anxiety compared to those who received efficacy information, contrary to the prediction. The participants, who did not receive efficacy information and reported less anxiety, also spent more time exploring the CDC webpage and conducting searches on Google compared to those who received efficacy information. Similarly, people who did not receive efficacy information achieved higher quiz scores compared to participants who received efficacy information. It is important to note that anxiety was not statistically associated with the time participants spent on the CDC webpage or Google searches, nor with quiz scores. Thus, it remains inconclusive whether better information processing and increased information seeking behaviors are a result of lower levels of anxiety.

Contrary to Study 1, anxiety was found to be positively related to participants' efficacy beliefs for the context of type 2 diabetes, but not for the context of energy blackouts. A previous RPA study of smokers' cancer information seeking (Zhao & Cai, 2009) also observed the positive association between efficacy beliefs and anxiety. Zhao and Cai (2009) suggested that this positive relationship might have occurred due to the gap between smokers' knowledge

and their behaviors. Some smokers already know what they can do to reduce the cancer risk, but they have not engaged in those behaviors or done enough. Providing information related to what they can do to them could increase their anxiety, as this makes them to realize the gap between knowledge and behavior.

This explanation can be applied to our finding for the type 2 diabetes; our participants were recruited based on their pre-existing high risk perception and low efficacy beliefs. Given their pre-existing risk perception and efficacy beliefs, it is likely that participants may already be aware of the preventive behaviors they can take but have not yet implemented them effectively. Also, the preventive behaviors for diabetes are changes to diet and exercise -things many people know they should be doing but may not be. Thus, when encountering information reinforcing what they can do to reduce the risk, and stressing how easy and effective they are, it might have increased their anxiety by highlighting the discrepancy between their knowledge of the importance of these behaviors and their actual behaviors. In other words, the information about preventive behaviors may serve as a reminder or a cue for participants to evaluate their own actions and potentially feel anxious about not having engaged in those behaviors to a satisfactory extent. This self-evaluation process can lead to heightened anxiety as individuals become more aware of the gap between their knowledge and their actual preventive behaviors. The same would not be true for energy blackouts; people are not likely to have thought much about this topic or taken steps to reduce the risk of them.

GENERAL DISCUSSION

The role of anxiety in relation to information processing and management behaviors has been a subject of debate in the literature on emotions. Understanding the ways in which anxiety impacts response to risk information and information attention, processing, and behaviors is crucial in the field of risk communication, as anxiety is a common emotion experienced by people when faced with health or environmental risks (e.g., Clayton, 2020; Grigsby et al., 2002; Hickman et al., 2021; Smith et al., 2013). Nonetheless, the role of state anxiety in shaping one's attention and information management behaviors within the context of risk has been understudied despite its importance.

The current studies aimed to understand the role of anxiety in information processing and management behaviors through the lens of the RPA framework (Rimal & Real, 2003; Turner et al., 2006). The first study aimed to examine the role of anxiety on information processing and management intention based on the RPA framework with the nationally representative sample. To further understand how anxious people pay attention and seek information, the laboratory experiment was conducted as the second study utilizing physiological measures with only the RPA's *anxious* segment - people with high perceived risk and low perceived efficacy for our study contexts of type 2 diabetes and energy blackouts.

Consistent the predictions of Turner et al. (2006), the findings from these studies reveal that anxiety, influenced by risk perception and efficacy beliefs, was associated with information processing (i.e., systematic processing and heuristic processing) and risk information seeking intentions for energy blackouts. However, no significant relationship was found between

anxiety and the information seeking intention or processing variables in the context of type 2 diabetes. This discrepancy in the relationship between anxiety and information behavior across different topics highlights the need for future research to further explore and understand the specific effects of anxiety in relation to different types of risks.

The findings from Study 2 indicated that people with high risk perception and low efficacy beliefs had tendency to prioritize risk information over information about preventive behaviors. While risk information is undoubtedly important in understanding and assessing the potential dangers, information about preventive behaviors is crucial in empowering individuals to take appropriate actions to prevent or mitigate risks. To further explore this phenomenon, future studies could investigate strategies to enhance the attention and processing of information related to preventive behaviors. This could involve examining the effectiveness of different presentation formats, such as highlighting the benefits and effectiveness of preventive measures, using visual aids or illustrations to demonstrate the steps of preventive behaviors, or employing persuasive communication techniques to increase the salience and relevance of such information.

Another interesting finding of these studies is the positive relationship between efficacy beliefs and anxiety. Although scholars have suggested that increasing individuals' efficacy beliefs can lead to decreased anxiety (Bandura, 1977, 1982, 1997) and increased motivation to engage in preventive behaviors, the findings suggest that this may not always be the case. Study 1 showed a positive association between efficacy beliefs and anxiety for energy blackouts, while Study 2 with only people having high risk perception and weak efficacy beliefs found a positive relationship between efficacy beliefs and anxiety for type 2 diabetes. We

attempted to explain these findings with the nature of topic (i.e., collective vs. personal) and the characteristics of participants. These findings highlight the need for a more nuanced understanding of the relationship between efficacy beliefs and anxiety. Simply enhancing efficacy beliefs without considering the specific context and individual characteristics may not always lead to the desired outcomes. Risk communication efforts should carefully consider the potential unintended effects accordingly.

The findings from both studies suggest that the RPA framework could benefit from additional theoretical development about anxiety and the *anxious* segment. Our finding from Study 1 indicated that anxiety was more strongly associated with risk perception than with efficacy beliefs, which is consistent Turner et al.'s (2006) findings. In fact, efficacy beliefs showed either weak positive associations or no significant relationship with anxiety. Furthermore, in study 2, efficacy beliefs were either not related to anxiety or positively related to it, depending on the topic, even when the level of risk was controlled across conditions. Given these findings, it is important to reconsider the labeling of the *anxious (or avoidant)* segment within the RPA framework. It suggests that anxiety may not be a defining characteristic of the segment, as other segments experience more anxiety (i.e., the responsive segment) and efficacy beliefs and anxiety were positively related or not associated in these studies. Therefore, additional theoretical development is warranted to better understand the relationship between anxiety, risk perception, and efficacy beliefs within the RPA framework. Future research should explore alternative factors that may contribute to anxiety and refine the conceptualization of the anxious segment to align with empirical findings.

LIMITATIONS

Despite the valuable insights gained from this research, several limitations need to be addressed. First, the process of designing effective efficacy induction for Study 1 involved four pilot tests, despite having carefully examined the successful manipulation from previous studies (e.g., Prestin & Nabi, 2012; Turner et al., 2006). Previous literature often varied the number of preventive behaviors as a way to enhance efficacy beliefs (e.g., Turner et al. 2006); this could be a confounding for the current study as it could also vary the number of information participants look for. Thus, Study 1 focused on enhancing efficacy beliefs by stressing how to overcome barriers (e.g., Prestin & Nabi, 2012), but ultimately yielded four pilot studies. Future research in this area should continue to explore and refine approaches to manipulate efficacy beliefs effectively.

Second, the knowledge measurements showed a lack of variance across studies and topics. The average knowledge score was consistently high, while the standard deviations were relatively small. The measurement of knowledge was based on the content of the actual websites, but the study did not distinguish between information the participants knew coming into the study and information participants learned from the website. It is possible that participants had prior knowledge about the risks, which could have influenced their quiz scores and limited the variability in the knowledge scores.

Third, the laboratory setting of Study 2 may have limited the ecological validity of the findings. Participants' behaviors and responses in a controlled experimental environment may differ from their real-life information seeking and processing behaviors. One specific limitation

was the time constraint placed on participants for browsing the infographic, which was set at two minutes based on a pilot test. This limited time frame may have reduced the variation in the time participants spent on efficacy information versus risk information in the infographic. In real-life situations, individuals might choose to read certain type of information more thoroughly while skimming though others. However, due to the time limitation in the study and participants being aware of it, they may have tried to maximize their time by browsing all the provided information.

Lastly, the sample size of Study 2 is a potential limitation. The sample size was carefully determined based on the power analysis prior collecting the data, and we chose the appropriate statistical tests to minimize the statistical errors. Still, we acknowledge that having a larger sample size generally improves the statistical power.

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APPENDIX A: TABLES

Table 1

Demographic Characteristics of Study 1 (N = 401)

	n	*%*		*n*	*%*
Sex			**Racial or Ethnic groups**		
Male	196	49.0	European American	296	73.8
Female	204	51.0	African American	51	12.7
			Asian	23	5.7
Education			Hispanic	16	4.0
Some high school or less	1	0.2	Others	15	3.7
High school diploma or GED	45	11.2			
Some college without degree	99	24.7	**Income**		
Associates or technical degree	43	10.7	Less than 25k	54	13.5
Bachelor's degree	148	36.9	25,000 – 49,999	98	24.4
Graduate or professional degree	63	15.7	50,000 – 74,999	80	20.0
Prefer not to say	2	0.5	75,000 – 99,999	63	15.7
			100,000 – 149,999	59	14.7
			More than 150k	38	9.5
			Prefer not to say	9	2.2

Table 2

Stimuli for Study 1

	General Information
Type 2 diabetes	Type 2 diabetes is a disease caused by genetics, diet and lifestyle. It effects the way the body uses sugar as a fuel and can impact people's lives. This long-term condition results in too much sugar circulating in the bloodstream. Eventually, high blood sugar levels can lead to disorders of the circulatory, nervous, and immune systems. Type 2 diabetes is common in older adults, but the increase in the number of children with obesity and poor diets has led to more cases of it in younger people.
Energy blackouts	Energy blackouts, also called power outages, are often caused by high power demand. Blackouts occur when the energy grid gets over-loaded, and they involve shutting down the energy service to people's homes; oftentimes at the local level (neighborhoods). Eventually, regular blackouts can lead to decreased productivity and increased stress. Blackouts are projected to become more common and last longer because of more extreme temperatures all over the U.S. People are using more energy to control the temperature in their homes, and this causes energy blackouts.
	Risk Inductions
	Low Risk 
	High Risk 

Table 2 (cont'd)

Stimuli for Study 1

Type 2 diabetes	According to the information you provided, **your risk for type 2 diabetes has been calculated as within the bottom 10 percent of the population.** This means that **you are only slightly vulnerable to type 2 diabetes.** This assessment was made by calculating various factors, including your age, gender, race, family history, your reported behaviors, and other factors. While this assessment is not 100% accurate, it is highly reliable. **Type 2 diabetes is NOT a very serious disease and can be managed through lifestyle changes. In most cases, the effects of diabetes includes only mild inconvenience.**	According to the information you provided, **your risk of type 2 diabetes has been calculated as within the top 10 percent of the population.** This means that **you are highly vulnerable to type 2 diabetes.** This assessment was made by calculating various factors, including your age, gender, race, family history, your reported behaviors, and other factors. While this assessment is not 100% accurate, it is highly reliable. **Type 2 diabetes can be a deadly disease.** The effects of diabetes can range anywhere from inconvenience due to major changes in lifestyle to something **much more dangerous and fatal**.
Energy blackouts	According to the information you provided, **your risk for an energy blackout where you live has been calculated as within the bottom 10 percent of the population.** This means that **you are only slightly vulnerable to having an energy blackout where you live**. This assessment was made by calculating various factors, based on the location of where you live (weather, electrical grid, transmission capacity limits) and other factors. While this assessment is not 100% accurate, it is highly reliable.	According to the information you provided, **your risk for an energy blackout where you live has been calculated as within the top 10 percent of the population**. This means that **you are highly vulnerable to having an energy blackout where you live.** This assessment was made by calculating various factors, based on the location of where you live (weather, electrical grid, transmission capacity limits) and other factors. While this assessment is not 100% accurate, it is highly reliable.

Table 2 (cont'd)

Stimuli for Study 1

	Energy blackouts are NOT a very serious problem and can be managed. In most of the cases, effect of an energy blackout is only a mild inconvenience that doesn't last very long.	**Energy blackouts are a very serious problem.** The effects of energy blackout can range anywhere from inconvenience due to changes in lifestyle to something **much more dangerous and fatal** if temperatures are extreme.
	Efficacy Inductions	
	Low Efficacy	High Efficacy
		

Table 2 (cont'd)

Stimuli for Study 1

Type 2 diabetes	Your risk status may be very low [or very high, depending on the risk manipulation], but based on current research, the following behaviors might prevent type 2 diabetes. We should caution that **their effectiveness is still not well established.** **Possible ways to Prevent Type 2 Diabetes:** 1) *Remove all added sugars from your diet.* A zero sugar diet might help reduce the risk of type 2 diabetes. In order for this to be most effective, you have to cut out all sugar at once. This can be hard because so many foods have added sugar. Looking at labels for added sugar adds time to shopping and is inconvenient but something to try to do. 2) *Exercise for 30 minutes every day.* Exercising for 30 minutes every day may help reduce the risk of type 2 diabetes. When you have a busy schedule or don't feel motivated, working out regularly can be challenging but it is worth trying. We understand that exercising every day is not an option for everyone.	Your risk status may be very low [or very high, depending on the risk manipulation], but based on current research, the following behaviors have been found to be ***highly effective*** to help ensure that you remain free from type 2 diabetes. **Highly Effective Diabetes Prevention Measures**: 1) *Remove added sugars from your diet.* A low sugar diet considerably reduces the risk of type 2 diabetes. It is actually really easy to do. You don't have to cut out all sugar at once - you can start with cutting out added sugars from the foods you eat. Small changes in your diet can be easy and make a big impact in preventing diabetes. 2) *Exercise (or even just move your body) for just 30 minutes a day.* Even a bit of nonstrenuous exercise for 30 minutes a day lowers your blood sugar and drastically reduces the risk of type 2 diabetes. Start with short walks or make active choices (e.g., take the stairs) everyday life. It is easier than you think to sneak exercise into your day and it is surprisingly effective; anyone can do it!

Table 2 (cont'd)

Stimuli for Study 1

	It's important to mention that changing your behaviors might reduce the risks of getting type 2 diabetes but it might not. Eating healthy and exercising regularly do not always prevent it -Indeed, there is new research to show even thin people who exercise can still get it. There are many other causes of diabetes that you cannot control. Hopefully, we will find a cure for type 2 diabetes pretty soon. Until that happens, we can take a few precautions, but mostly we just have to hope that we will be OK.	**With every little thing you do, you can make a difference in your health. Type 2 diabetes is largely preventable.** Research shows that about 9 in 10 cases of type 2 diabetes in the U.S. can be avoided by making **small changes** to diet and exercise. **Remember, you are in charge of your own health. Making small changes now can have a big impact in preventing diabetes in the future. You've got this!**
Energy blackouts	Your risk status may be very low [or very high, depending on the risk manipulation], but based on current research, **there are a few ways to try to prevent energy blackouts that people can do, but their effectiveness is still not well established.** Possible Ways to Prevent Energy Blackouts: 1) *Adjust the temperature on your thermostat.* Adjusting the temperature in your house or apartment can help reduce energy consumption a bit - for example, keeping it cooler when it's cold outside or turning off air conditioning when it's hot. You may be uncomfortable (too hot or too cold) and that is not the best. Sometimes people need to stay cool for health reasons.	Your risk status may be very low [or very high, depending on the risk manipulation], but based on current research, all of the following have been found to be ***highly effective techniques*** in ensuring that you prevent energy blackouts. **Highly Effective Preventive Measures**: 1) *Adjust the temperature on your thermostat.* Adjusting temperature in your house can definitely lower the risk of energy blackouts in your neighborhood. For example, you can set your air conditioner a few degrees higher and lowering the heat in the winter. Either of these is a super effective way to do your part to reduce the potential for blackouts. Using fans or opening windows are great ways to cool your house or move warm air around. This is easy and simple to do.

Table 2 (cont'd)

Stimuli for Study 1

	2) *Use large appliances during early morning or late evening.* Shifting time that you use large appliances (e.g., dishwasher, oven, washer, dryer) might help reduce the risk of energy blackouts slightly. It requires a lot of effort compared to its impact in preventing energy blackouts but is worth a try.	2) *Use large appliances during early morning or late evening.* Even the simple thing of shifting the times that you use large appliances (e.g., dishwasher, oven, washer, dryer) significantly contributes to reducing potential energy blackouts - especially for neighborhoods. **It is easy, simple, and effective.** Just doing this once in a while, whenever you can do it, can help reduce stress on the grid and make a big impact!
	We should mention that using less energy does not always prevent energy blackouts but these are things to try. There are many other causes of energy blackouts that you cannot control, such as severe weather, natural disasters, equipment failure and et cetera. Energy blackouts mostly occur locally at the neighborhood level. Even though you try to use less energy, if your neighbors don't, it will not really matter what you do. Hopefully, we will find a way to prevent blackouts pretty soon. Until that happens, we can just keep trying to prevent them, but mostly we just have to hope that we will be OK.	**With these simple changes, you can make a difference. Energy blackouts are largely preventable.** Research shows about 9 in 10 cases of energy blackouts in the U.S. can be avoided by people doing these simple things. Because most energy blackouts occur very locally at the level of neighborhoods **what you do** to use less energy is important to prevent this problem! **Remember, every little action you do can make a difference in reducing stress on the grid and preventing blackouts. You've got this!**

Table 3

Measurements and Their Validity/Reliability

Constructs	Items	Study 1				Study 2			
		a	χ^2 *(df), p*	*CFI*	*SRMR*	*a*	χ^2 *(df), p*	*CFI*	*SRMR*
Perceived susceptibility	I believe [a risk] has harmful consequences I believe [a risk] has severe negative consequences I believe [a risk] has serious negative consequences I believe [a risk] has significant consequences I believe [a risk] is extremely dangerous	.96	57.46 (5), .00	.98	.017	.90	12.34 (5), .03	.96	.040
Perceived severity	It is likely that [a risk] will harm me It is possible that I will experience [a risk] I am at risk for [a risk] Risks associated with [a risk] is acceptably low (R) I am vulnerable to [a risk]	.85	27.26 (5), .00	.98	.043	.73	4.40 (5), .49	1.0	.039
Self-efficacy beliefs	It is easy for me to [engage in the preventive behavior 1] to prevent [a risk] I am confident that I can [engage in the preventive behavior 1] to help prevent [a risk] I am able to [engage in the preventive behavior 2] to help prevent [a risk] It is easy for me to [engage in the preventive behavior 2] to help prevent [a risk] I am confident that I can do [general preventive behaviors] to help reduce the risk of [a risk]	.87	12.13 (3), .00	.99	.010	.83	17.49 (3), .001	.92	.040
Response efficacy beliefs	[Engaging in the preventive behavior 1] can help reduce the risk of [a risk]	.91	87.38 (3), .00	.95	.028	.83	12.34 (3), .18	.99	.036

Table 3 (cont'd)

Measurements and Their Validity/Reliability

	If I [engage in the preventive behavior 1], I will lower the risk of [a risk] [Engaging in the preventive behavior 2] can help reduce the likelihood of [a risk] If I [engage in the preventive behavior 2], I will lower the risk of [a risk] I am confident that [general preventive behaviors] are effective in reducing the risk of [a risk]								
State anxiety	Thinking about the impact of [a risk] made me feel **uncomfortable** **nervous** **worried** **anxious** **apprehensive**	.97	72.10 (9), .00	.98	.012	.96	23.59 (9), .005	.96	.031
Systematic processing	I thought about what actions I myself might take based on what I have read on the websites I found myself making connections between the information on the websites and what I have read or heard about elsewhere I tried to think about the importance of the information on the websites for my daily life I thought about how the information on the websites related to other things I know I tried to relate the ideas in the information on the websites to my own personal experiences	.94	35.17 (5), .00	.97	.009	.	.	.	.

Table 3 (cont'd)

Measurements and Their Validity/Reliability

Heuristic processing	I skimmed through the information While reading the website, I focused on only a few points I did not spend much time thinking about the information The websites contained more information than I personally need While reading the websites, I did not think about the arguments presented in the websites *– deleted based on the CFA results*	.84	23.92 (2), .00	.97	.038	.	.	.	.
Information seeking intention	I will try to seek information about [a risk] in the near future I intend to find more information about [a risk] soon I intend to look for information about [a risk] in the near future I will look for information related to [a risk] in the near future	.99	5.00 (2), .082	.99	.002	.95	9.53 (2), .009	.97	.020
Information avoidance	I would prefer not to learn about [a risk] I will avoid reading things about [a risk] I do not want any more information about [a risk] I will avoid contents about [a risk] on social media I will avoid watching TV programs about [a risk]	.94	90.54 (5), .00	.95	.029	.87	7.22 (5), .205	.99	.040

Table 3 (cont'd)

Measurements and Their Validity/Reliability

Energy blackouts knowledge quiz	When the power goes out, it is recommended to keep the refrigerator and freezer doors closed You can use generators and fuel indoor when the power goes out Heating and cooling consume 50% of energy consumption in the home Energy blackouts do not influence water safety In case of energy blackouts caused by power line hazards, if a power line falls on a car, you should stay inside the vehicle If power is out for less than 8 hours, the food in your refrigerator and freezer will be safe to consume During an energy blackout, people might experience heat stroke Michigan is not prone to energy shortfalls If someone has been electrocuted, you should pull the person from the source of electricity CDC recommends using candles or gas lanterns rather than battery-powered flashlights as part of a disaster supply kit	.	.	.	.	.	.	.	.
Type 2 diabetes knowledge quiz	If you have type 2 diabetes, your cells don't respond normally to insulin High blood sugar can cause heart disease, vision loss, and kidney disease	.	.	.	.	.	.	.	.

Table 3 (cont'd)

Measurements and Their Validity/Reliability

	The symptoms of type 2 diabetes are easy to spot Managing stress is important to manage type 2 diabetes You can develop type 2 diabetes at any age By monitoring your skin on your feet, you can monitor type 2diabetes If you take insulins or diabetes medicines, you don't need to eat healthy Managing blood pressure and cholesterol is not relevant to how to manage type 2 diabetes Children can have type 2 diabetes especially when they have a close relative who has it Drinking more water could help prevent type 2 diabetes								
Topic relevance	To me, [a risk] is *not at all important – very important* *not of interest – of great interest* *not at all relevant – very relevant*	.72	.	.	.	.81	.	.	.
Fear	Thinking about the impact of [a risk] made me feel **uneasy** **fearful** **afraid** **scared** **frightened**	.98	93.05 (2), .00	.97	.009	.96	11.86 (2), .003	.97	.036

Table 3 (cont'd)

Measurements and Their Validity/Reliability

Trait anxiety	I feel that difficulties are piling up so that I cannot overcome them I worry too much over something that really doesn't matter Some unimportant thoughts run through my mind and bothers me I take disappointments so keenly that I can't put them out of my mind I get in a state of tension or turmoil as I think over my recent concerns and interests	.92	61.36 (5), .00	.96	.031	.87	13.39 (5), .020	.94	.055
Collective efficacy beliefs (only measured for energy blackouts)	I have confidence in the ability of my neighbors in saving energy by taking collective actions I am confident that all my neighbors can engage in energy saving behaviors together I am sure that my neighbors have capacity to use less energy to help reduce the risk of energy blackouts My neighbors are willing to join in and do their share to save energy My neighbors can work together to save energy	.93	38.14 (5), .00	.97	.029	.90	18.64 (5), .002	.86	.07

Table 4

Descriptive Statistics and Correlations between Variables for Energy Blackouts (N = 200) (Study 1)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. RI		-.06	.52**	-.01	.20**	.08	-.11	.09	.12	-.05	.20**	-.02	-.13	-.07	.10	.02
2. EI			.14	.19**	.18**	.13	-.11	.06	.19**	-.17*	.20**	.01	-.09	.02	-.01	-.02
3. RP				.21**	.56**	.16*	-.16*	.04	.45**	-.29**	.52**	.07	-.05	.01	.17*	.01
4. EB					.21**	.40**	-.17**	.20**	.33**	-.32**	.11	-.18*	.05	.34**	.01	-.10
5. Anx.						.31**	-.21**	.13	.58**	-.29**	.86**	.22**	-.06	-.02	.15*	.04
6. SP							-.42**	.21**	.41**	-.39**	.19**	-.13	.00	.27**	.16*	.01
7. HP								-.16*	-.41**	.34**	-.14*	.14	.12	-.20**	-.17*	.07
8. Know.									.01	-.24**	.03	-.11	-.01	-.17*	-.09	-.07
9. SI										-.47**	.50**	.05	.08	.37**	.22**	-.06
10. Avo.											-.16*	.03	-.003	-.16*	-.18**	.20**
11. Fear												.24**	-.04	-.02	.11	.05
12. TA													-.19**	-.14**	-.03	.05
13. TR														.10	.02	-.01
14. CE															.16*	-.05
15. PS																.04
16. PA																
M	.58	.54	23.31	32.93	3.69	5.37	3.72	7.89	3.73	2.53	3.02	3.25	2.35	4.12	.29	.04
SD	.50	.50	9.31	9.74	1.68	1.01	1.44	1.18	1.64	1.20	1.64	1.61	.81	1.35	.46	.20
Min.	0	0	2	6.4	1	1	.01	3	1	1	1	1	1	1	0	0
Max.	1	1	47.6	49	7	7	7	10	7	7	7	7	4	7	1	1

Notes. * $p < .05$, ** $p < .001$; RI = risk induction, EI = efficacy induction, RP = risk perception, EB = efficacy beliefs; Anx. = anxiety; SP = systematic processing; HP = heuristic processing; Know. = knowledge, SI = seeking intention, Avo. = Avoidance, TA = trait anxiety, TR = topic relevance, CE = collective efficacy, PS = past seeking behavior, PA = past avoidance

Table 5

Descriptive Statistics and Correlations between Variables for Type 2 Diabetes (N = 201) (Study 1)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. RI		-.01	.51**	-.12	.34**	-.01	.02	.09	.11	.08	.30**	-.05	.16*	.15*	.10
2. EI			-.07	.20**	-.04	-.10	.16*	.02	-.13	.11	-.07	-.05	-.05	-.09	.05
3. RP				-.16*	.50**	.27**	-.17*	-.70	.41**	-.19**	.46**	.07	.24**	.32**	.02
4. EB					-.05	.16*	-.04	.03	.10	-.19**	-.04	-.02	-.20**	-.02	.02
5. Anx.						.34**	-.14	.13	.48**	-.06	.90**	.02	.34*	.21**	.16*
6. SP							-.47**	.14*	.66**	-.42**	.32**	.07	.12	.22**	-.08
7. HP								-.16*	-.42**	.46***	-.14*	-.13	-.05	-.20**	.17*
8. Know.									.08	.003	.08	.05	.05	-.08	.03
9. SI										-.53**	.49**	.07	.10	.25**	.001
10. Avo.											-.03	-.09	.11	-.21**	.30**
11. Fear												.02	.34**	.16*	.20**
12. TA													-.17*	.11	-.04
13. TR														-.01	.19**
14. PS															-.07
15. PA															
M	.49	.50	24.27	31.14	4.14	5.08	3.78	8.72	4.14	2.47	3.69	3.18	2.36	.53	.08
SD	.50	.50	9.84	9.68	1.83	1.32	1.41	1.31	1.82	1.25	1.90	1.49	.77	.50	.28
Min.	0	0	2.20	6.72	1	1	1	1	1	1	1	1	1	0	0
Max.	1	1	49	49	7	7	6.75	10	7	6.4	7	7	4	1	1

Notes. * $p < .05$, ** $p < .001$; RI = risk induction, EI = efficacy induction, RP = risk perception, EB = efficacy beliefs; Anx. = anxiety; SP = systematic processing; HP = heuristic processing; Know. = knowledge, SI = seeking intention, Avo. = Avoidance, TA = trait anxiety, TR = topic relevance, PS = past seeking behavior, PA = past avoidance

Table 6

Estimated Means of Risk Perception, Efficacy Beliefs, and Anxiety of the RPA Segments (Study 1)

Topic		RPA Segments (*Estimated Mean* (*SE*))				*F (df)*	*Post hoc*
		Indifferent (*n* = 30)	Proactive (*n* = 65)	Anxious (*n* = 52)	Responsive (*n* = 53)		
Energy Blackouts	Risk Perception	13.03 (.95)	17.01 (.64)	26.58 (.72)	33.66 (.71)	148.98*** (3, 196)	Responsive > anxious > proactive > indifferent
	Efficacy Beliefs	22.35 (1.06)	38.34 (.72)	24.32 (.80)	40.72 (.80)	122.80*** (3, 196)	Responsive, proactive > anxious, indifferent
	Anxiety	2.45 (.26)	3.21 (.18)	3.83 (.20)	4.83 (.20)	21.20*** (3, 199)	Responsive > anxious, proactive Anxious > indifferent
Topic		RPA Segments (*Estimated Mean* (*SE*))				*F (df)*	*Post hoc*
		Indifferent (*n* = 53)	Proactive (*n* = 33)	Anxious (*n* = 58)	Responsive (*n* = 57)		
Type 2 Diabetes	Risk perception	16.48 (.74)	12.24 (.94)	31.43 (.71)	31.19 (.71)	157.88*** (3, 197)	Anxious, responsive > indifferent > proactive
	Efficacy Beliefs	26.91 (.77)	42.28 (.98)	21.98 (.74)	37.96 (.74)	133.33*** (3, 197)	Proactive > responsive > indifferent > anxious
	Anxiety	3.43 (.22)	3.30 (.29)	4.71 (.21)	4.74 (.21)	11.15*** (3, 199)	Anxious, responsive > indifferent, proactive

Notes. *** $p < .001$; When anxiety was DV, trait anxiety was included in the model as a covariate; As a post-hoc test, Bonferroni was used for the analyses of variance and confidence interval was used for the analysis of covariance.

Table 7

Multivariate Regressions on Anxiety (Study 1 H1)

	Contexts					
	Energy Blackouts			Type 2 Diabetes		
	B	*SE*	*P*	*B*	*SE*	*p*
Constant	1.189	.170	.000	1.027	.169	.000
Risk perception	.027	.008	.001	.019	.007	.005
Efficacy beliefs	.018	.006	.006	.001	.006	.833
RP * EB	-.001	.001	.335	-.001	.001	.353
Fear	.778	.043	.000	.803	.035	.000
Trait anxiety	.050	.039	.201	.046	.042	.275
Model Summary						
R^2	.760			.809		
F (df)	123.02 (5, 194)			163.79 (5, 194)		
p	.000			.000		

Table 8

Mediation Analysis on Systematic/Heuristic Processing via Anxiety (Study 1 H2(a))

Context: Energy Blackouts									
	DV: Anxiety			DV: Systematic Processing			DV: Heuristic Processing		
	B	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*
Constant	1.368	.264	.000	4.406	.299	.000	4.543	.455	.000
RP	.024	.008	.003	-.006	.009	.526	-.010	.013	.447
EB	.021	.007	.003	.028	.007	.0002	-.022	.011	.056
RP*EB	-.0004	.001	.531	-.001	.001	.363	.002	.001	.032
Anxiety	.	.	.	.254	.077	.001	-.192	.116	.100
Trait anxiety	.050	.039	.198	-.072	.041	.082	.129	.063	.058
Fear	.775	.043	.000	-.086	.075	.256	.045	.114	.694
Past seeking behavior	.185	.135	.174	.183	.144	.207	-.297	.219	.177
Collective EB	-.056	.048	.250	.117	.051	.023	-.145	.078	.064
Context: Type 2 Diabetes									
	B	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*
Constant	.922	.183	.000	4.047	.293	.000	4.245	.337	.000
RP	.016	.007	.024	.019	.011	.076	-.014	.012	.267
EB	.001	.006	.851	.030	.009	.002	-.010	.011	.329
RP*EB	-.0004	.001	.440	.000	.001	.980	-.0001	.001	.939
Anxiety	.	.	.	.118	.109	.278	.031	.145	.806
Trait anxiety	.052	.042	.220	.043	.063	.501	-.019	.073	.798
Fear	.801	.035	.000	.057	.102	.579	-.079	.117	.502

Table 8 (cont'd)

Mediation Analysis on Systematic/Heuristic Processing via Anxiety (Study 1 H2(a))

Context: Type 2 Diabetes									
	B	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*
Past seeking behavior	.182	.121	.136	.323	.184	.050	-.456	.212	.033

Notes. RP indicates risk perception; EB indicates efficacy beliefs; For energy blackouts, the regression model on anxiety was statistically significant, R^2 = .764, F (7, 192) = 88.564, p < .001, the regression model on systematic processing was statistically significant, R^2 = .274, F (8, 191) = 9.001, p < .001, and the regression model on heuristic processing was statistically significant, R^2 = .168, F (8, 191) = 4.834, p < .001; For type 2 diabetes, the regression model on anxiety was statistically significant, R^2 = .811, F (6, 193) = 137.741, p < .001, the regression model on systematic processing was statistically significant, R^2 = .190, F (7, 192) = 6.445, p < .001, and the regression model on heuristic processing was not statistically significant, R^2 = .061, F (7, 192) = 1.793, p > .05.

Table 9

Conditional Direct and Indirect Effects of Risk Perception on Information Processing via Anxiety (Study 1 H2(a))

	Contexts							
	Energy Blackouts				Type 2 Diabetes			
Conditional direct effect of RP on systematic processing								
Level of EB	*B*	*SE*	*95% CI*		*B*	*SE*	*95% CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	.001	.012	-.024	.025	.019	.014	-.010	.047
Moderate	-.007	.008	-.023	.010	.019	.011	-.002	.040
Strong	-.012	.009	-.030	.007	.019	.013	-.007	.046
Conditional indirect effect of RP on systematic processing based on the level of EB								
Level of EB	*B*	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	.007	.004	.0009	.016	.002	.003	-.001	.010
Moderate	.006	.003	.0012	.013	.002	.002	-.001	.008
Strong	.005	.003	-.0003	.013	.001	.002	-.002	.006
Index of moderated mediation on systematic processing								
	B	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
EB	-.0001	.0002	-.0005	.0003	-.0001	.0001	-.0004	.0001
Conditional direct effect of RP on heuristic processing								
Level of EB	*B*	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	-.032	.019	-.069	.005	-.013	.017	-.046	.020
Moderate	-.006	.013	-.031	.019	-.014	.012	-.038	.011
Strong	.012	.014	-.016	.040	-.015	.015	-.045	.015
Conditional indirect effect of RP on heuristic processing								
Level of EB	*B*	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	-.005	.004	-.016	.001	.001	.003	-.006	.006
Moderate	-.005	.003	-.012	.001	.001	.002	-.004	.005
Strong	-.004	.003	-.012	.001	.0003	.002	-.003	.005
Index of moderated mediation on heuristic processing								
	B	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
EB	.0001	.0002	-.0002	.0005	.000	.0001	-.0002	.0002

Notes. RP indicates risk perception; EB indicates efficacy beliefs; The levels of EB are the 16th, 50th, and 84th percentiles; Number of bootstrap samples for percentile bootstrap confidence interval was 5000.

Table 10

Mediation Analysis on Knowledge via Anxiety (Study 1 H2(b))

Context: Energy Blackouts						
	DV: Anxiety			DV: Knowledge (Quiz Score)		
	B	*SE*	*P*	*B*	*SE*	*p*
Constant	1.189	.170	.000	7.728	.262	.000
RP	.027	.008	.001	-.006	.011	.594
EB	.018	.006	.006	.017	.009	.057
RP*EB	-.001	.001	.335	-.001	.001	.625
Anxiety	.	.	.	.254	.099	.011
Trait anxiety	.050	.039	.201	-.076	.054	.157
Fear	.778	.043	.000	-.173	.098	.078
Context: Type 2 Diabetes						
	B	*SE*	*P*	*B*	*SE*	*p*
Constant	1.027	.169	.000	8.346	.295	.000
RP	.019	.007	.005	-.002	.011	.869
EB	.001	.006	.833	-.006	.010	.550
RP*EB	-.001	.001	.352	-.0004	.001	.662
Anxiety	.	.	.	.206	.115	.075
Trait anxiety	.046	.042	.275	.013	.067	.844
Fear	.803	.035	.000	-.138	.108	.204

Notes. RP indicates risk perception; EB indicates efficacy beliefs; For energy blackouts, the regression model on anxiety was statistically significant, R^2 = .760, F (5, 194) = 123.021, p < .001, the regression model on knowledge was statistically significant, R^2 = .080, F (6, 193) = 2.791, p < .05; For type 2 diabetes, the regression model on anxiety was statistically significant, R^2 = .809, F (5, 194) = 163.791, p < .001, the regression model on knowledge was not statistically significant, R^2 = .024, F (6, 193) = .790, p > .05.

Table 11

Conditional Direct and Indirect Effects of Risk Perception on Knowledge via Anxiety (Study 1 H2(b))

	Contexts							
	Energy Blackouts				Type 2 Diabetes			
Conditional direct effect of RP on knowledge								
Level of EB	*B*	*SE*	*95% CI*		*B*	*SE*	*95% CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	.008	.004	.002	.017	.002	.015	-.027	.031
Moderate	.007	.003	.001	.014	-.002	.011	-.023	.020
Strong	.005	.003	-.001	.013	-.006	.014	-.034	.021
Conditional indirect effect of RP on knowledge based on the level of EB								
Level of EB	*B*	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	.008	.004	.002	.017	.005	.003	.0004	.013
Moderate	.007	.003	.001	.014	.004	.002	.001	.010
Strong	.005	.003	-.001	.013	.003	.002	-.001	.009
Index of moderated mediation								
	B	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
EB	-.0002	.0002	-.0006	.0002	-.0001	.0002	-.0005	.0002

Notes. RP indicates risk perception; EB indicates efficacy beliefs; The levels of EB are the 16th, 50th, and 84th percentiles; Number of bootstrap samples for percentile bootstrap confidence interval was 5000.

Table 12

Mediation Analysis on Information Seeking Intention via Anxiety (Study 1 H3(a))

Context: Energy Blackouts						
	DV: Anxiety			DV: Seeking Intention		
	B	*SE*	*P*	*B*	*SE*	*p*
Constant	1.368	.264	.000	.286	.399	.475
RP	.024	.008	.003	.028	.012	.017
EB	.021	.007	.003	.014	.010	.167
RP * EB	-.0004	.001	.531	-.001	.001	.542
Anxiety	.	.	.	.448	.102	.000
Trait anxiety	.050	.039	.198	-.007	.055	.896
Fear	.775	.043	.000	.021	.100	.833
Previous seeking behavior	.185	.135	.174	.233	.192	.227
Collective efficacy beliefs	-.056	.048	.250	.411	.068	.000
Context: Type 2 Diabetes						
	B	*SE*	*P*	*B*	*SE*	*p*
Constant	.922	.183	.000	2.694	.367	.000
RP	.016	.007	.024	.044	.013	.001
EB	.001	.006	.851	.029	.012	.012
RP * EB	-.0004	.001	.440	.0002	.001	.883
Anxiety	.	.	.	.109	.136	.422
Trait anxiety	.052	.042	.220	-.076	.079	.337
Fear	.801	.035	.000	.280	.128	.029
Previous seeking behavior	.182	.121	.136	.388	.230	.094

Notes. RP indicates risk perception; EB indicates efficacy beliefs; For energy blackouts, the regression model on anxiety was statistically significant, $R^2 = .764$, F (7, 192) = 88.564, $p < .001$, and the regression model on information seeking intention was statistically significant, $R^2 = .507$, F (8, 191) = 24.56, $p < .001$; For type 2 diabetes, the regression model on anxiety was statistically significant, $R^2 = .811$, F (6, 193) = 137.741, $p < .001$, and the regression model on information seeking intention was statistically significant, $R^2 = .327$, F (7, 192) = 13.32, $p < .001$.

Table 13

Conditional Direct and Indirect Effects of Risk Perception on Information Seeking Intention via Anxiety (Study 1 H3(a))

	Contexts							
	Energy Blackouts				Type 2 Diabetes			
Conditional direct effect of RP on information seeking								
Level of EB	*B*	*SE*	*95% CI*		*B*	*SE*	*95% CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	.033	.016	.001	.065	.042	.018	.007	.078
Moderate	.027	.011	.005	.049	.044	.014	.017	.070
Strong	.022	.012	-.002	.047	.045	.017	.013	.078
Conditional indirect effect of RP on information seeking intention based on the level of EB								
Level of EB	*B*	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	.013	.006	.002	.025	.002	.004	-.004	.011
Moderate	.011	.005	.002	.020	.002	.003	-.004	.009
Strong	.009	.005	-.001	.019	.001	.003	-.003	.007
Index of moderated mediation								
	B	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
EB	-.0002	.0003	-.0009	.0005	.0000	.0001	-.0004	.0002

Notes. RP indicates risk perception; EB indicates efficacy beliefs; The levels of EB are the 16th, 50th, and 84th percentiles; Number of bootstrap samples for percentile bootstrap confidence interval was 5000.

Table 14

Mediation Analysis on Information Avoidance via Anxiety (Study 1 H3(b))

Context: Energy Blackout						
	DV: Anxiety			DV: Information avoidance		
	B	*SE*	*P*	*B*	*SE*	*p*
Constant	1.369	.266	.000	3.239	.362	.000
RP	.026	.008	.001	-.024	.010	.024
EB	.020	.007	.004	-.022	.009	.014
RP * EB	-.001	.001	.385	.001	.001	.576
Anxiety	.	.	.	-.292	.092	.002
Trait anxiety	.047	.039	.230	.007	.050	.892
Fear	.777	.044	.000	.208	.091	.023
Previous avoiding behavior	.127	.305	.676	1.07	.390	.006
Collective efficacy beliefs	-.042	.047	.376	-.083	.061	.175
Context: Type 2 Diabetes						
	B	*SE*	*P*	*B*	*SE*	*P*
Constant	1.016	.171	.000	2.240	.263	.000
RP	.019	.007	.006	-.032	.010	.001
EB	.001	.006	.829	-.027	.009	.002
RP * EB	-.001	.001	.362	.001	.001	.320
Anxiety	.	.	.	-.020	.102	.842
Trait anxiety	.049	.042	.250	.061	.060	.312
Fear	.807	.036	.000	.006	.096	.953
Previous avoiding behavior	-.107	.212	.616	1.305	.300	.000

Notes. RP indicates risk perception; EB indicates efficacy beliefs; For energy blackouts, the regression model on anxiety was statistically significant, $R^2 = .762$, F (7, 192) = 87.552, $p < .001$, the regression model on information seeking intention was statistically significant, $R^2 = .233$, F (8, 191) = 7.256, $p < .001$; For type 2 diabetes, the regression model on anxiety was statistically significant, $R^2 = .809$, F (6, 193) = 136.009, $p < .001$, the regression model on information seeking intention was statistically significant, $R^2 = .188$, F (7, 192) = 6.354, $p < .001$.

Table 15

Conditional Direct and Indirect Effects of Risk Perception on Information Avoidance via Anxiety (Study 1 H3(b))

	Contexts							
	Energy Blackouts				Type 2 Diabetes			
Conditional direct effect of RP on information avoidance								
Level of EB	*B*	*SE*	*95% CI*		*B*	*SE*	*95% CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	-.028	.015	-.057	.001	-.039	.013	-.065	-.013
Moderate	-.023	.010	-.043	-.003	-.032	.020	-.051	-.013
Strong	-.019	.011	-.041	.003	.023	.012	-.047	.002
Conditional indirect effect of RP on information avoidance based on the level of EB								
Level of EB	*B*	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
Weak	-.009	.005	-.020	-.002	-.0005	.003	-.007	.005
Moderate	1.83	-.007	-.015	-.002	-.0004	.002	-.005	.004
Strong	-.006	.004	-.014	.0002	-.0003	.002	-.004	.003
Index of moderated mediation								
	B	*SE*	*95% Boot CI*		*B*	*SE*	*95% Boot CI*	
			LLCI	*ULCI*			*LLCI*	*ULCI*
EB	.0002	.0002	-.0002	.0007	.0000	.0001	-.0002	.0002

Notes. RP indicates risk perception; EB indicates efficacy beliefs; The levels of EB are the 16th, 50th, and 84th percentiles; Number of bootstrap samples for percentile bootstrap confidence interval was 5000.

Table 16

Demographic Characteristics of Study 2 (N = 55)

	n	*%*		*n*	*%*
Sex			**Racial or Ethnic groups**		
Male	13	23.6	European American	39	70.9
Female	42	76.4	African American	1	1.8
			Asian	9	16.4
Education			Hispanic	1	1.8
Some high school or less	0	0.0	Others	5	9.1
High school diploma or GED	2	3.6			
Some college without degree	12	21.8	**Income**		
Associates or technical degree	5	9.1	Less than 25k	10	18.2
Bachelor's degree	17	30.9	25,000 – 49,999	9	16.4
Graduate or professional degree	18	32.7	50,000 – 74,999	6	10.9
Prefer not to say	1	1.8	75,000 – 99,999	7	12.7
			100,000 – 149,999	14	25.5
			More than 150k	5	9.1
			Prefer not to say	4	7.3

Table 17

Descriptive Statistics and Correlations between Variables for Energy Blackouts (N = 28) (Study 2)

	1	2	3	4	5	6	7	8	9	10	11	12
1. EI		-.31	-.08	.03	.05	-.08	-.07	-.20	-.27	.12	.16	-.31
2. RP			.29	-.09	.11	.07	.01	.47*	-.08	-.01	.39*	.28
3. EB				.16	-.15	-.13	-.11	.22	-.06	-.09	.09	.05
4. TR (s)					-.96**	-.12	-.60**	.28	-.15	.20	.07	.15
5. TE (s)						.30	.72**	-.30	.09	-.09	.03	-.22
6. AFR							.80**	-.01	.07	.24	-.05	-.27
7. AFE								-.32	.16	.11	-.13	-.32
8. Anx.									.00	-.18	.23	.14
9. GSR										-.04	-.19	-.04
10. TCDC (m)											.25	.16
11. TG (m)												-.08
12. Know.												
M	.57	32.48	33.75	68.13	50.32	44.05	34.37	4.19	6.21	3.58	2.89	6.57
SD	.50	7.62	8.70	5.70	6.82	13.50	10.65	1.44	6.30	1.43	1.48	.74
Min.	0	9.6	19.44	57	31.13	7.10	9.72	1	0	.71	.12	4
Max.	1	49	49	78.57	61.93	62.56	50.12	6.50	21	6.27	5.96	7

Notes. * $p < .05$, ** $p < .001$; s indicates that the unit of time was seconds; m indicates that the unit of time was minutes. EI = efficacy induction, RP = risk perception, EB = efficacy beliefs; TR = time spent on risk information, TE = time spent on efficacy information, AFR = amount of fixation on risk content, AFE = amount of fixation on efficacy content, Anx. = self-reported anxiety; GSR = count of arousal peaks measured by galvanic skin sensors, TCDC = time spent on the CDC, TG = time spent on Google, Know. = knowledge

Table 18

Descriptive Statistics and Correlations between Variables for Type 2 Diabetes (N = 27) (Study 2)

	1	2	3	4	5	6	7	8	9	10	11	12
1. EI		.26	.26	-.07	.07	.19	.12	.37	-.09	-.33	-.36	-.37
2. RP			.16	.13	-.12	.29	.15	.28	-.19	-.01	-.38	-.18
3. EB				.09	-.09	-.06	-.04	.46*	.10	-.13	-.28	.02
4. TR (s)					-.98**	.68**	-.32	.09	.02	-.07	.01	.14
5. TE (s)						-.57**	.46*	-.13	-.10	.08	-.01	-.07
6. AFR							.32	.00	-.21	.00	.00	.22
7. AFE								-.09	-.22	.07	-.10	.26
8. Anx.									.06	-.14	-.32	-.05
9. GSR										-.19	.09	-.14
10. TCDC (m)											.66**	.29
11. TG (m)												.23
12. Know.												
M	.52	33.06	27.31	63.29	54.98	43.37	36.74	3.50	5.22	2.83	3.06	9.04
SD	.51	6.93	6.44	9.85	8.90	13.29	10.73	1.49	6.34	1.40	3.14	1.13
Min.	0	15.40	14	40.77	40.77	9.15	12.02	1	0	.64	5.83	6
Max.	1	42.24	42	78.13	71.80	63.03	53.95	6	19	.13	14	10

Notes. * $p < .05$, ** $p < .001$; s indicates that the unit of time was seconds; m indicates that the unit of time was minutes; EI = efficacy induction, RP = risk perception, EB = efficacy beliefs; TR = time spent on risk information, TE = time spent on efficacy information, AFR = amount of fixation on risk content, AFE = amount of fixation on efficacy content, Anx. = self-reported anxiety; GSR = count of arousal peaks measured by galvanic skin sensors, TCDC = time spent on the CDC, TG = time spent on Google, Know. = knowledge

Table 19

Independent T-Test Results Comparing High Efficacy and No Efficacy Conditions on Time Spent on the Area of Interest (Study 2 H1)

Topic: Energy Blackouts											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Time spent on efficacy content	No efficacy	12	49.90	8.84	2.55	45.10	54.61	-.25	16.46	.79	-.10
	Efficacy info.	16	50.63	5.12	1.28	48.13	52.99				
Time spent on risk content	No efficacy	12	67.93	7.00	2.46	63.98	72.05	-.16	26	.88	-.06
	Efficacy info.	16	68.28	4.74	2.94	65.96	70.66				
Topic: Type 2 Diabetes											
DV	Condition	*N*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Time spent on efficacy content	No efficacy	13	54.34	8.20	2.27	49.87	58.43	-.35	25	.73	-.14
	Efficacy info.	14	55.57	9.79	2.62	50.57	60.65				
Time spent on risk content	No efficacy	13	63.93	8.86	2.46	59.04	68.68	.32	25	.75	.13
	Efficacy info.	14	62.68	11.00	2.94	56.99	68.23				

Notes. The unit of time was seconds (s).

Table 20

Independent T-Test Results Comparing High Efficacy and No Efficacy Conditions on the Amount of Fixation (AoF) towards the Area of Interest (Study 2 H2)

Topic: Energy Blackouts											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
AoF toward efficacy content	No efficacy	12	35.26	10.75	3.10	28.56	40.54	.38	26	.71	.14
	Efficacy info.	16	33.70	10.88	2.72	28.30	38.60				
AoF toward risk content	No efficacy	12	45.33	14.31	4.13	36.03	52.52	.43	26	.68	.16
	Efficacy info.	16	43.08	13.25	3.31	36.25	48.77				
Topic: Type 2 Diabetes											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
AoF toward efficacy content	No efficacy	13	35.48	10.66	2.96	29.64	41.54	-.58	25	.57	-.22
	Efficacy info.	14	37.91	11.07	2.96	32.04	43.50				
AoF toward risk content	No efficacy	13	40.77	12.91	3.58	33.30	47.33	-.98	25	.34	-.38
	Efficacy info.	14	45.79	13.65	3.65	38.53	51.89				

Notes. The amount of fixation is a total time the respondent spent fixating at the AOI; The unit of time was seconds (s).

Table 21

Independent T-Test Results Comparing High Efficacy and No Efficacy Conditions on the Relative Time and Relative Fixation (Study 2 RQ1 and RQ2)

Topic: Energy Blackouts											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Relative time	No efficacy	12	.75	.21	.06	.63	.87	.06	17.36	.95	.02
	Efficacy info.	16	.75	.13	.03	.69	.81				
Relative fixation	No efficacy	12	.79	.15	.04	.71	.87	-.51	26	.62	-.19
	Efficacy info.	16	.84	.35	.09	.72	1.04				
Topic: Type 2 Diabetes											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Relative time	No efficacy	13	.88	.27	.08	.75	1.05	-.49	25	.63	-.19
	Efficacy info.	14	.94	.35	.09	.77	1.12				
Relative fixation	No efficacy	13	.94	.38	.11	.75	1.14	.37	25	.71	.14
	Efficacy info.	14	.89	.31	.08	.73	1.05				

Notes. The relative time was calculated by dividing time spent on efficacy content by time spent on risk content; The relative fixation was calculated by dividing the amount of fixation toward efficacy content by the amount of fixation toward risk content.

Table 22

Independent T-Test Results Comparing High Efficacy and No Efficacy Conditions on Efficacy Beliefs (Study 2 H3)

Topics	Condition	*n*	*M*	*SD*	*SE*	Bootstrap CI 95%		Independent t-test			
						Lower	*Upper*	*t*	*df*	*p (one-tailed)*	*Cohen's d*
Energy blackouts	No efficacy	12	6.83	.39	.11	6.57	7.00	1.85	21.76	.05	.64
	Efficacy info.	16	6.38	.89	.22	5.89	6.77				
Type 2 Diabetes	No efficacy	13	9.46	.88	.24	8.90	9.87	1.99	25	.03	.77
	Efficacy info.	14	8.64	1.22	.32	8.00	9.27				

Table 23

Independent T-Test Results Comparing High Efficacy and No Efficacy Conditions on Anxiety (Study 2 H4)

Topic: Energy Blackouts											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Self-reported anxiety	No efficacy	12	4.51	1.08	.31	3.92	5.17	1.03	26	.16	.39
	Efficacy info.	16	3.95	1.65	.41	3.20	4.74				
Galvanic response	No efficacy	12	8.17	7.66	2.21	3.90	12.55	1.45	26	.08	.55
	Efficacy info.	16	4.75	4.81	1.20	2.58	7.14				
Topic: Type 2 Diabetes											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Self-reported anxiety	No efficacy	13	2.94	1.30	.36	2.19	3.63	-2.00	25	.03	-.77
	Efficacy info.	14	4.02	1.51	.40	3.27	4.76				
Galvanic response	No efficacy	13	5.77	6.22	1.73	2.60	9.50	.43	25	.34	.16
	Efficacy info.	14	4.71	6.65	1.78	1.46	8.44				

Notes. Galvanic response is measured as the count of peaks detected while participants viewed the infographic.

Table 24

Independent T-Test Results Comparing High Efficacy and No Efficacy Conditions on Knowledge (Study 2 H5)

Topics	Condition	*n*	*M*	*SD*	*SE*	Bootstrap CI 95%		Independent t-test			
						Lower	*Upper*	*t*	*df*	*p (one-tailed)*	*Cohen's d*
Energy blackouts	No efficacy	12	6.83	.39	.11	6.57	7.00	1.85	21.76	.05	.64
	Efficacy info.	16	6.38	.89	.22	5.89	6.77				
Type 2 Diabetes	No efficacy	13	9.46	.88	.24	8.90	9.87	1.99	25	.03	.77
	Efficacy info.	14	8.64	1.22	.32	8.00	9.27				

Table 25

Independent T-Test Results Comparing High Efficacy and No Efficacy Conditions on Information Seeking (Study 2 H6)

Notes. The unit of time was minutes (m).

Topic: Energy Blackouts											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Time on the CDC website	No efficacy	12	3.39	1.39	.49	2.66	4.16	-.59	26	.28	-.23
	Efficacy info.	16	3.72	1.49	.37	2.96	4.44				
Time on Google	No efficacy	12	2.62	1.53	.44	1.73	3.46	-.84	26	.20	-.32
	Efficacy info.	16	3.09	1.46	.36	2.46	3.86				
Topic: Type 2 Diabetes											
DV	Condition	*n*	*M (s)*	*SD*	*SE*	*Bootstrap CI 95%*		Independent t-test			
						Lower	Upper	*t*	*df*	*p (two-tailed)*	*Cohen's d*
Time on the CDC website	No efficacy	13	3.31	1.52	.42	2.49	4.10	1.77	25	.04	.68
	Efficacy info.	14	2.39	1.17	.31	1.78	2.97				
Time on Google	No efficacy	13	4.22	4.07	1.13	2.23	6.51	1.89	14.47	.04	.75
	Efficacy info.	14	1.99	1.36	.36	1.31	2.74				

Table 26

Paired T-Test Results Comparing High Efficacy and No Efficacy Conditions on the Amount of Time (Study 2 Post-Hoc)

Topic	Condition	DVs	*M (s)*	*SD*	*SE*	Paired t-test			
						t	*df*	*p (two-tailed)*	*Cohen's d*
Energy blackouts	No efficacy (*n* = 12)	Time on risk info.	67.93	7.00	2.02	3.99	11	.002	1.15
		Time on efficacy info.	49.90	8.84	2.55				
	High efficacy (*n* = 16)	Time on risk info.	68.28	4.75	1.19	7.20	15	< .001	1.80
		Time on efficacy info.	50.63	5.12	1.28				
Type 2 Diabetes	No efficacy (*n* = 13)	Time on risk info.	63.93	8.86	2.46	2.04	12	.06	.56
		Time on efficacy info.	54.34	8.20	2.27				
	High efficacy (*n* = 14)	Time on risk info.	62.68	10.99	2.94	1.29	13	.22	.34
		Time on efficacy info.	55.57	9.79	2.62				

Notes. The unit of time was seconds (s).

APPENDIX B: FIGURES

Figure 1

The Hypothesized Moderated Mediation Model (from H2 to H3)

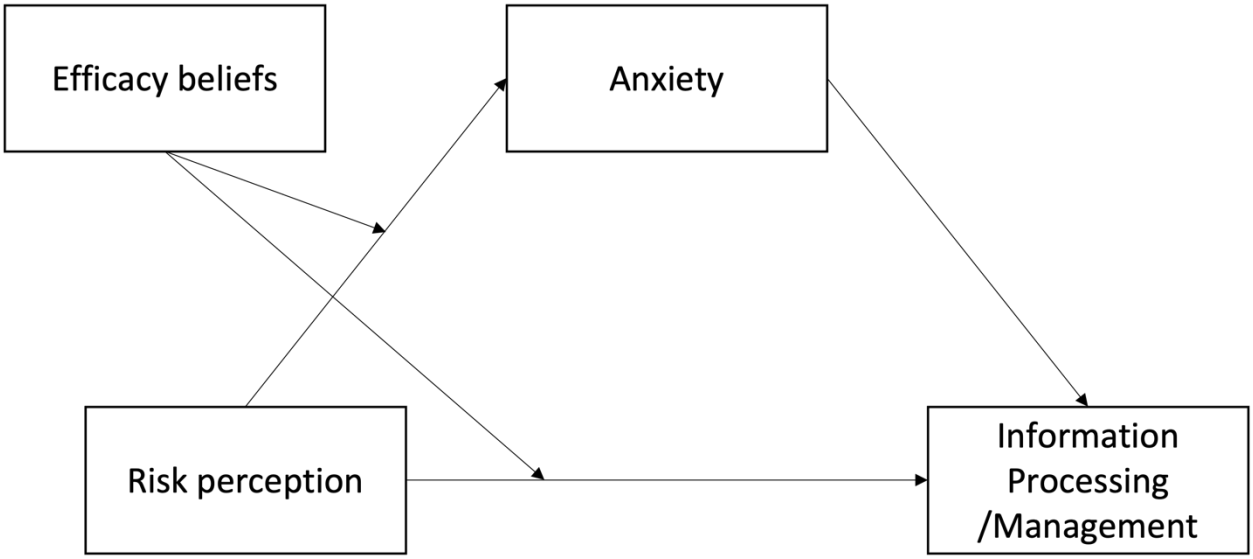

Figure 2

The Interaction Effect of Risk Perception and Efficacy Beliefs on Heuristic Processing in the Context of Energy Blackouts (Study 1)

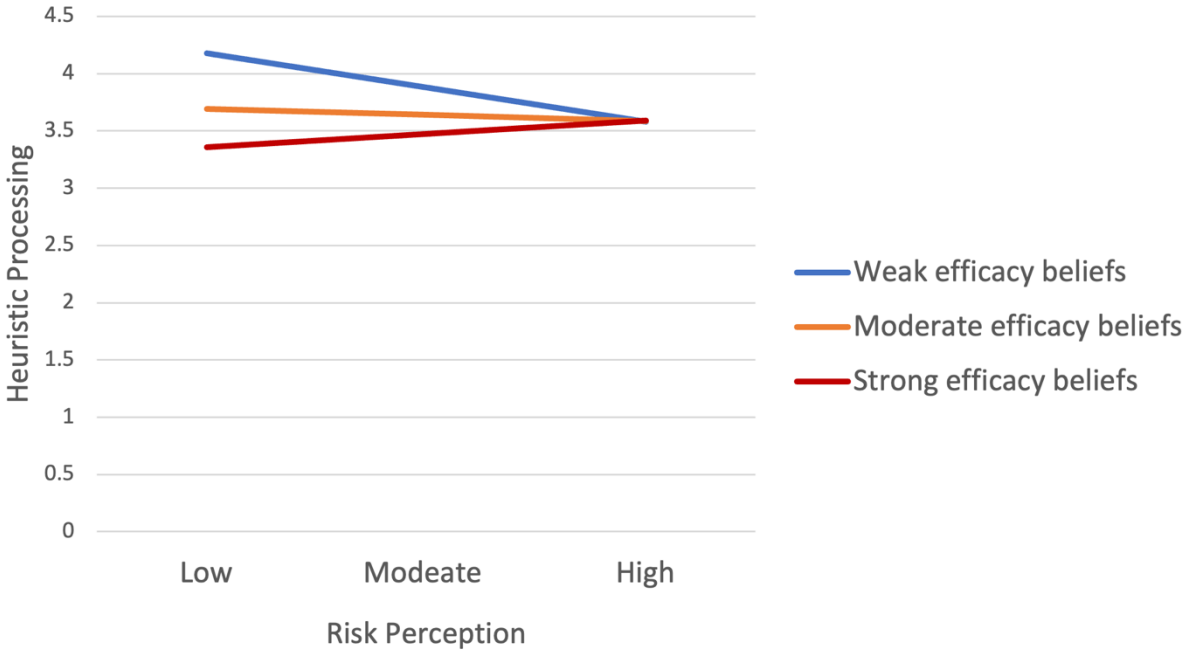

Figure 3

Stimuli for Study 2 – Energy Blackouts (Condition with Efficacy Information)

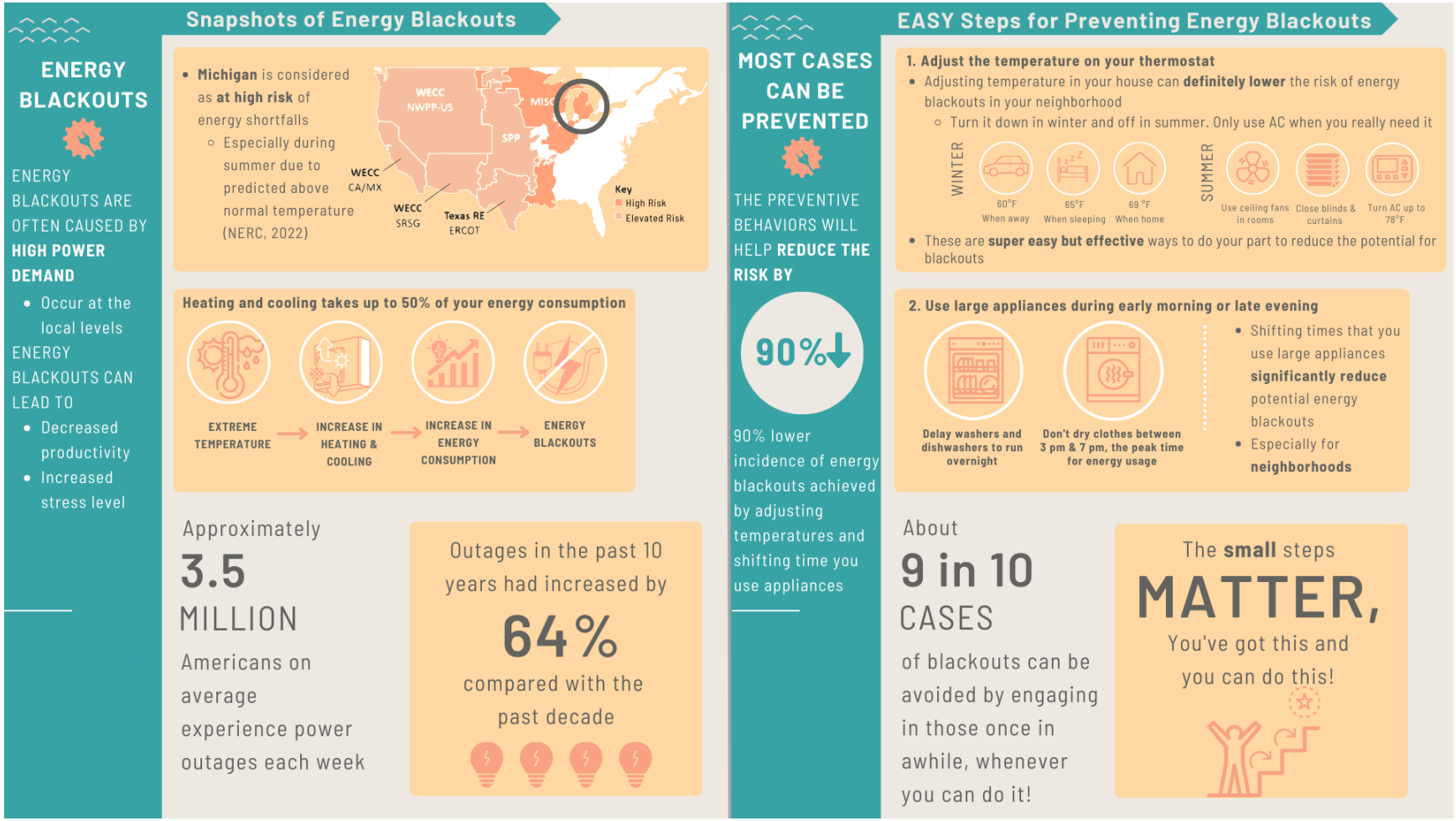

Figure 4

Stimuli for Study 2 – Energy Blackouts (Condition without Efficacy Information)

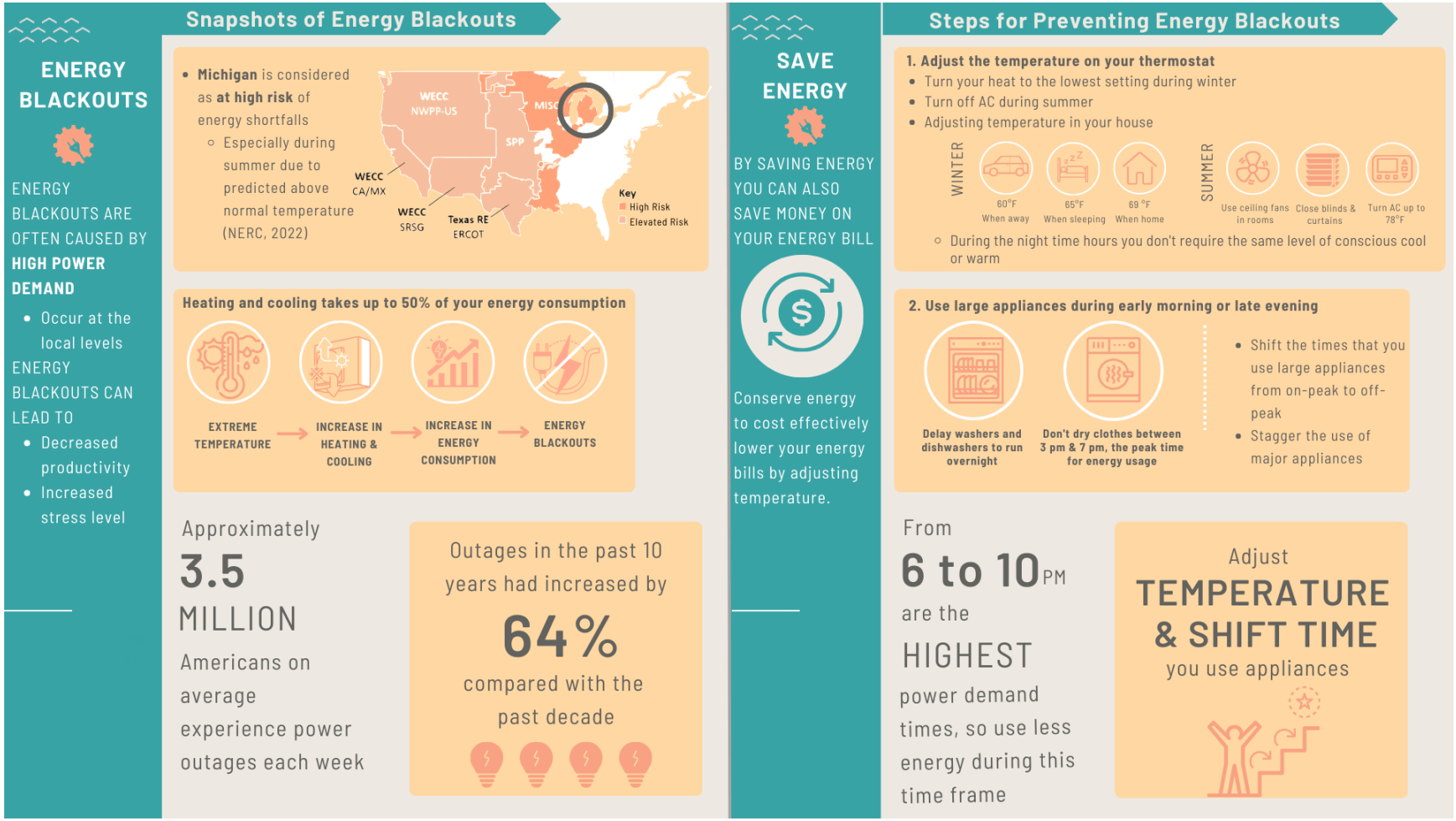

Figure 5

Stimuli for Study 2 – Type 2 Diabetes (Condition with Efficacy Information)

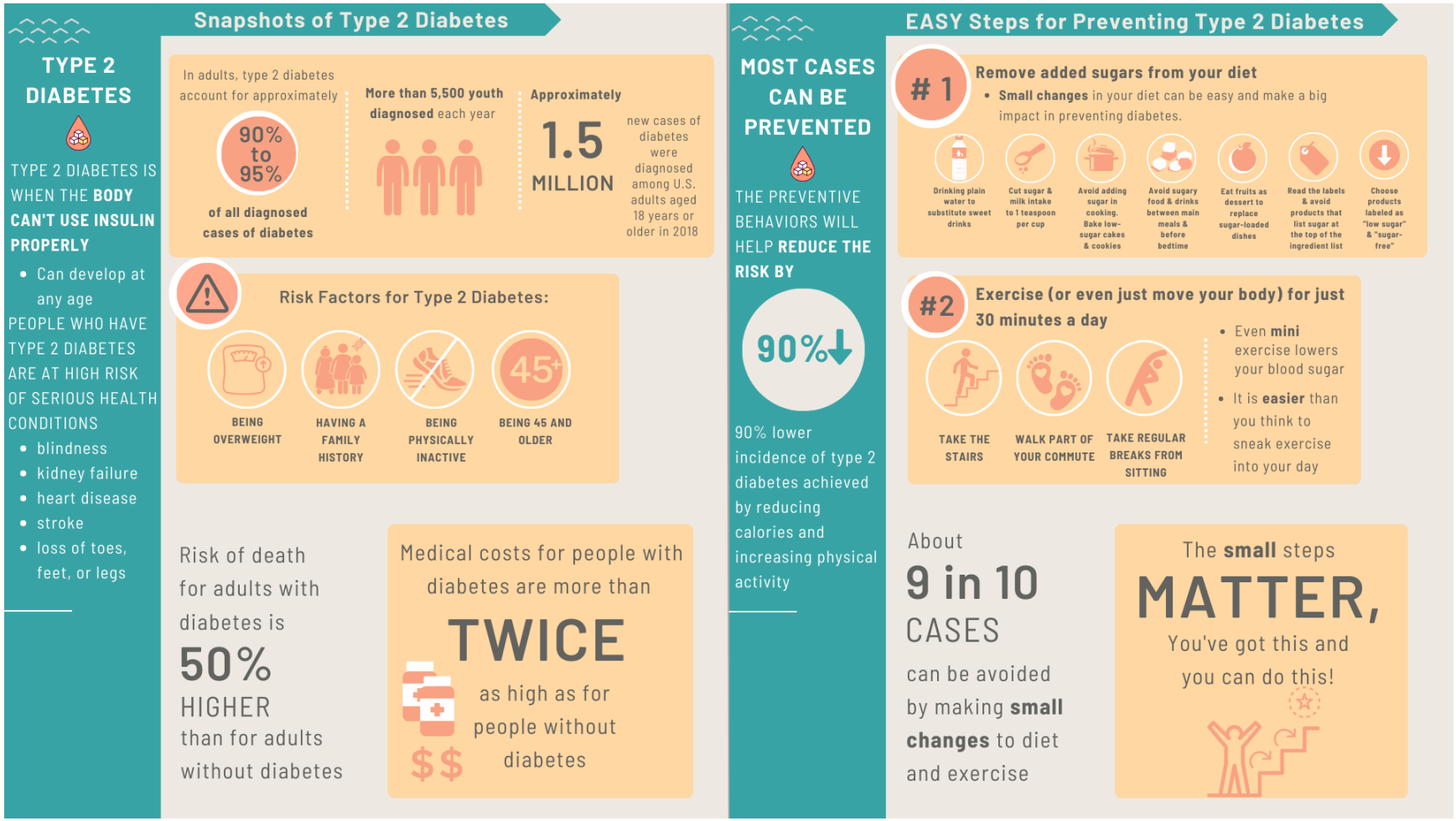

Figure 6

Stimuli for Study 2 – Type 2 Diabetes (Condition without Efficacy Information)