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Abstract

This study examines the conceptual linkages between individuals' uncertainty judgments and such affective reactions (worry and anger) within the context of an environmental health risk. It uses data from a longitudinal study (n = 334) of people's reactions to the risks of eating contaminated fish from the Great Lakes, which employed the Risk Information Seeking and Processing model, and, in the process, seeks to test the expanded model, which includes preventive behavior. Findings support the expanded model and indicate that worry and anger strongly influenced uncertainty judgments, but anger and worry influenced attitudes toward fish avoidance and information insufficiency differently.

Keywords: Risk Information Seeking and Processing model; uncertainty; worry; anger; environmental health risk

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Individuals' senses of uncertainty about a risk and their affective reactions to that risk often figure prominently in subsequent behavioral decisions (Slovic, Peters, Finucane, & MacGregor, 2005). How those factors interact with each other, as well as with other aspects of individuals' responses to a risk, remains less well understood. It is important to study their relationships because it helps to explain how negative affective responses toward a health risk may influence one's subjective evaluation of uncertainty about that health risk. This study seeks to explore that affect/uncertainty relationship by utilizing the Risk Information Seeking and Processing (RISP) model, which gathers information about both uncertainty and affective perceptions as part of a larger array of predictors (Griffin, Dunwoody, & Neuwirth, 1999). Although most studies employing the model have used information seeking as a dependent variable, this study will take advantage of the original, expanded model, which also sought to explain behavioral intentions by incorporating components of the theory of planned behavior (TPB) (Ajzen, 1991).

To analyze the relationships that affective responses and uncertainty judgment have with risk information seeking and risk-preventive behaviors, we use panel data from a survey of perceptions of the risk of eating contaminated Great Lakes fish conducted by Griffin, Dunwoody, and Neuwirth (1999) and that employed their RISP model. This RISP data set is rare in that it includes a one-year lag between behavioral intention of fish avoidance and self-reported fish avoidance behavior.

Using the health risk of eating contaminated Great Lakes fish as a case study, the purpose of this current study is to advance the RISP model by investigating conceptual links among affective responses toward a health risk, uncertainty judgments about the risk, and behaviors that would address the risk. More specifically, this study is a theory-building effort to enhance the RISP model by introducing uncertainty into the model and exploring its relationships with affective responses, information seeking and risk preventive behaviors. Illuminating the theoretical links among those variables not only is of interest to risk communication researchers but also may help risk managers better understand how people's information-seeking and risk-preventive behaviors are shaped by their affective responses to the risk and by their uncertainty perceptions.

The Study Context: The Risk of Eating Great Lakes Fish

Fishing in North America (American Sportfishing Association, 2013), particularly in the Great Lakes region (Imm et al., 2005), is a popular activity for food, recreation, and social interaction among local residents and anglers. On a regular basis and in various media, such as pamphlets and news stories, authorities in states bordering the Great Lakes disseminate health advisories that explain how to minimize exposure to the chemicals that may contaminate these fish. Such cautionary messages have not diminished the popularity of eating Great Lakes fish (Imm et al., 2005), and commercially- and sport-caught fish from the lakes are readily accessible to area residents at local restaurants and fish markets (Turyk et al., 2012. Preventing potential adverse effects on people's health by encouraging the public to seek information about these risks and to act accordingly is important.

Although the nutritional content in fish is beneficial to our health (Turyk et al., 2012), fish that are contaminated by polychlorinated biphenyls (PCBs) or by mercury—both found in the Great Lakes—pose risks of cancer and fetal developmental problems (Weisskopf et al., 2005). Therefore, depending on the frequency and amount of fish eaten and contaminant levels in those fish, consuming Great Lakes fish can be harmful (Anderson et al., 1998; Turyk et al., 2012). The mixture of benefits and potential harms can lead to uncertainty about the role of fish in a healthy diet (Castro-Gonzalez & Medez-Armenta, 2008). Therefore, an effort to understand the factors that influence people to adopt behaviors consistent with these risks remains a priority. Those behaviors include avoiding or limiting consumption of the fish; avoiding eating large fish, which are more likely to have accumulated toxins; and cleaning and preparing fish in ways that minimize exposure to toxins.

Risk Information Seeking and Processing Model (RISP)

The risk information seeking and processing model (RISP) seeks to explicate the underlying processes that lead individuals to invest in risk information seeking and subsequent preventive behaviors (Griffin et al., 1999). Important to the RISP model is the concept of information insufficiency. It is built on the sufficiency principle articulated by the heuristic-systematic information processing model (HSM) (Eagly & Chaiken, 1993), which asserts that people seek to reach a “sufficient” degree of confidence in order to make judgments and will exercise whatever effort is required to attain that level of judgmental confidence. Information insufficiency is defined as the perceived amount of information an individual would need to deal confidently with a risk (Griffin, Neuwirth, Dunwoody & Giese, 2004). Operationally, information insufficiency is the self-reported gap between the information an individual already possesses (current knowledge) and the information she/he believes is needed to cope with a risky situation (sufficiency threshold). The larger the gap, the model posits, the more motivated an individual will be to seek information about the risk and to process that information more effortfully. The RISP model predicts that factor, such as people’s affective response to the risk (e.g., worry, anger) and their perceptions of the risk’s hazard characteristics should influence information insufficiency and, in turn, affect information-seeking and processing behaviors.

To extend the explanatory reach of the RISP model from information seeking and processing to health behavior, as articulated in the original model, Griffin and his colleagues drew on the TPB (Ajzen, 1991). Specifically, the RISP model postulates that individuals' perceptions of preventive behaviors and hazard characteristics should ultimately influence their attitude toward those behaviors and, in turn, influence their intention to engage in them.

Studies of a variety of health and environmental risks have provided evidence for the usefulness of the RISP model (Yang, Aloe, & Feeley, 2014). However, most studies applying the model, to date, have attended to the segment of the model focused on information seeking and processing outcomes; only a few studies have engaged the TPB aspect of behavior in the model. The current study seeks to grapple with the second stage of the original model by investigating the role of uncertainty and the influence of affective responses on fish consumption behaviors.

Individuals' evaluations of the uncertainty of a health risk could influence the way they respond to the risk behaviorally (e.g., Kim, Kim & Niederdeppe, 2015). However, studies using the RISP model have yet to explore the role of uncertainty judgment and its relationships with affective responses and information insufficiency. Our study attempts to fill this gap. We argue that uncertainty judgment may serve as a link between affective reactions to a health risk and information insufficiency in the RISP model (see Figure 1). Specifically, affective reactions arise from people's appraisal of hazard characteristics. Such affective reactions toward the hazard may serve as informational input to enable people to make judgments about the uncertainty of that hazard. The greater this sense of subjective uncertainty about the complexity and unpredictability of the hazard and its outcomes, then, the greater the perceived information gap because the sense of risk uncertainty provides an internal cue that an individual's current level of information about the hazard is insufficient to adequately address the hazard. That sense of insufficiency, according to the model, prompts individuals to seek information and to process that information more effortfully.

Given that the RI SP model employs concepts from the TPB, judgments about behavioral intentions in the model are assumed to stem from conscious and goal-directed processes. However, affect plays an important role in risk decision making and behavior (Slovic et al., 2005). Past studies using the RISP model have paid relatively little attention to how affective responses could influence health behavioral intentions via their impact on attitude. Our study seeks to remedy that.

This study utilizes a subset of variables in the RISP model—essentially the key variables of perceived hazard characteristics and affective, cognitive and behavioral responses—to examine the roles of uncertainty and affect. A small number of previous studies have used the RISP model to examine the effect of risk information processing strategies on people's behavioral beliefs and attitude strength toward health behaviors (Griffin, Neuwirth, Giese, & Dunwoody, 2002), thus linking risk information processing to behavioral intentions via behavioral beliefs and attitude strength. Here, we focus instead on the influence of negative affect and uncertainty on two behavioral reactions to the risk, as we suspect that information seeking behavior and fish avoidance behavior are two conceptually distinct behavioral reactions. It is important to note that, while this study employs a number of concepts offered by RISP, it is not a test of the RISP model per se, although we will make some recommendations at the discussion stage for its modification.

In the next section, we review the theoretical underpinnings of the relationship between affective reactions and uncertainty judgments, as well as the influence of affective responses on attitudes toward a specific behavior.

Affective Responses and Uncertainty

Communication scholars have developed a number of theoretical frameworks to explore uncertainty (see Bradac, 2001 for a review); here, we employ Brashers's definition (2001): A person's judgment of the level of uncertainty inherent in a risk represents the degree to which he or she perceives that risk as being ambiguous, complex, or unpredictable. The more uncertainty felt about a risk, the less control people believe they have.

How might affective reactions to a health risk influence uncertainty judgments regarding that risk? As argued by appraisal theory, emotions arise from an individual's interpretation of an event (Smith & Ellsworth, 1985). This argument is consistent with the RISP model's propositions that affective responses to a risk stem from the individuals' cognitive assessment of its hazard characteristics. Affective responses may then function as a source of information for individuals, leading them to make judgments about the uncertainty of the risk. The feelings-as-information hypothesis offers a theoretical foundation to explain the process of how people might use affective reactions as information for making judgments. The hypothesis (Schwarz, 2010) argues that people are likely to make use of their affective responses to form an evaluative judgment of an event, especially when the judgmental tasks are complex and demanding. More specifically, people may ask themselves, "How do I feel about the event?" when they form a judgment. The affective reactions triggered by the event, thus, may function as a source of information relevant to the judgmental task. Following the same logic, making judgments about the uncertainty of the risks of eating contaminated fish from the Great Lakes is a difficult and demanding task, thus making individuals' emotional reactions to the risks potentially relevant to the judgment at hand.

Although uncertainty may be associated with positive emotions such as hope, this study focuses on the relationship between specific negative affective states (anger and worry) because of their relevance to the risks of eating contaminated fish.

Affective Responses and Behavioral Intent

Although the TPB has received substantial support over the years in explaining an individual's health-related behaviors, one major critique is the theory's insufficient attention to emotional influences on behavior (Conner & Armitage, 1998). Recent research on the psychology of risk has shown that affect plays a vital role in risk judgment and behavior (Slovic et al., 2005).

Within the TPB framework, affect may shape one's intention to engage in risk- preventive behaviors through its influence on attitude toward those behaviors, in part because both affect and attitude are evaluative reactions to a specific behavior (Clore & Schnall, 2005). That is, affective response is a form of evaluation; as such, the evaluations manifested in affect toward the behavior may map onto the evaluative orientation of attitude toward the behavior. Taking the consumption of fish from the Great Lakes as an example, the evaluations embodied in emotional reactions to the risks of eating fish may be conceptually similar to the evaluative attitudes about related behavioral intentions (such as avoidance) that would lead an individual to minimize the risks of such consumption.

Given that different types of affect are associated with different appraisals of an event (Smith & Ellsworth, 1985), they are likely to influence attitude differently. As such, different affective responses toward eating fish from the Great Lakes may have differential impacts on attitude toward avoiding the consumption of those fish.

Hypotheses and Research Questions

Perceived hazard characteristics, affective responses and uncertainty. The RISP model proposes that people's reactions to a hazard are influenced by individuals' perceptions of the characteristics of that hazard. When considering the risk of eating contaminated fish from the Great Lakes, five variables in the RISP model that are linked to perceived hazard characteristics are relevant to this study: risk judgement, trust in government, personal control, perceived threat to future generations, and risk attribution (Griffin et al., 1999; Griffin et al., 2008). Below, we briefly explain these five factors and their potential influences.

A *risk judgment* is one's subjective appraisal of both the likelihood that a risk may affect one and the severity of that impact, should it occur. A *perceived threat to future generations* denotes the individual's assessment of how likely the health risk would pose harm to future generations. Although these two constructs tap into a person's risk perception, they are conceptually distinct. Risk judgment is an individual-level risk assessment while perceived threat to future generations is societal-level in nature. Evidence has shown that people who perceived greater risk to themselves or to future generations expressed greater uncertainty (Powell, Dunwoody, Griffin, & Neuwirth, 2007) and experienced higher levels of worry or anger (Griffin et al., 2008; Yang & Kahlor, 2013).

Trust in government, which refers to the extent to which individuals depend on the government or its authorized agencies to protect them from health threats, plays a key role when dealing with a potential threat to the public because most people do not have the expertise to assess the risk themselves (Cvetkovich, Siegrist, Murray, & Tragesser, 2002). Evidence suggests that people with less trust in the government are more likely to perceive greater uncertainty (Powell et al., 2007) and to experience negative emotions such as worry and anger (Griffin et al., 2008; Griffin et al., 2004).

Based on the RISP model and previous studies, we propose the following hypotheses regarding these three concepts:

H1: Risk judgment will be positively associated with (a) worry, (b) anger, and (c) uncertainty.

H2: Perceived threat to future generations will be positively associated with (a) worry, (b) anger, and (c) uncertainty.

H3: Governmental trust will be negatively associated with (a) worry, (b) anger, and (c) uncertainty.

Personal control, which reflects individuals' perceptions of their ability to influence the level of harm posed by a health threat, has been positively associated with anger toward regulatory agencies (Griffin et al., 2008). However, the finding of another study using the RISP model indicated no significant relationship between personal control and worry (Griffin et al., 2004). Given that there are mixed findings of the relationship between personal control and affective responses, we pose the following research question:

RQ1: Does personal control relate to (a) worry, (b) anger, and (c) uncertainty?

Risk attribution is a component of perceived hazard characteristics in the RISP model (Griffin et al., 2008). People who ascribed flood damage to poor government management strategies were likely to be angrier; as a result, they tended to express a greater need for information and indicate an intention to engage in more active information seeking, presumably to reassert their own control over the risky situation (Griffin et al., 2008).

Causal attribution may also have an impact on worry. An attribution research study in psychology examined how people perceived their financial position in life and their attributions to causal agents (Smith & Kluegel, 1982). The findings indicated that people who perceived themselves as poor felt more worry when they attributed the causes of their financial situation to their social contexts.

For the purpose of our study, we conceptualize *risk attribution* as the degree to which individuals consider that eating the contaminated fish could make them sick. This conceptualization is appropriate in the context of risk since it describes the individual's recognition that an action could influence the probability of an undesirable future event and, thus, is similar to the TPB concept of a behavioral belief (Ajzen, 1991). Risk attribution could be internal (e.g., my behavior could cause a risk to my health), external (e.g., I incur a risk because of the behaviors of others, including organizations and agencies), or a combination.

Both worry and anger about potentially becoming ill could be associated with risk attribution (one might expect anger to be more likely if an external agent is perceived as the culprit). Risk attribution might affect uncertainty as well. If individuals realize that their behavior might have negative consequences, that might increase their uncertainty about performing an action that had heretofore seemed risk-free. In addition, people suffering from illnesses face innumerable uncertainties, such as whether health professionals can accurately diagnose the problem, how much those professionals understand the course of disease and prognosis, and whether those treatments are likely to be effective. These sources of uncertainty in illness (Mishel, 1997) might also arise in the minds of people wondering whether their behaviors (e.g., eating contaminated fish) might have negative health consequences.

These matters require much more exploration. Thus, we pose the research question:

RQ2: Does risk attribution relate to (a) worry, (b) anger, and (c) uncertainty?

Affective responses and uncertainty. Anger and worry are two potential affective reactions to the prospect of adverse health risks. Appraisal theory suggests that anger is associated with assessments of one's own goal obstacles and level of control (Kuppens, Van Mechelen, Smits, & De Boeck, 2003). In the context of health hazards, a feeling of anger is particularly likely to develop when individuals feel they have lost control over a situation (Griffin et al., 2008). Worry in the RISP model is regarded as a feeling that reflects the anxiety caused by a future hazard (Griffin et al., 1999). According to the feelings-as-information hypothesis (Schwarz, 2010), affective responses to a health hazard may influence individuals' judgment. Research on environmental health risk (Powell et al., 2007) and cancer risk (Han, Moser, & Klein, 2006) has shown positive associations between negative emotions (worry and anger) and uncertainty. Guided by this evidence, we posit the following:

H4: Greater levels of (a) worry about and (b) anger toward the risk of eating contaminated fish from the Great Lakes will be positively associated with uncertainty judgments.

Affective responses, information insufficiency, and attitude toward fish avoidance. Affective reactions may promote behavioral change through their influence on attitudes toward the behavior (Clore & Schnall, 2005). Anger leads to behavioral efforts to protect one's health. For example, angry residents in flood-prone areas in one study were motivated to gather more information about the flood risk (Griffin et al., 2008), suggesting that anger increased the need for information (i.e., information insufficiency). Furthermore, the experience of anger may facilitate behavior change. Because anger is associated with the desire to defend oneself and correct perceived wrongs, angry people with high levels of self-efficacy are more likely to adopt the advocated behavior to "fix" the situation after reading anger-promoting health messages (Turner, 2007).

Similarly, worry prompts individuals to engage in problem-solving processes and threat prevention behavior. For example, worry is an important determinant of personal and government action for risk reduction (Baron, Hershey, & Kunreuther, 2000; McCaul, Mullens, Romanek, Erickson, & Gatheridge, 2007).

Based on the above argument, we pose the following hypotheses:

H5: Worry will be positively associated with (a) information insufficiency and (b) attitude toward fish avoidance.

H6: Anger will be positively associated with (a) information insufficiency and (b) attitude toward fish avoidance.

Uncertainty judgment, information insufficiency, and attitude toward fish avoidance. Uncertainty about a health risk, in this study, involves one's subjective judgment about the ambiguity, complexity, and unpredictability of the consequence of the risk. Griffin and his colleagues (1999) argued that one's degree of uncertainty about a risk reflects aspects of judgmental confidence regarding that risk. In addition, people are uncertain when they decide that their level of knowledge is not sufficient to permit them to decide what to do (Weary & Edwards, 1996). As a result, uncertainty appraisal in a risk context could heighten the need for more information. We pose the following a hypothesis:

H7: Greater levels of uncertainty will be positively associated with information insufficiency.

Uncertainty signals a perceived loss of control over one's environment. As a result, uncertainty is regarded as an aversive mental state that people attempt to reduce (Weary & Edwards, 1996). In this sense, uncertainty can be a behavioral motivator (Hogg, 2000). In the case of this study, avoiding fish from the Great Lakes is one way to reduce the uncertainty of adverse effects. Therefore, people who are uncertain may be motivated to have more positive attitudes toward fish avoidance. However, the relationship between uncertainty and attitude toward a healthy behavior has not yet been examined in the context of risk. Therefore, we pose the following research question:

RQ3: Do uncertainty judgments relate to attitudes toward fish avoidance?

Attitude toward fish avoidance, information insufficiency, and behaviors. Consistent with RISP predictions**,** much evidence supports the relationship between information insufficiency and information seeking behavior (Yang et al., 2014; Hwang & Jeong, 2016). A prior study also provides support to the relationship between attitude toward a behavior and an individual's intention to perform that behavior (McEachan, Conner, Taylor, & Lawton, 2011). Following the same logic of the TPB, behavioral intention is hypothesized as the proximal antecedent to action, and meta-analyses show that behavioral intention is a good predictor of an actual behavior (Conner & Sparks, 2005). Thus, we posit the following hypotheses:

H8: Information insufficiency will be positively associated with information seeking behavior.

H9: Attitude toward fish avoidance will be positively associated with intention to avoid fish.

H10: Fish avoidance intention will be positively associated with subsequent fish avoidance behavior.

Figure 1 shows a graphical representation of the hypothesized model of this study. The hypotheses and research questions are indicated on the relevant paths in the model.

METHOD

Data

This study is a secondary analysis of panel survey data collected by Griffin, Dunwoody, and Neuwirth from two large midwestern cities between 1996 and 1999. The current analysis of a subset of 334 respondents was part of this three-year panel study[1] (see Table I for sample

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[1] A three-wave, panel-design, telephone sample survey was conducted by the Wisconsin Survey Research Laboratory between 1996 and 1999. Funding was provided by a grant from the U.S. Agency for Toxic Substances and Disease Registry. Residences were chosen by random digit dialing (RDD) and the respondents were selected randomly within households. The sample size in the first wave was 1,123 with a 55% response rate. Of the 1,123 respondents, 716 (63.8% re-interview rate) were successfully re-interviewed in the second wave. With the purpose of controlling for sensitization in the panel, 171 new respondents were added by using the same sampling procedure as in the first wave. The total sample size in the second wave was 887 with a 41% response rate. The interviews took about 20 minutes. Respondents in the first- and second-wave were divided into three groups, and each group was asked to give their perception of one of the three risks involving the Great Lakes: eating potentially contaminated fish, drinking tap water drawn from the Lakes, and potential threats to the Great Lakes' ecosystem. In the third wave of the study, only the respondents who were asked about the potential risks of eating contaminated fish were recontacted, which consisted of a sample size of 356 and a 34% response rate (296 respondents remained from the first wave of the eating potential contaminated fish group, and 60 were added in the second wave).

A subset (N= 166) of the 356 respondents in the wave three of the panel survey was randomly chosen to receive a magazine-like article about the health of the Great Lakes and its fish (i.e., information catalyst). The primary goal of the information catalyst was to examine information processing strategies. Given that this is not the foci of the current study, the *information catalyst* was included as control variable (0 = did not receive the information catalyst, 1 = received the information catalyst and read it). Respondents, who received the information catalyst but did not read it, were excluded from this analysis (n =

characteristics). Respondents were randomly drawn from two cities situated on the shores of the Great Lakes: Milwaukee, Wisconsin, on Lake Michigan and Cleveland, Ohio, on Lake Erie.

This longitudinal study afforded the opportunity to examine the influences of affective responses and uncertainty judgments on subsequent risk-preventive behavior. To achieve this, we utilized variables from panel survey waves two and three. All but one of the variables come from the wave two survey while the fish avoidance behavior variable was taken from the wave three survey, conducted a year later[2]. The wave three behavioral item allows us to strengthen causality arguments by introducing a time lag between the expression of a behavioral intention at wave 2 and the behavior itself for one of our dependent variables. However, information seeking, the second behavioral reaction in this study, was limited to data from the wave two surveys because comparable measures of self-reported information seeking behavior were not gathered in wave 3.

Measures

Table II presents reliability calculations for aggregate variables and Pearson's correlations for the variables. Table III presents item wording, measurement scales and descriptive data for all variables and indices.

Perceived hazard characteristics involve five variables: *risk judgment, personal control, governmental trust, perceived threat to future generations, and risk attribution*. Specifically, the *risk judgment* variable was created by multiplying respondents' subjective appraisal of the probability of coming to harm with their appraisal of the symptom severity that could stem from consuming fish caught in the Great Lakes (see Table III for details).

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22) because these respondents did not require to answer some items in the wave three surveys. Therefore, a total of 334 respondents were included in this study.

[2] We used data from the wave 2 and wave 3 surveys for analysis because the wave 1 survey contained no measures related to TPB (e.g., fish avoidance intention and fish avoidance behavior). The only place in the entire three-wave panel surveys where we have the chance to see whether behavioral intention predicts to future behavior is from behavioral intention in wave 2 surveys and the actual behavior in wave 3 surveys.

Personal control was measured by averaging three items assessing perceived individual ability to maintain control over the risk. *Governmental trust* was measured by averaging three items assessing respondents' trust in the government to manage the risk.

Perceived threat to future generations was captured by a single item in which respondents were asked to what extent they agreed that contamination of fish in the Great Lakes threatens the health and safety of future generations. *Risk attribution* was measured by a single item, which tapped into people's perception that consumption of contaminated fish might be hazardous to them personally.

Uncertainty judgment was captured by a single item in which respondents were asked to indicate their degree of uncertainty when they think about the possible health risk to them posed by eating fish from the Great Lakes.

The affective responses, *worry* and *anger*, were each measured by a single item. Respondents indicated their levels of *worry* and *anger* when asked to think about the potential health risk to them posed by eating Great Lakes fish.

Current knowledge and sufficiency threshold were used to construct the variable *information insufficiency*, which tapped into respondents' perceptual gap between the information they possessed and the information they felt they needed to deal confidently with the health risk of eating fish from the Great Lakes.

Information seeking behavior was captured by averaging two items assessing respondents' behavior to seek information about eating Great Lakes fish. *Attitude toward fish avoidance* was measured by averaging four items assessing respondents' views about avoiding eating fish from the Great Lakes. *Fish avoidance intent* was captured by averaging two items assessing respondents' intentions to avoid eating Great Lakes fish. As noted earlier, *fish avoidance* *behavior* was taken from the wave three surveys and it was measured by a single item. Respondents self-reported how often they had eaten fish caught from the Great Lakes in the past summer.

Individual characteristics and whether or not the respondent was given the opportunity to read an article about Great Lakes fishing were used as control measures. Individual characteristics included *education* (measured as educational attainment ranging from grade school to postgraduate), *annual household income, age, ethnicity* (minority group; 0 = no, 1 = yes), *gender* (1 = male, 2 = female), *political conservatism* (measured on a 5-point scale ranging from 1 being liberal to 5 being conservative), and *experience with food-borne illness* (measured on a dichotomous scale whether or not the respondent had ever suffered from food poisoning; 0 = no, 1 = yes).

RESULTS

Analysis

Using maximum likelihood estimation with robust standard errors in Mplus 6.11, we examined the paths and statistical fit of the measurement model, followed by the full structural model. Missing data for all variables (less than 1%) were handled by list-wise deletion. Governmental trust, personal control, attitude toward fish avoidance, information seeking, and fish avoidance intent were measured as latent constructs, while perceived threat to future generations, risk attribution, uncertainty, worry, and anger were treated as single-item, observed variables. Risk judgment and information insufficiency were each treated as observed variables by fixing the error variance at zero. Individual characteristics and whether a person read the information catalyst were controlled in the measurement and structural models, using the residual approach (Stephenson & Palmgreen, 2001). In addition, we added a residual correlation between worry and anger because both are affective responses to the health risk. The measurement model indicated that the data achieved a good fit[3,4,] CFI = 1.0, SRMR = 0.03, RMSEA = 0.01 (90% CI: .00, .03), χ^2 (67, N = 334) = 67.92, p = 0.45, and the structural model achieved an adequate fit[2], CFI = .92, RMSEA = 0.06 (90% CI: .05, .07), χ^2 (179, N = 334) = 378.47, χ^2 /df = 2.11, p < .001, SRMR = 0.10. The structural model is shown in Figure 2. We employ one-tailed tests to test directional hypotheses testing and two-tailed tests to answer our research questions (Hayes, 2009).

Hypotheses and Research Questions

Worry with perceived hazard characteristics. Hypotheses 1a and 2a predicted that risk judgment and perceived threat to future generations, respectively, would be positively related to worry. The data support both H1a (β = .19, p < .001) and H2a (β = .10, p < .05). That is, people were more inclined to worry when they perceived greater personal risks and greater risk to future generations from eating Great Lakes fish. RQ2b asked about the relationship between risk attribution and worry. Results showed that respondents, when deciding whether to eat Great Lakes fish, were more likely to worry if they considered the impact of fish consumption on their health (β = .27, p < .001).

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3 According to guidelines for adequate and/or acceptable mode fit (Holbert & Stephenson, 2002; Hu & Bentler, 1995), a value of the root mean squared error of approximation (RMSEA) below .06 is considered a good fit, and a value less than or equal to .08 indicates an adequate fit with the upper bound of the 90% RMSEA confidence interval less than .10. A value of Comparative Fit Index (CFI) greater than .90 indicates an adequate fit, and a value greater than .95 suggests a good fit. The value of a standardized root mean squared residual (SRMR) of less than .08 is considered acceptable. A nonsignificant chi-square distributed test statistic (χ^2) is considered a good fit; however, this statistic is sensitive to sample size (Hu & Bentler, 1995). Therefore, the χ^2 /df was also reported where a value less than five suggested a good fit (Kline, 2005).

4 The factor loading of the three items of personal control were: item 1 = .83***, item 2 = .80***, item 3 = .77***; The factor loading of the three items of governmental trust were: item 1 = .72***, item 2 = .78***, item 3 = .64***; the factor loading of the four items of attitude toward fish avoidance were: item 1 = .88***, item 2 = .81***, item 3 = .71***, item 4 = .49***; the factor loading of the two items of fish avoidance intention were: item 1: .98***, item 2 = .92***; the factor loading of the two items of information seeking were: item 1: .86*, item 2: .60*. For the specific items of each variable, please refer to Table III. * < .05, ** < .01, *** < .001.

H3a predicted a negative relationship between governmental trust and worry. However, governmental trust ($\beta = -.10$, *n.s.*) was not related to worry, so H3a was not supported. RQ1a asked about the relationship between personal control and worry. We found that personal control ($\beta = -.04$, *n.s.*) was not associated with worry.

3.2.1. Anger with perceived hazard characteristics

H1b posited that risk judgment would be positively related to anger. The data supported H1b ($\beta = .12$, $p < .05$), suggesting that people felt angrier when they perceived a greater level of personal risk from eating contaminated fish from the Great Lakes.

H3b postulated a negative relationship between governmental trust and anger. Governmental trust ($\beta = -.19$, $p < .001$) was indeed significantly and negatively associated with anger, so H3b was supported. Individuals were more likely to feel angry when they felt less trusting of government's ability to protect them from the risks of eating contaminated Great Lakes fish.

RQ2b queried the relationship between risk attribution and anger. Risk attribution and anger were positively related ($\beta = .34$, $p < .001$), suggesting that respondents felt angrier when they perceived a clearer causal link between their health and eating fish.

H2b posited that perceived threat to future generations would be positively related to anger. However, that was not the case ($\beta = .09$, *n.s.*). RQ1b asked about the relationship between personal control and anger; we found that personal control ($\beta = .01$, *n.s.*) and anger were not related.

Uncertainty with perceived hazard characteristics. Hypotheses 1c and 2c predicted that risk judgment and perceived threat to future generations, respectively, would be positively related to uncertainty judgments. H3c postulated a negative relationship between governmental trust and uncertainty judgments. Contrary to H1c, risk judgment ($\beta = -.02$, *n.s.*) was not related to uncertainty. However, perceived threat to future generations (β = .11, p < .001) and governmental trust (β = -.09, p < .05) were significantly associated with uncertainty in the expected directions, supporting H2c and H3c. The findings suggest that individuals were more likely to perceive uncertainty about the potential health risks when they were less trusting of government or when they perceived a greater risk to future generations. Unexpectedly, perceived risk to oneself did not predict to uncertainty.

RQ1a and RQ2a examined the associations of personal control and risk attribution with uncertainty. The results indicate that personal control (β = -.10, p < .05) was negatively related to perceived uncertainty, suggesting that respondents who perceived less control over the risk tended to have greater uncertainty about the risk. However, risk attribution and uncertainty were unrelated, (β = -.02, *n.s.*).

Worry, anger, and uncertainty. H4a and 4b postulated that both worry and anger would be positively related to uncertainty. Both worry (β = .48, p < .001) and anger (β = .30, p < .001) were indeed significantly associated with uncertainty judgments, suggesting that people tended to perceive greater uncertainty when they felt more negative affect.

Information insufficiency with worry, anger, and uncertainty. H5a, H6a and H7 postulated that worry, anger and uncertainty would be positively associated with information insufficiency, and these relationships indeed emerged (β = .14, p < .05). This suggests that people tended to sense a greater need for information when they were uncertain about the risk. However, neither worry (β = .10, *n.s.*) nor anger (β = .10, *n.s.*) was related to information insufficiency.

Attitude toward fish avoidance with worry, anger, and uncertainty. H6b proposed that anger would be positively associated with attitude toward fish avoidance. This turned out to be the case (β = .18, p < .05). People who felt angrier about the presence of contamination in fish from the Great Lakes preferred to avoid eating those fish.

H5b proposed a positive relationship between worry and attitudes toward fish avoidance, while RQ3 asked about the relationship between uncertainty and attitudes toward fish avoidance. The findings, however, showed that neither worry (β = -.01, *n.s.*) nor uncertainty (β = -.03, *n.s.*) had a relationship with attitude toward fish avoidance.

Information insufficiency and information seeking behavior. H8 postulated that information insufficiency would be positively associated with information-seeking behavior. Analysis revealed that information insufficiency (β = .47, p < .001) and information seeking behavior were indeed positively related, suggesting that people who perceived a greater need for information to deal adequately with the health risks were likely to express a greater intention to seek information about those risks.

Attitude toward fish avoidance, fish avoidance intent, and fish avoidance behavior. H9, which predicted a positive relationship between attitudes toward fish avoidance and fish avoidance intent, was supported (β = .11, p < .05). Individuals who felt more strongly about avoiding fish consumption from the Great Lakes indicated greater behavioral intentions to do so. H10 predicted a positive association between fish avoidance intent and subsequent fish avoidance behavior. The hypothesis was supported (β = .45, p < .001), suggesting that people who had a greater intention to avoid the fish from the Great Lakes were indeed more likely to report eating less fish a year later. Figure 2 illustrates the structural model stemming from these tests.

Additional mediation analyses. One unanticipated finding was that worry and anger had no direct, significant influence on information insufficiency. That led us to investigate whether the effect of worry and anger on information insufficiency and attitude toward fish avoidance might be fully mediated by uncertainty judgment. Table IV presents the direct and indirect effects.

The findings indicate that the effect of worry on information insufficiency is indeed fully mediated by uncertainty judgments, ($\beta = .07$, $p < .05$), as is the effect of anger on information insufficiency ($\beta = .04$, $p < .05$). However, the indirect effects of worry and anger on attitude toward fish avoidance via uncertainty judgment were not significant, (worry: $\beta = -.02$, *n.s.*; anger: $\beta = .07$, *n.s.*). In short, both worry and anger seem to have influenced information insufficiency via uncertainty judgments. That is, anger and worry seem to have boosted perceptions of uncertainty, which in turn generated a greater need for information (i.e., information insufficiency) and subsequent information-seeking behavior. Anger had a direct influence on attitude toward fish avoidance, but worry remained unrelated to attitude toward fish avoidance, either directly or indirectly.

DISCUSSION

Using the Risk Information Seeking and Processing model (RISP), this study set out to investigate the relationships among affective responses toward the risk of eating contaminated fish, uncertainty judgments about that risk, and attitudes toward health behaviors that would minimize the risk. To do so, we used the longitudinal dataset collected by Griffin, Dunwoody, and Neuwirth between 1996 and 1999 for secondary analysis. A major difference between the previous studies using the same dataset and this current study is that we utilized a subset of variables from the RISP model and added uncertainty judgment as a separate variable to examine its relationship with affective responses and their influences on health-related behavioral responses. As a result, this study provides a clearer understanding of the role of uncertainty judgments relative to affective attitudes and subsequent behavioral responses.

Using data collected nearly twenty years ago is always a concern. However, this study is a theory-building effort, freeing it to some extent from the strictures levied by the need for data currency. Although risk issues and behaviors will change over time, the conceptual links between affective responses to risks and perceptions of the uncertainty of those risks should remain fairly stable. An understanding of those links is important not only to risk communication scholars who will continue to advance our understanding but also to risk managers, who will encounter uncertainty perceptions and emotional reactions across an array of risks. Additionally, the ability to explore the causal link between a behavioral intention (to avoid fish) and actual behavior a year later make this data set unique.

An overarching finding in this study is that uncertainty plays a central role in the RISP model. Our analysis revealed that perceived threat to future generations, personal control and governmental trust influenced uncertainty, which in turn had an impact on information insufficiency. That is, people's uncertainty judgments about the risk of eating contaminated fish from the Great Lakes seem to have been influenced by the extent to which they felt they had personal control, their level of trust in government, and their perceptions of threat to future generations. Our findings also showed that the more worried and angry people felt about the risk, the more they perceived that risk as uncertain. This strong association between emotions and uncertainty judgments supports the feelings-as-information hypothesis (Schwarz, 2010). The centrality of uncertainty as a factor in this study is striking.

This examination of the relationship between uncertainty and information insufficiency (see Figure 2) also contributes to the advancement of the RISP model. As defined in this study, uncertainty judgment refers to individuals' subjective appraisal of ambiguity, complexity, and the unpredictability of a risk. On the other hand, judgmental confidence in HSM is part of, and indirectly operationalized by, the information insufficiency variable in the RISP model. As shown in our findings, uncertainty judgments about a health risk and level of information insufficiency are significantly related, but uncertainty judgment taps into only some aspects of judgmental confidence in the information insufficiency concept. Although these two variables are related, they are not synonymous. They are only moderately correlated, r = .35, $p < .001$, and uncertainty judgment explained less than 10% of the variance in information insufficiency. Our findings suggest that uncertainty judgment is an important variable that should be treated separately in the RISP model. Other factors in the model, such as informational subjective norms, as well as individuals' tolerance of uncertainty and their ability to adapt to uncertainty, both emphasized in uncertainty management theory (Bradac, 2001), may also influence information insufficiency.

Another important theoretical contribution to the RISP model stemming from this study is an exploration of the influence of negative affective states on attitudes toward a risk-related behavior (See Figure 2). Our findings revealed that anger and worry seemed to have influenced attitudes differently. Specifically, anger—but not worry—had a significant direct and positive impact on attitude toward fish avoidance. People who expressed more anger about the risk of consuming contaminated Great Lakes fish were more likely to indicate a greater likelihood of avoiding fish, a finding consistent with the literature. However, neither worry nor anger was directly related to information insufficiency. The influence of these two affective states on information insufficiency was indirect, through uncertainty judgments.

The lack of a relationship between worry and attitude toward fish avoidance is an interesting finding given the ubiquity of the use of "worry" and its analogs in risk communication studies. One possible explanation is that worry is a different type of emotion. Bohm and Pfister (2000) argued that worry is a prospective, loss-based emotion, resulting from subjective anticipation of future negative events causing loss, harm and danger. Risk studies have shown that prospective, loss-based emotions are more likely to motivate people to actively engage in preventive behaviors such as taking actions to reduce or mitigate the potential harmful consequences and to improve the situation. For example, Robinson and his colleagues (2001) showed that worry was associated with anticipated effortful coping strategies. One could argue that the behavioral intention we chose—avoiding fish—is a more passive behavior and, thus, less likely to be aligned with worry than more active behaviors such as information seeking or preparing fish in ways that minimize the presence of contaminants.

A unique design element of this current analysis was to add a time lag between fish avoidance intention and fish avoidance behavior, thanks to the availability of data from two waves of the original study, separated by a year. This enabled us to reflect on causality in our assessment of the link between the intent to perform a health behavior and the actual behavior. Our finding shows a strong association between the two. That is, respondents' intention to avoid fish from the Great Lakes was strongly related to their actual fish avoidance behavior a year later. This finding provides an empirical addition to the causal link between behavioral intention and the actual behavior in the RISP model.

Our findings also provide useful insights into the differential influence of perceived hazard characteristics on these affective responses to the health risk. Risk judgment had a significant and positive impact on both worry and anger, but, it did not relate to uncertainty. Although respondents may perceive eating contaminated fish from the Great Lakes region as a low-level risk (*M* = 18.99 on a scale of 0 to 100, *SD* = 22.43) and this perceived low-level risk generates relatively low levels of worry, those worry levels do influence uncertainty. It appears that a person needs to make the link between risk judgment and worry before the dyad affects uncertainty perceptions.

Consistent with the literature, risk attribution was also positively related to both worry and anger. However, while perceived threat to future generations had a significant positive impact on worry, its impact on anger was negligible. Conversely, governmental trust was negatively related to anger but played a negligible role in worry. When pondering the behavior of “responsible” agencies, people may react to perceived negligence with more moral emotions, such as anger. These differences between anger and worry remind us that affective emotions, even when on the same side of the valence continuum (negative in this case) can have conceptually distinct impacts on attitudes and behavior.

Risk attribution, defined as the extent to which individuals think about whether eating the contaminated fish could potentially cause them to become ill, was related to both worry and anger, suggesting that risk attribution affects emotions at both individual (worry) and societal (anger) levels. In other words, among local residents who expected to become ill from eating contaminated Great Lakes fish, we found not only a heightened sense of individual worry but also increased levels of anger toward agencies in charge of managing risks at a societal level. Future research could profitably examine risk attribution as a form of outcome expectancy and its effect on variables in the RISP model. Further studies might also explore internal and external risk attributions.

In addition to enhancing our theoretical understanding of risk communication processes, our results have some practical implications. Many health risk managers try to minimize communication of uncertainty, but this study suggests that making uncertainty a substantive part of a risk message may be the better strategy. Helping audiences understand the extent of uncertainty about a health risk may help worried individuals to perceive a greater need for information about the risk, which in turn may prompt them to seek out more information. In the case of Great Lakes fish consumption advisories, for example, risk communicators might emphasize the risk's complexity by drawing the audience's attention to factors that influence the effects of consuming contaminated fish on themselves and on the future generations. Such intervening factors may include the level of contaminants in different sizes and species of fish, the incubation period of different contaminants, and the ways in which individuals may react—both biologically and psychologically—to the contaminants.

Similarly, risk communicators may want to consider valuing – rather than trying to avoid – audiences' affective responses to a risk. As shown in our findings, anger regarding the risk of consuming contaminated fish from the Great Lakes was associated with a positive attitude toward fish avoidance. According to Turner's anger activism model (Turner, 207), people who feel moderately angry about a health risk and who experience high levels of efficacy are more intent on engaging in strategies to cope with risky situations. Therefore, as suggested by Turner, carefully crafted risk messages that anticipate moderate level of anger and that foster individuals' self-efficacy may encourage people to take actions to address the risk.

It is important to consider the limitations of this study. First, because this was a secondary analysis, we were restricted to single-item measures for some constructs (e.g., perceived threat to future generations, specific affective responses). Future research may seek to measure these constructs in a more comprehensive way. And while the theory-building components of this study are, we think, of value, the data focus on only one risk. These affect/uncertainty/behavior patterns need to be replicated using other risk issues.

This study provides some other suggestions for subsequent research. As noted earlier, other factors may also influence information insufficiency. Examining the constructs important to uncertainty management, problem integration, and uncertainty reduction theories within the framework of RISP may have merit. Furthermore, individuals' tolerance of uncertainty may also play an important role in information insufficiency. Studies that can examine the interplay of both individual and societal factors in the construction of uncertainty perceptions will be useful next steps in this risk communication domain. Finally, information processing – especially systematic processing – should relate positively to the stability of attitude toward the behavior, behavioral intention, and actual behavior over time. Those are important concepts when it comes to people adopting healthier lifestyles. Therefore, future research should examine the link between information processing to the stability (or change) in attitude toward the behavior, behavioral intention and the actual behavior over time.

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Table 1. Participant Characteristics

Characteristics	*N* (%)
Gender	
Male	162 (48.5%)
Female	172 (51.5%)
Age	
Mean: 50.31 years old; Standard deviation: 15.09 years old	
Education	
Eighth grade or less	4 (1.2%)
Some high school	12 (3.6%)
High school grad or GED certificate	81 (24.3%)
Some college or associate degree	109 (32.6%)
College graduate	73 (21.9%)
Postgrad or professional degree	55 (16.5%)
Race	
White	293 (87.7%)
Non-white	41 (12.3%)
Annual income before taxes (US Dollars)	
Mean: 47023.95; Standard deviation: 27501.78	

Note. *N*= 334.

Table 2. Reliabilities and correlations of the variables.

	Reliability	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Risk judgment	-	1.00												
2. Perceived threat to future generations[1]	-	.32***	1.00											
3. Personal control[2]	.84	-.06	.02	1.00										
4.Governmental trust[2]	.76	-.19***	-.11	.01	1.00									
5. Risk attribution[1]	-	.33***	.41***	.10	-.11*	1.00								
6. Uncertainty judgment[1]	-	.29***	.35***	-.09	-.25***	.33***	1.00							
7. Worry[1]	-	.33***	.32***	-.02	-.17**	.38***	.73***	1.00						
8. Anger[1]	-	.30***	.32***	.04	-.25***	.44***	.69***	.74***	1.00					
9. Information insufficiency Current knowledge Sufficiency Threshold	-	.14*	.14*	.01	-.17**	.16**	.28***	.27***	.26***	1.00				
10. Information seeking behavior[2]	.72	.15**	.21***	.08	-.07	.29***	.29***	.36***	.43***	.38***	1.00			
11. Attitude toward fish avoidance[2]	.75	.00	.04	-.01	-.04	.07	.11	.10	.16**	.03	.08	1.00		
12. Fish avoidance intent[2]	.94	.31***	.34***	.01	-.23***	.47***	.36***	.37***	.42***	.06	.10	.10	1.00	
13. Fish avoidance behavior	-	.06	.13*	.17**	-.10	.22***	.19***	.19**	.21***	-.08	-.01	-.01	.44***	1.00

Note. [1] denotes single item measure, [2] denotes Cronbach's alpha. *$p < .05$, **$p < .01$, ***$p < .001$. *N*=334.

Table 3. Descriptive data for key variables

Concepts	M	SD	Measures
Risk judgment (Risk judgement = perceived susceptibility x perceived severity) (0-100 scale)	18.99	22.43	(Perceived susceptibility) How likely are *you* to become ill in the future from eating contaminated fish caught in Lake [Michigan] [Erie]? (11-point scale: 0 = you would have absolutely no chance whatsoever of becoming ill to 10 = you are certain to) (Perceived severity) If you were to become ill from eating contaminated Lake [Michigan] [Erie] fish, how serious do you think this illness would be? (11-point scale: 0 = not serious at all to 10 = it would be as serious as it can possibly be)
Personal control (5-point scale: 1 = strongly disagree to 5 = strongly agree)	4.15	.68	(Item 1) If I want to, I could easily avoid eating fish from the Great Lakes. (Item 2) I have personal control over whether or not I would eat the fish from the Great Lakes. (Item 3) Whether or not I would eat the fish from the Great Lakes is completely up to me.
Governmental trust (5-point scale: 1 = strongly disagree to 5 = strongly agree)	2.76	.87	(Item 1) The government is doing a competent job of protecting people's health from risks related to eating contaminated Great Lakes fish. (Item 2) I trust the government to protect me from risks related to eating contaminated Great Lakes fish. (Item 3) Government officials care about the health and safety of people like me.
Perceived threat to future generations (5-point scale: 1 = strongly disagree, 3 = Feeling netural, 5 = strongly agree)	3.88	1.02	Contamination of fish in Lake [Michigan] [Erie] threatens the health and safety of future generations.

Risk attribution (5-point scale: 1 = strongly disagree, 3 = Feeling netural, 5 = strongly agree)	3.69	1.05	In deciding whether or not to eat fish from Lake [Michigan] [Erie], I take into account whether I might be at risk from PCBs.
Uncertainty judgment (11-point scale: 0 = none of this feeling to 10 = a lot of this feeling)	5.38	3.08	When you think about the possible *health risks posed to you* from eating Lake [Michigan] [Erie] fish, how much uncertainty do you feel?
Worry (11-point scale: 0 = none of this feeling to 10 = a lot of this feeling)	4.45	3.26	When you think about the possible *health risks posed to you* from eating Lake [Michigan] [Erie] fish, how much worry do you feel?
Anger (11-point scale: 0 = none of this feeling to 10 = a lot of this feeling)	4.82	3.46	When you think about the possible *health risks posed to you* from eating Lake [Michigan] [Erie] fish, how much anger do you feel?
Information insufficiency[1]			
Current knowledge	38.65	22.67	Now, we would like you to rate your knowledge about this risk. Please use a scale of zero to 100, where zero means knowing nothing and 100 means knowing everything you could possibly know about this topic. Using this scale, how much do you think you currently know about the risk from eating Lake [Michigan] [Erie] fish?
Sufficiency threshold	66.29	22.12	On a scale of zero to 100, where zero means need to know nothing and 100 means need to know everything they could possibly know to deal adequately with this risk in your life, How much knowledge you would *need* to deal adequately with the possible risk from eating Lake [Michigan] [Erie] fish in your own life?

Information seeking behavior (5-point scale: 1 = strongly disagree to 5 = strongly agree)	3.41	.81	(Item 1) When it comes to the risk from eating Lake [Michigan] [Erie] fish, I'm likely to go out of my way to get more information. (Item 2) When the topic of risks from eating Lake [Michigan] [Erie] fish comes up, I try to learn more about it.
Attitude toward fish avoidance (5-point scale: 1 = strongly disagree to 5 = strongly agree)	3.11	.74	For me to avoid eating fish from Lake [Michigan] [Erie], (Item 1) would be a good thing to do. (Item 2) would be beneficial for me. (Item 3) would be a rewarding thing to do. (Item 4) would be a useless thing to do. (reversed)
Fish avoidance intent (5-point scale: 1 = strongly disagree to 5 = strongly agree)	2.88	1.14	Given the opportunity to eat fish from Lake [Michigan] [Erie] (item 1) in the next few months, I would definitely avoid the fish. (item 2) next summer, I would definitely avoid the fish.
Fish avoidance behavior (the item was from the wave 3 surveys; 3-point scale: 1= Not at all, 2 = Once or twice, 3 = More than once or twice)	2.06	.79	This past summer, about how often did you eat fish caught in Lake [Michigan] [Erie]? This could be fish caught by an angler or purchased from a store or restaurant. Would you say not at all, once or twice, or more than once or twice? (reversed)

Note. [1]To construct the *information insufficiency* variable, we used the residual approach rather than the difference score approach (i.e., rather than subtracting the current knowledge score from the sufficiency threshold score). [(73)] The difference score approach suffers from the problems of a high correlation between current knowledge and difference scores and measurement errors.[(74)] In the residual approach, current knowledge was entered into the regression equation as a predictor of the sufficiency threshold, and the predicted value was saved as the unstandardized residual. As such, the variance accounted for by current knowledge was removed from the information sufficiency threshold. The unstandardized residual then served as the information insufficiency variable.

Table 4. Direct and indirect effect of worry and anger on information insufficiency and attitude toward fish avoidance.

	Information insufficiency		Attitude toward fish avoidance	
	Worry	Anger	Worry	Anger
	β	β	β	β
Total effect	.17†	.14†	-.00	.16†
Direct effect	.10	.10	.02	.17†
Indirect effect via uncertainty	.07†	.04†	-.02	-.01

Note. β denotes standardized beta. N=334, * < .05, ** < .01, *** < .001, two-tailed test; † < .05, †† < .01, ††† < .001, one-tailed test.

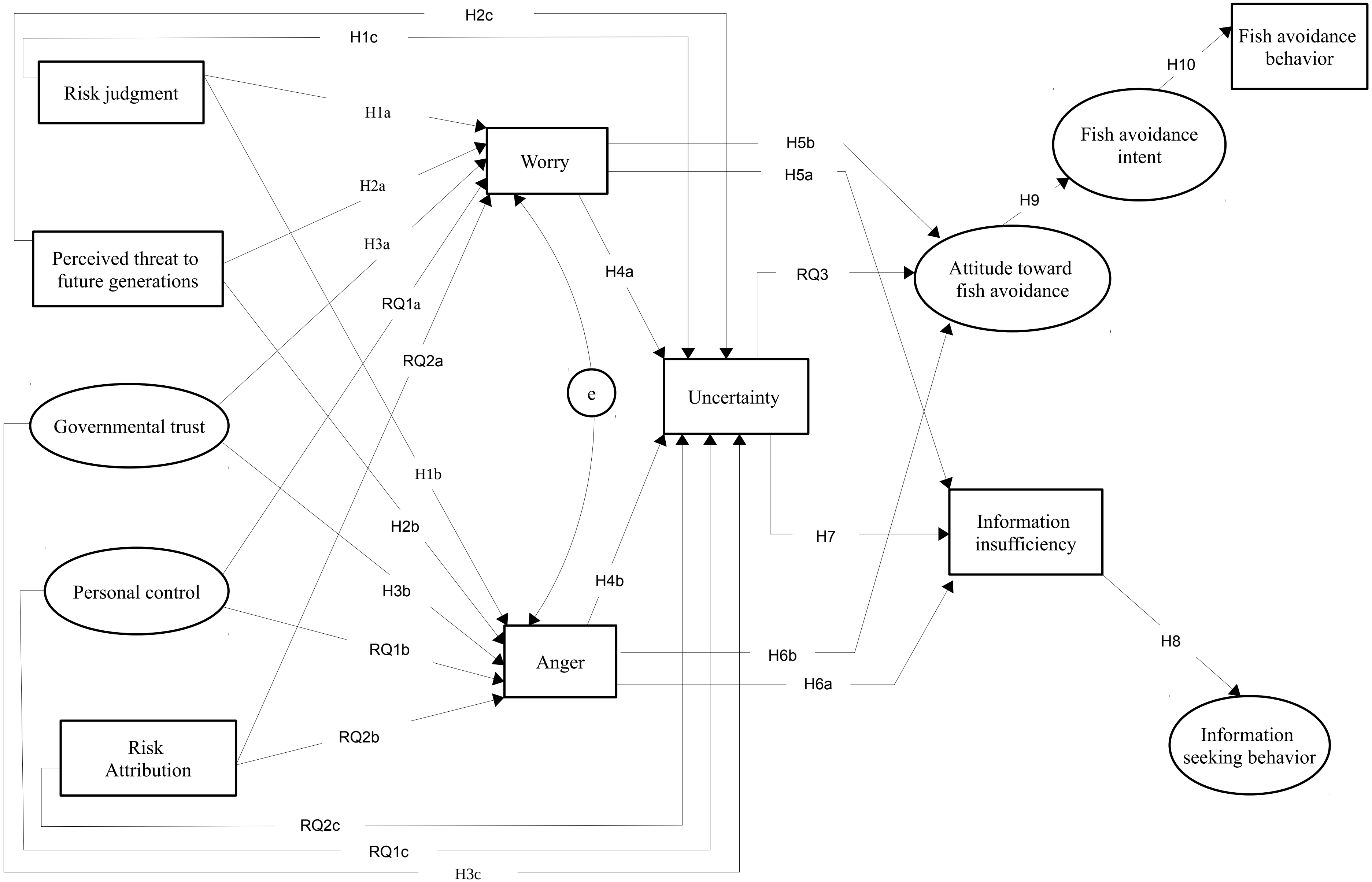

Figure 1. Hypotheized model.
Note.: *N*=334, “e” stands for correlation between error terms.

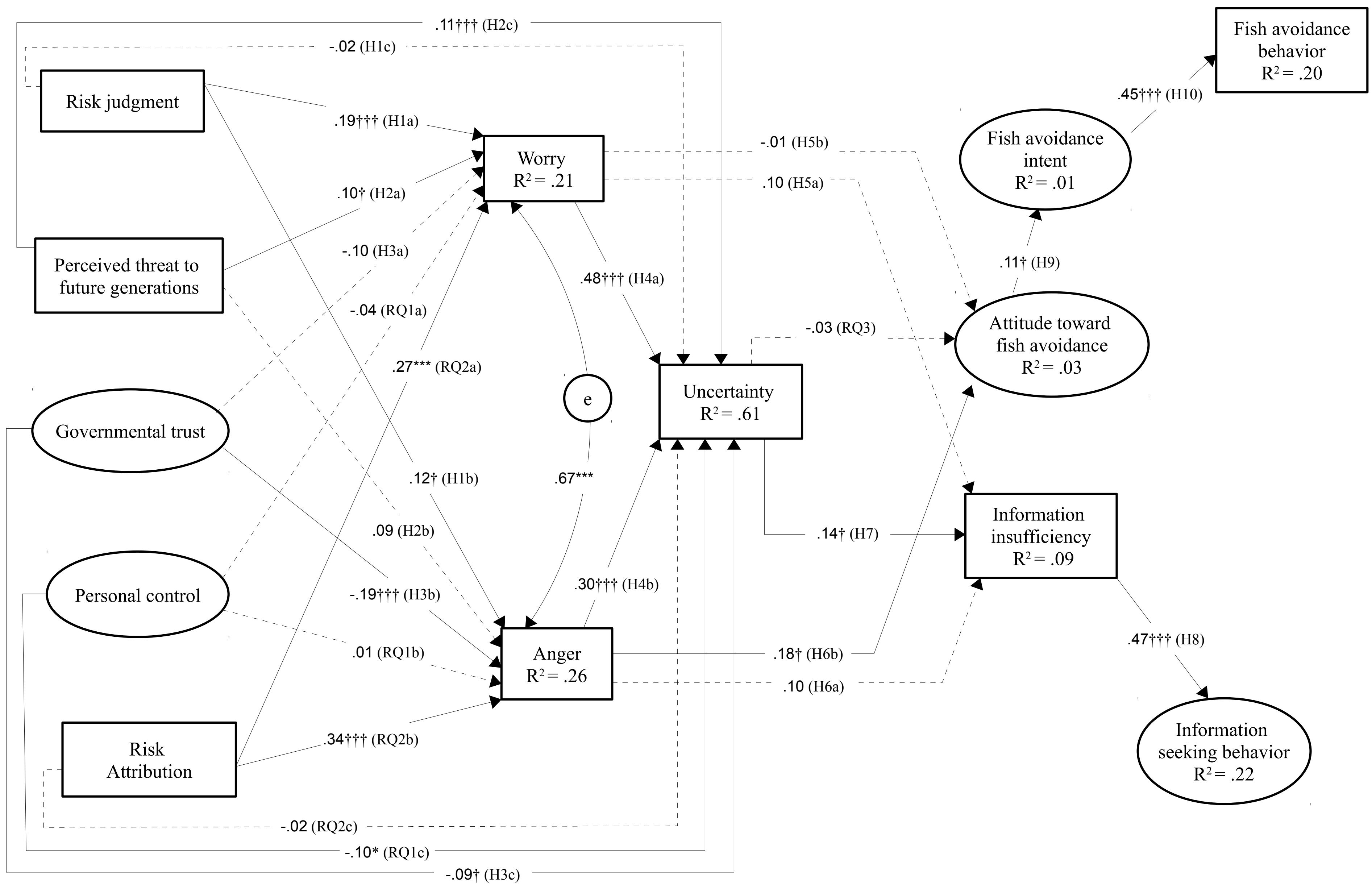

Figure 2. Structural model.

Note.: *N*=334,"e" stands for correlation between error terms, The solid lines represent significant paths whereas the dotted lines represent non-significant paths.

* < .05, ** < .01, *** < .001, two-tailed test; † < .05, †† < .01, ††† < .001, one-tailed test.