Crafting messages to promote water conservation: Using time-framed messages to boost conservation actions in the United States and China

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Abstract
Grounded in construal-level theory (CLT), this experiment examines how messages with different temporal frames (i.e., present- vs. future-framed) influence individuals’ perceptions of, and reactions to, water conservation. One hundred ninety-three participants, 99 from China and 94 from the United States, participated in this study. Results indicated that a present-framed message results in more positive attitudes toward water conservation than the future-framed message. Participants who scored higher on individual future-time orientation show stronger behavioral intention to conserve water than participants who scored lower. A significant interaction between temporal message framing and country emerged such that the future-framed message resulted in greater behavioral intention for Chinese participants than their U.S. counterparts whereas the present-framed message did not differentially influence Chinese and U.S. participants. Implications of findings for theory-building and application are discussed.

1 | INTRODUCTION

Predicting and explaining the ways in which messages can be used to promote environmentally sustainable behaviors is of significance. Message framing, a technique used to construct meanings and influence message recipients’ perceptions (Pelletier & Sharp, 2008), has been used to persuade people to engage in environmentally sustainable behaviors (Cheng, Woon, & Lynes, 2011). It is presupposed that the way in which message recipients respond to a particular message depends on how the message is constructed (Davis, 1995). Among many ways to frame persuasive messages (e.g., gain vs. loss, goal framing, etc.), gain/loss message framing and emotional arousing messages are most commonly used whereas other message framing techniques are less frequently used or explored (Cheng et al., 2011).

Water scarcity, the environmental issue of interest for this research, is widely recognized as an environmental and human health risk (Kummu et al., 2016). Behaviors to conserve water, like many health behaviors (e.g., healthy diet and physical exercise), lead to outcomes that are not immediately observable to the person performing those behaviors. The perceived immediacy of risk-related consequences has been identified as an important factor influencing people’s risk decision-making and corresponding behavioral change (Nan, 2007; Slovic, 1987). While research has been conducted to examine driving forces for behaviors to conserve water (e.g., normative influence, personal involvement; Lapinski, Rimal, DeVries, & Lee, 2007; Sarabia-Sánchez, Rodríguez-Sánchez, & Hyder, 2014), less is known about the extent to which messages that appeal to the immediacy of the outcomes associated with a water shortage affect individuals’ behavioral intention to conserve water and factors that can influence the relationship between time-framed messages and behavioral intentions. Moreover, although mental construal of the temporal closeness of an event can be an individual dispositional trait, it is also influenced by the culture in which an individual is embedded. Due to the complexity as well as the potential utility of time orientation, this research examines a series of intertwined questions about the ways in which temporal message framing shapes peoples’ water conservation perceptions and behavioral intention. It further addresses the role of cultural and individual differences in this relationship. In order to test these predictions and research questions, this study is built on construal-level theory (CLT) (Liberman & Trope, 1998), and is designed to examine the effects of variation in temporal message framing on risk perceptions, attitudes, and behavioral intention, while examining how the effects might vary based on individual (Zimbardo & Boyd, 1999) and cultural differences (Voss & Blackmon, 1998) in time orientation.
2 | CONSTRUAL-LEVEL THEORY

CLT (Liberman & Trope, 1998) primarily explains how the temporal distance of events changes the ways in which people mentally represent the information or event. The basic tenet of CLT is that individuals tend to form abstract and schematic information when thinking about events occurring in a distant future, whereas concrete and contextualized information is formed when proximate events are construed. In support of these propositions, Liberman and Trope (1998, study 1) showed that when people were asked to describe activities that would happen either the next day or 40 years later, they described distant activities more abstractly (e.g., I would broaden my horizon by reading a science book) and more recent events more concretely (e.g., I read a science book by flipping the page). Although temporal distance is the primary mental construal on which CLT builds, CLT is also considered as "a unified theory of psychological distance" (Nan, 2007, p. 490), which includes other dimensions such as social distance (Lewin, 1951).

Since reviewing all the dimensions of psychological distance is beyond the scope of this paper, the present study focuses on temporal distance and investigates how temporal message framing, along with cultural and individual differences in temporal distance work together to influence peoples’ water conservation behaviors.

Based on CLT’s conceptualization of abstraction, it is expected that by highlighting the temporal aspects of a risk through messaging, this activates either a concrete (proximate) or abstract (distant) representation of the risk in people’s minds. If the message focuses on the short-term nature of the risk, it will prompt a more concrete construal of the risk and subsequently have greater impact on perceptions (in this case risk perceptions and attitudes toward the risk behavior) and behaviors. If the message focuses on the distant nature of the risk, the construal of it will be abstract and have a more limited influence on perceptions and behaviors. Specifically, compared to information which focuses on distal risks, risk information which frames an environmental risk to happen in the proximal future is more likely to result in concrete and personal reactions, which will result in greater influence on people’s risk perception, attitudes, and behavioral intention (Chandran & Menon, 2004).

Risks that are presented as distal will be construed with less detail and therefore these messages are less powerful in shaping message recipients’ risk perceptions. Risk perceptions here are conceptualized as a subjective assessment of a specified type of negative events happening and how concerned we are with the consequences (subjective assessment of a specified type of negative events happening either the next day or 40 years later, they described distant activities more abstractly (e.g., I would broaden my horizon by reading a science book) and more recent events more concretely (e.g., I read a science book by flipping the page)). Although temporal distance is the primary mental construal on which CLT builds, CLT is also considered as “a unified theory of psychological distance” (Nan, 2007, p. 490), which includes other dimensions such as social distance (Lewin, 1951).

Individuals tend to make decisions based on anticipated consequences of imagined future scenarios, and they are more likely to engage in pro-environmental behaviors (Joireman & Liu, 2014; Milfont, Wilson, & Diniz, 2012), and take actions to prevent diseases such as using sunscreen (Orbell & Kyriakaki, 2008), taking part in disease screening (Diniz, 2012), and take actions to prevent diseases such as using sunscreen (Orbell & Kyriakaki, 2008), taking part in disease screening (Diniz, 2012) and more recent events more concretely (e.g., I read a science book by flipping the page). Although temporal distance is the primary mental construal on which CLT builds, CLT is also considered as “a unified theory of psychological distance” (Nan, 2007, p. 490), which includes other dimensions such as social distance (Lewin, 1951).

Hypothesis 1. Messages that portray a shortage of water to happen in the proximal future will have stronger persuasive effects on perceived severity of a shortage of drinkable water (a), perceived susceptibility of a shortage of drinkable water (b), more favorable attitudes toward water conservation (c), and stronger behavioral intention to conserve water (d), than messages that portray the same issue to happen in the distant future.

2.1 | Individual and cultural differences in future-time orientation

The effect of temporal message framing on the dependent variables of interest in the present study (i.e., risk perceptions, attitudes, and behavioral intention to conserve water) may be influenced by individual future-time orientation. Generally defined as “the human ability to anticipate future events, give them personal meaning, and to operate with them mentally” (Nurmi, 1991, p. 4), individual future-time orientation has been found to influence a series of cognitive and behavioral outcomes (Zimbardo, Keough, & Boyd, 1997). For example, Strathman, Gleicher, Boninger, and Edwards (1994) found that individual differences in future-time orientation influenced peoples’ attitudes toward offshore oil drilling. Moreover, research has found that future-minded individuals tend to make decisions based on anticipated consequences of imagined future scenarios, and they are more likely to engage in pro-environmental behaviors (Joireman & Liu, 2014; Milfont, Wilson, & Diniz, 2012), and take actions to prevent diseases such as using sunscreen (Orbell & Kyriakaki, 2008), taking part in disease screening (Diniz, 2012), and more recent events more concretely (e.g., I read a science book by flipping the page). Although temporal distance is the primary mental construal on which CLT builds, CLT is also considered as “a unified theory of psychological distance” (Nan, 2007, p. 490), which includes other dimensions such as social distance (Lewin, 1951).

Hypothesis 2. People who score high on individual future-time orientation will have greater risk perception of a shortage of drinkable water (a), more favorable attitudes toward water conservation (b), and stronger behavioral intention to conserve water (c) compared to people who are low in future-time orientation.

Differences in future-time orientation do not only exist at the individual level, but also function at the level of the collective. In fact,
Kluckhohn and Strodtbeck (1961) argue that one's time orientation is largely a product of his/her culture; in this research, we test for a cross-cultural difference in time orientation. Kaufman and Lane (1992) suggest that experiences and perceptions of time vary across cultures, religions, organizations, and situations. Hofstede's (1994) research indicates that long-term orientation is mostly found in East Asian countries, in particular mainland China, Hong Kong, and Japan. Ko and Gentry (1991) suggest that Asians have more extended future orientation in comparison to Americans. In Hall's seminal work (1976), it is believed that Americans hold more structured time perspective and therefore pay more attention to the present occurrence relative to people from Asian countries. In comparison, Asian people's time perspective is more dynamic, which allows them to make connections between the past and the future, and therefore focus more on the future. As such, the following hypothesis predicting differences in time orientation between China and the United States is proposed:

**Hypothesis 3.** There will be differences in individual future-time orientation among members of the sample such that Chinese participants will exhibit greater orientation toward the future than U.S. participants.

### 2.2 Temporal message framing, country difference in time orientation and their joint effects

The effects of temporal message framing on risk perceptions, attitude, and behavior may vary depending on individual future-time orientation differences. Strathman et al. (1994) examined the effect of temporal message framing on message receivers' attitudes, and found that people who scored lower on individual future-time orientation showed more favorable attitudes toward messages framed with immediate consequences of oil drilling while people with higher scores on individual future-time orientation indicated their favorableness when messages were framed with distant outcomes. Orbell and colleagues conducted a number of studies on tailoring temporal messages based on individual time orientation (e.g., Orbell & Hagger, 2006; Orbell & Kyriakaki, 2008; Orbell, Perugini, & Rakow, 2004). In particular, Orbell and Hagger (2006) found that for type 2 diabetes screening, present-oriented individuals were more persuaded to uptake the behavior by messages that were framed with positive outcomes occurring immediately, and the reverse is true for future-oriented individuals. An identical pattern was found with sunscreen use (Orbell & Kyriakaki, 2008). Kees (2011) found that present-oriented individuals were persuaded by present-framed messages, but discounted future-framed messages about unhealthy diet.

When time orientation is taken as a culture-level value shared by a group people, it is likely that a future-framed message is more persuasive for Chinese participants who are hypothesized to be more future-oriented than their U.S. counterparts because it matches their time orientation. Thus, we hypothesize that cultural-level time orientation would moderate the effects of temporal message framing on the study dependent variables:

**Hypothesis 4.** Temporal message framing will interact with participants’ country of origin to influence participants' perception of severity of shortage of drinkable water (a), perceived susceptibility of shortage of drinkable water (b), attitudes toward conserving water (c), and behavioral intention to conserve water (d) such that future-framed messages are more persuasive for Chinese participants than for U.S. participants.

Finally, this study tests for the relationship among the risk perception and attitudinal variables discussed above. Positive relationships between risk perceptions, attitudes, and behaviors to mitigate a risk has been found in a variety of domains including disease-preventive behaviors, and pro-environmental behaviors (e.g., Brewer et al. 2007; Huang, 1993, O'Connor, Bord, & Fisher, 1999). Therefore, the following hypothesis is proposed.

**Hypothesis 5.** Participants’ perception of severity and susceptibility of shortage of drinkable water are positively correlated to attitude toward conserving water (a), and behavioral intention to conserve water (b).

### 3 Method

#### 3.1 Design, participants, and procedure

This study employed a 2 (country: United States vs. China) × 2 (temporal message framing: present vs. future) between-subjects factorial design. Participants from a large Midwest university in the United States and a large Midwest university in China were invited to participate in a web-based study about water conservation. American participants were recruited in exchange for extra credit, and Chinese participants participated without course credit. The resulting sample included 193 participants. Ninety-nine Chinese (41 males, 57 females, and 1 unwilling to disclose) and 94 American college students (20 males, 73 females, and 1 unwilling to disclose) participated in this study, with an average age of 23.04 (SD China = 3.81) and 20.24 (SD United States = 2.00), respectively. All study materials were translated and back-translated by the authors who were fluent in both Chinese and English.

Participants were provided a URL which randomly assigned participants into one of two message framing conditions. After giving consent, participants first responded to a short survey consisting of measures of their concern for environment and their individual future-time orientation. Next, participants responded to items asking their attitudes toward contemporary water quality in the United States or in China, and four questions testing their knowledge about water shortage in the United States and in China. Afterwards participants were presented with a water conservation-related message that was either present-framed or future-framed (described below).

After exposure to the message, participants completed a postmessage questionnaire consisting of questions about perceived severity and susceptibility of shortage of drinkable water, attitudes toward water conservation, and intention to change behaviors to conserve water. Besides these focal variables, participants were asked to provide
information about their perceptions of the message quality. The entire experiment took approximately 20–30 min to complete. Participants were thanked and debriefed after completing the survey.

3.2 Water conservation messages

Four factual questions about the water situation in the participant’s home country (either China or the United States) were asked before participants were presented as a strategy to enhance issue involvement and motivate message scrutiny (Johnson & Eagly, 1989). Questions were the same except for the year to which the question referred was varied to correspond to the present/future orientation of the message and the country (China/United States). The present-framed message dealt with risks occurring the year following the data collection, and the future-framed message dealt with the year 2050. Answers to the four questions were provided on the following page as part of the main message.

The main message consisted of three parts: (a) information about predicted water shortages, (b) consequences of water shortages, and (c) actions that can be taken to conserve water. Similar to the four questions used to increase issue involvement, the Chinese messages referred to the water situation in China and quotations were from credible Chinese sources that are equivalent to the American sources. Although the message was written about the local environment, the other content information was kept the same for the Chinese and United States versions of the message.

All information about the shortage of drinkable water, susceptibility and severity of the consequences of the shortage, and actions that need to be taken to conserve water were kept consistent between two messages, except the time orientation of consequence was manipulated. The present-framed message used phrases like “by this year” or “the coming/next year,” whereas future-framed message referenced “in 2050” or “at least in 40 years.” All time references were bold to catch attention from participants.

3.3 Measures

Measures used in this study were drawn from published research. The measures consisted of Likert-type items with a 7-point response scales ranging from 1 (strongly disagree) to 7 (strongly agree). Items for each scale were summed such that higher scores indicated greater agreement. Descriptive statistics and measure reliability indices were summarized in Tables 1 and 2 and reported the zero-order correlations among variables measured in this study. Confirmatory factor analyses and measurement invariance tests were conducted for all scales and are available from the first author.

3.3.1 Individual future-time orientation

A 5-item scale adopted from Lukwago, Kreuter, Bucholtz, Holt, and Clark (2001) was used to assess participants’ trait in terms of future-time orientation. An example item was: “I have a plan for what I want to do in the next 5 years of my life.”

3.3.2 Perceived severity

A 4-item scale was adopted from Witte, Meyer, and Martell (2001) and modified to assess perceived severity of water shortage. An example item was “A shortage of drinkable water is a serious risk.”

<table>
<thead>
<tr>
<th>Measure</th>
<th>United States</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual future-time orientation</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>4.74</td>
<td>1.07</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>6.12</td>
<td>0.94</td>
</tr>
<tr>
<td>Attitude</td>
<td>5.08</td>
<td>1.45</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>5.52</td>
<td>1.23</td>
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<tr>
<td>Source credibility</td>
<td>5.68</td>
<td>1.09</td>
</tr>
<tr>
<td>Argument quality</td>
<td>5.33</td>
<td>0.96</td>
</tr>
<tr>
<td>Message believability</td>
<td>5.17</td>
<td>0.89</td>
</tr>
<tr>
<td>Concern for environment</td>
<td>4.75</td>
<td>1.18</td>
</tr>
</tbody>
</table>

TABLE 1 Descriptive statistics and reliabilities for measures across two countries

TABLE 2 Zero-order correlations among measured variables (N = 193)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Individual future-time orientation</th>
<th>Perceived severity</th>
<th>Perceived susceptibility</th>
<th>Attitude</th>
<th>Behavioral intention</th>
<th>Source credibility</th>
<th>Argument quality</th>
<th>Message believability</th>
<th>Concern for environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual future-time orientation</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived severity</td>
<td>.02</td>
<td>.38**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>.11</td>
<td>.69**</td>
<td>.44**</td>
<td>.65**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>.20**</td>
<td>.35</td>
<td>.48**</td>
<td>.65**</td>
<td>.65**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>.20**</td>
<td>.29**</td>
<td>.29**</td>
<td>.40**</td>
<td>.40**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source credibility</td>
<td>.30**</td>
<td>.25**</td>
<td>.28**</td>
<td>.32**</td>
<td>.24**</td>
<td>.78**</td>
<td>1.00</td>
<td></td>
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<tr>
<td>Argument quality</td>
<td>.36**</td>
<td>.63**</td>
<td>.63**</td>
<td>.59**</td>
<td>.59**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message believability</td>
<td>.29**</td>
<td>.21**</td>
<td>.28**</td>
<td>.36**</td>
<td>.36**</td>
<td>.63**</td>
<td>.59**</td>
<td>.59**</td>
<td>1.00</td>
</tr>
<tr>
<td>Concern for environment</td>
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<td>.13</td>
<td>.08</td>
<td>.24**</td>
<td>.29**</td>
<td>.10</td>
<td>.04</td>
<td>.08</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01.
3.3.3 | Perceived susceptibility
A 4-item scale was adopted from Witte et al. (2001) and modified to assess perceived susceptibility of water shortage. An example item was "I am likely to be impacted by the shortage of drinkable water."

3.3.4 | Attitudes toward water conservation
A 4-item scale was adopted from Lapiniski et al. (2007) to measure attitudes toward water conservation. An example item was "I think conserving water is a good idea."

3.3.5 | Behavior change intention
A 4-item scale was adopted from Lapiniski et al. (2007) and was used to examine participants’ intention of personal behavior change regarding water conservation. An example item was "I plan to make some changes in the way I live to conserve water."

3.3.6 | Concern for environment
Four items adopted from Dietz, Fitzgerald, and Shwom (2005) were used to assess participants’ care for the environment. An example item was "I am interested in protecting the environment."

3.3.7 | Manipulation checks
In order to assess perceptions of the messages among the two samples, participants were asked to complete two 7-point Likert-type items assessing the extent to which they believed the messages addressed an immediate issue (e.g., “It is clear that a shortage of drinkable water will happen immediately”), and two 7-point Likert-type items assessing whether they believed the messages addressed a future issue (e.g., “It is clear that a shortage of drinkable water will not occur in at least 40 years”). The 2 items used to assess message recipients’ perception that a shortage of drinkable water was an immediate issue were correlated at $r = .50, p < .001$; the 2 items used to assess message recipients’ perception that a shortage of drinkable water was a future issue were correlated at $r = .82, p < .001$.

3.3.8 | Message quality
In order to assure that message quality would not differ across two messages, we examined message quality by assessing message credibility, argument quality, and message believability. Message credibility was measured with 6 items on a semantic differential scale (e.g., reliable/unreliable, worthless/valuable). Argument quality was measured with a 5-item semantic differential scale (e.g., weak/strong, poorly reasoned/well reasoned). Message believability was measured with a 4-item 7-point Likert scale (e.g., “I found the information presented here to be believable”).

4 | RESULTS

4.1 | Preliminary analysis
A series of independent samples t tests were also conducted to examine whether Chinese differed from Americans in their concern for environment, and their perceptions of source credibility, message believability, and argument strength. There was no significant difference yielded in participants’ perceptions of source credibility, message believability, and argument strength, $t(191)s < 1.75, ps > .05$. However, U.S. participants ($M = 4.75, SD = 1.18$) scored significantly lower than Chinese participants ($M = 5.66, SD = 1.00$) on concern for environment, $t(191) = 5.76, p < .001$.

A $2 \times 2$ MANOVA was conducted to examine whether the manipulation was successful, with country and temporal message framing entered as the independent variables and respondents’ perceptions of water shortage occurring in a proximal and distant future entered as the dependent variables. MANOVA results revealed a significant main effect by temporal message framing, Wilk’s $\lambda = .82, F(1, 189) = 20.27, p < .001$, partial $\eta^2 = .177$ and a significant main effect by country, Wilk’s $\lambda = .81, F(1, 189) = 21.42, p < .001$, partial $\eta^2 = .186$. The interaction between country and temporal message framing was not significant, Wilk’s $\lambda = .99, F(1, 189) = 0.47, p = .623$, partial $\eta^2 = .005$. Univariate tests indicated that participants assigned to the present-framed message condition ($M = 5.03, SD = 1.23$) scored significantly higher than their counterpart ($M = 4.03, SD = 1.42$) in their perception that a shortage of drinking water would occur in the immediate future, $F(1, 189) = 26.86, p < .001$, partial $\eta^2 = .124$. Participants assigned to the future-framed message condition ($M = 4.13, SD = 1.79$) scored significantly higher than their counterpart ($M = 2.91, SD = 1.67$) in their perception that a shortage of drinking water would occur in a distant future, $F(1, 189) = 33.71, p < .001$, partial $\eta^2 = .151$. Chinese participants ($M = 4.02, SD = 1.91$) perceived that drinking water shortage would happen in a distant future more strongly than their U.S. counterparts ($M = 2.96, SD = 1.57$), $F(1, 189) = 27.44, p < .001$, partial $\eta^2 = .127$. The results indicated that message manipulation functioned as intended.

4.2 | Hypothesis testing
The first hypothesis proposed that compared to future-framed messages, present-framed messages were more likely to result in enhanced risk perceptions (severity and susceptibility) of the shortage of drinkable water (Hypothesis 1a and b), more favorable attitudes toward water conservation (Hypothesis 1c), and stronger behavioral intention to conserve water (Hypothesis 1d). The fourth hypothesis predicted that temporal message framing would interact with country to affect perceived severity (Hypothesis 4a), perceived susceptibility (Hypothesis 4b), attitude (Hypothesis 4c), and behavioral intention to conserve water (Hypothesis 4d). Hypotheses 1 and 4 were tested together with a two-way MANOVA with temporal message framing and country entered as the independent variables, risk perceptions, attitude, and behavioral intention entered as the dependent variables. The multivariate effect was significant by temporal message framing, Wilk’s $\lambda = .94, F(1, 189) = 2.91, p = .023$, partial $\eta^2 = .059$. MANOVA results also showed a significant multivariate effect by country, Wilk’s $\lambda = .91, F(1, 189) = 4.34, p = .002$, partial $\eta^2 = .085$, and by the interaction between temporal message framing and country, Wilk’s $\lambda = .92, F(1, 189) = 4.07, p = .003$, partial $\eta^2 = .080$. Univariate tests indicated that participants assigned to the present-framed message condition ($M = 6.59, SD = 0.72$) showed more favorable attitudes toward water conservation than participants in the future-framed message condition ($M = 6.25, SD = 0.86$), $F(1, 189) = 7.31, p = .008$, partial $\eta^2 = .040$. Temporal
message framing did not significantly influenced participants’ perceived severity, $F(1, 189) = 2.91, p = .090, \eta^2 = .015$; perceived susceptibility, $F(1, 189) = 0.08, p = .772, \eta^2 < .001$; and behavioral intention to conserve water, $F(1, 189) = 0.30, p = .585, \eta^2 = .002$. Country significantly influenced participants’ behavioral intention to conserve water, $F(1, 189) = 16.54, p < .001, \eta^2 = .080$. Specifically, Chinese participants ($M = 6.15, SD = 0.89$) indicated stronger behavioral intention to conserve water than their U.S. counterparts ($M = 5.52, SD = 1.23$). Country did not influence participants’ perceived severity, $F(1, 189) = 0.84, p = .360, \eta^2 = .004$, perceived susceptibility, $F(1, 189) = 3.65, p = .058, \eta^2 = .019$, or attitude $F(1, 189) = 3.75, p = .054, \eta^2 = .019$.

The univariate analysis indicated that the only significant interaction effect was for the dependent variable of behavioral intention to conserve water. Simple effect analysis using ANOVA was conducted to determine the source of the interaction between country and temporal message framing on behavioral intention to conserve water. The results showed that after reading the present-framed messages, participants from China ($M = 6.06, SD = 0.90$) and United States ($M = 6.28, SD = 0.89$) did not differ in their behavioral intention to conserve water, $F(1, 189) = 2.17, p = .14, \eta^2 = .011$. However, after reading future-framed messages, Chinese participants ($M = 6.29, SD = 0.89$) indicated stronger behavioral intention to conserve water than their American counterparts ($M = 5.34, SD = 1.34$), $F(1, 189) = 18.06, p < .001, \eta^2 = .087$. These findings suggest that the interaction overrode the main effect of country on behavioral intention. Hence the results were consistent with Hypothesis 4d but not Hypothesis 4a-c.\(^4\)

Figure 1 illustrated the mean scores of perceived severity, perceived susceptibility, attitude, and behavioral intention in present- and future-framed message conditions across two samples.

The second hypothesis proposed that people who are high in individual future-time orientation would have greater risk perceptions of shortage of drinkable water (Hypothesis 2a and b), more favorable attitudes toward (Hypothesis 2c) and stronger behavioral intention to conserve water (Hypothesis 2d). A set of hierarchical regression analyses was conducted to test this hypothesis. Individual future-time orientation was entered as the main predictor. The results showed that individual future-time orientation was positively related to behavioral intention ($\beta = .20, t = 2.87, p = .005$), but not with attitudes ($\beta = .11, t = 1.54, p = .124$), perceived severity ($\beta = -.03, t = -0.39, p = .69$), and perceived susceptibility ($\beta = .02, t = 0.71, p = .762$). As such, the data were consistent with Hypothesis 2d, but inconsistent with Hypothesis 2a-c.

The third hypothesis predicted that Chinese were more future time oriented than their U.S. counterparts. We conducted an independent samples t test with future orientation as the dependent variable. Results showed that there was no difference between Chinese ($M = 4.72, SD = 1.11$) and U.S. participants ($M = 4.74, SD = 1.07$) in their future-time orientation, $t(191) = -0.11, p = .913$. Hence the data were inconsistent with Hypothesis 3.

Hypothesis 5 predicted a positive relationship between risk perception (i.e., perceived severity and susceptibility) and attitude and behavioral intention to conserve water. Four regression analyses were conducted with perceived severity or perceived susceptibility as the predictor. Results showed that perceived susceptibility was strongly associated with both attitudes ($\beta = .44, t = 6.75, p < .001$) and behavioral intention ($\beta = .48, t = 7.57, p < .001$). Perceived severity was associated with attitudes ($\beta = .69, t = 13.31, p < .001$) and behavioral intention ($\beta = .35, t = 5.21, p < .001$). Hence the data were consistent with Hypothesis 5.

\section*{5 | DISCUSSION}

The literature does not provide answers as to how facets of temporal construal function (i.e., as individual, cultural, and message characteristics).
together shape people’s risk perceptions, attitudes, and behaviors. This investigation attempted to examine the ways in which temporal orientation was manifested at both individual and cultural levels, how the differences in temporal orientation affected people’s response to messages about a shortage of drinking water, and how several important factors in risk perception played into this process. The present-framed message showed advantage over the future-framed message in changing message recipients’ attitudes, and temporal message framing was found to interact with country to influence message recipients’ behavioral intention to conserve water. Risk perceptions were found to be strongly associated with favorable attitudes toward conserving water and behavioral intention to conserve water. Findings are further discussed below with implications for future research.

Based on CLT (Liberman & Trope, 1998), it was hypothesized that framing messages to focus on present or future consequences would have different persuasive impacts. Framing the consequence of shortage of drinkable water as a problem that will happen in the near future resulted in more positive attitudes toward water conservation behaviors across both samples. Although a present-oriented message led individuals to consider conservation as acceptable or desirable, when it came to participants’ intention to engage in conservation behaviors, temporal message framing had limited impact.

The current study created two messages and drew samples from China and United States which were historically considered as future-oriented and present-oriented cultures, respectively. The results showed that Chinese participants responded more strongly to the future-framed message than U.S. participants in their behavioral intention to conserve water, while the two samples did not differ in their responses to the present-framed message. Moreover, temporal framing did not interact with country in time orientation to influence attitude or risk perceptions. The results suggest that there might be some other culture-related moderators playing a role in this interaction effect. More research is needed to identify other culturally relevant moderators (e.g., generativity) and fully understand the role of culture in influencing individuals’ attitude and behavior in the domain of environmental hazards. Cultural differences regarding future-time orientation were hypothesized, but our results showed that Chinese participants did not score higher than their U.S. counterparts in individual future-time orientation. Instead, both Chinese and U.S. participants showed a strong future-time orientation. This result is contradictory to the traditional view of cultural differences in this regard. It has been over 20 years since the latest direct comparison between the two countries was conducted (Hofstede, 1994); with the attempt to fill in the gap of evidence, this study provided updated evidence for the future-time orientation between China and United States among the population of college students. Our results indicate that the cultural difference in future-time orientation is likely to be overridden by the interaction between temporal message framing and cultural difference, which may explain why the main effect of cultural difference on future-time orientation is not evidenced. It is also possible that prediction might be shown with a different group of population in these two countries. A large, random sample of people from each country is warranted before any conclusions can be drawn regarding China–United States cultural differences in time orientation.

Robust positive correlations were shown between risk perceptions and attitudes and behavioral intentions (Hypothesis 5). It is indicated that the more severe people conceived the risk of drinkable water shortage and the more susceptible people perceived they were likely to experience such a risk, they held more favorable attitudes toward water conservation, as well as intended more to conserve water with actions. These findings are consistent with the existing literature, which suggests powerful influence of risk perceptions on attitudes (e.g., Huang, 1993) and behavioral intention (e.g., O’Connor et al., 1999), and indicate that in order to change attitudes and behavioral, messages need to take perceived severity and susceptibility of a given risk into consideration.

What is worthwhile noticing, is that Chinese and Americans were significantly different on the measure of concern for environment. Extant literature supports the linkage between environmental concern and pro-environmental behaviors (Pickett-Baker & Ozaki, 2008), as well as cross-cultural difference in concern for environment (Sarigölü, 2009). Concern for environment was not included in the hypotheses testing as it was not predicted to explain the cultural difference in response to temporal message framing of water shortage. Concerns over multi-collinearity in our statistical analysis prevented us including it as a potential explanatory mechanism in our model tests. Future research can examine the role of concern for environment as an explanatory variable in predicting cultural differences in response to messages differing in temporal framing.

6 | LIMITATIONS AND CONCLUSION

This study has a number of limitations worth a discussion. First, Chinese and U.S. participants’ risk perceptions about the susceptibility of drinking water shortage before they were exposed to messages approached statistical significance. In other words, this issue may not be viewed equally critically between the two samples. However, the differences were not large enough to merit an inclusion of prior risk perceptions as covariates in statistical analyses. Second, the experiment was conducted with a fairly small, nonprobability sample; thus, there is no claim of generalizability to a population. However, given the focus here on internal validity and theory testing, the sample is well justified. Finally, the current study limited its investigation on consideration of future consequence as a potential cultural difference in explaining individuals’ responses to water conservation messages. Additional research has shown differences in other cultural values (e.g., individualism, hedonism; Price, Walker, & Boschetti, 2014) in explaining adoptions of environmentally benign behaviors. Future studies investigating the effects of persuasive messages featuring these cultural beliefs and values are desirable.

Even with these considerations, the findings of this study add to the body of research about the importance of temporal construal in individuals’ responses to environmental risks. In the literature, simple messages that appeal to social norms, people’s citizen duty, and losses...
to the current and future generations (Dickerson, Thibodeau, Aronson, & Miller, 1992; Kantola, Syme, & Nesdale, 1983, Lapinski et al., 2007) have been found to yield positive impact on water conservation behaviors. As such, it may be the case that stronger present-framed messages are needed. Although no interaction was found between temporal message framing and individual time orientation, the fact that Chinese participants were more influenced by future-framed messages suggest that culture-based tailoring is necessary in environmental risk communication. The findings regarding the correlation between risk perceptions and attitude and behavioral intention indicate that risk perceptions should be brought into comprehensive models of response to environmental risk messages. That is, the effect of message framing may work through individual risk perceptions to affect attitudes, behavioral intention, and ultimately behavioral intent. Therefore, future studies need to further examine the interactions among message framing and risk perceptions in environmental attitudinal and behavioral changes.

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CONFLICT OF INTEREST

The authors do not have any conflict of interest.

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