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Applying the perceived probability of risk and bias toward optimism: Implications for travel decisions in the face of natural disasters

Bongkosh Rittichainuwat [a, *], Robert Nelson [b], Fitri Rahmafitria [c]

[a] International Program in Hotel & Tourism Management, Siam University, 38 Petkasem Rd., Phasichareon, Bangkok 10160, Thailand
[b] Hospitality Business Management, University of Delaware, 14 W. Main Street, Newark, DE 19716, USA
[c] Resort & Leisure Management, University of Pendidikan Indonesia, Setiabudhi Street, 229th, Banduang, Indonesia

HIGHLIGHTS

- Optimistic bias related to tsunami frequency and proximity to risk sources.
- Most tourists were optimistic about the place where they travel.
- Low frequency of tsunami occurrence created unperceived risks at tsunami-prone destinations.
- Tourists with more knowledge about tsunami safety perceived less risk.
- Perceived tsunami probability is destination specific.

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ABSTRACT

Unperceived risk leads to lack of preparedness. This study aims to examine tourists' risk perception and travel decisions using as variables demographics, knowledge about safety, and country of residence. Samples were gathered in Thailand, Japan, Australia, and Indonesia. A total of 916 completed questionnaires of five replicated surveys were used in this study. More than halve of the respondents whose country had been affected by the Indian Ocean tsunami in 2004 did not perceive tsunami risk when 10 years has passed. Frequency of tsunami occurrence was positively related to perceived tsunami probability. This study confirms the theory of probability that low frequency of a natural disaster results in unperceived risks. Even if their destination had a history of tsunamis, tourists' perceived risk of another such occurrence happening during their visit is low (that is, the risk of natural disaster is low). While the literature in earth science found that residents of risky areas tend to be optimistic about the place where they live, our study extends the theory of optimistic bias to indicate that the same optimistic bias is applicable to tourists. Asia and Southeast Asia were perceived as tsunami-prone but tourists still travelled there. Our study found that tourist risk perception was related to frequency of tsunami occurrence and was destination specific. The perception of probability of a natural disaster is also related to proximity and past experience. Replications are necessary to validate results before generalization.

1. Introduction

Asia has been perceived as a high-risk tourist destination in terms of natural disasters such as tsunamis (Birkland, Herabat, Little, & Wallace, 2006; Cohen, 2010; Henderson, 2005). While "tsunamis are a low-frequency hazard in most regions (Birkmann, Teichman, Welle, González, & Olabarrieta, 2010, p. 2659)", the effects of these unexpected hazards can be devastating. Yet, tsunami occurrences are under reported with many of them receiving little or no attention from the press. Collision between tectonic plates, volcanic eruptions and submarine landslides are major tsunami generators (Tinti, 2007). Academic researches funded by various business and authorities for different research purposes may result in incongruity (Cecić, Musson, & Stucchi 1996; Mäntyniemi, Tatevossian, & Tatevossian 2014) due to access to dissimilar sources of data collection (Burby & Wagner, 1996). Consequently, most people tend to forget such a possibility and are not worried about

* Corresponding author.
E-mail addresses: ngamson@gmail.com, ngamson@gmail.com (B. Rittichainuwat), bnelson@udel.edu (R. Nelson), rahmafitria@upi.edu (F. Rahmafitria).

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potential tsunami risks and dismiss themselves psychologically (Birkmann et al., 2010). Thus, unperceived risks can cause ignorance and negligence on disaster management.

It is also unclear whether people from countries where tsunamis are not possible or at least very unlikely may react differently compared to people who live in tsunami-prone regions (Siegrist, Sűtterlin, & Keller, 2014). Some of the tourist victims of the 2004 tsunami came from countries where natural disasters are extremely rare. They may have had a different awareness about tsunamis than tourists who had come from countries where tsunamis are more common. Hence, this study aims to examine risk perception and travel decisions among tourists who were in destinations which experienced tsunamis. This information is important for disaster preparedness.

According to a model by Bogardi, Birkmann and Cardona (2004) disaster risk reduction needs early warning systems before a disaster strikes. Understanding risk perception and decision making is important in risk analysis (Eiser et al. 2012) because many "individuals do not consider risk factors when selecting areas in which to live (Trumbo, Lueck, Marlatt, & Peek, 2011, p. 1907, p. 1907)" nor to visit. Moreover, risk perceptions can be changed (Sönmez & Graefe 1998), future research should examine destination specific risks (Cahyanto & Pennington-Gray, 2015) instead of general risk (Lepp, Gibson & Lane, 2011; Roehl & Fesenmaier, 1992). Specifically, it is important to examine relationships between tourist risk perception and tourist behavior within the context of a specific disaster to assist and evacuate tourists (Thapa, Cahyanto, Holland, & Absher, 2013). "Understanding how people interpret risks and choose actions based on their interpretations is vital to disaster reduction (Eiser et al., 2012. P. 5)."

Although the concepts of risk, risk perception, and risk tolerance (Pauley, O'Hare, & Wiggins 2008; Mansfeld, Jonas, & Cahaner, 2016) have been well established, the concept of unperceived risk is under examined. Only two documents in *Scopus* and *Sage* mentioned unperceived risks (Birkmann et al., 2010; Reichel, Fuchs, & Uriely, 2007). A risk which is unperceived can potentially cause reckless decision making (Reichel et al., 2007). Many tourism stakeholders underestimate unperceived risk which leads to lack of preparedness against hazards (Birkmann et al., 2010). Many scenic tourist attractions and resorts are located on water's edge along coasts to take advantage of panoramic views (Burby & Wagner, 1996). Yet, awareness about risks from the sea such as tsunami risks is low (Birkmann et al., 2010). Thus, this study also aims to examine tourists' risk perception and travel decisions using as variables demographics, safety knowledge, and country of residence.

This study also reinforces the significance of intrastudy replication for theory development and integrity of scientific knowledge (Collins, 1985; Rosenthal & Rosnow, 1984) by cross validating results in different settings, times, and places (Easley, Madden, & Dunn, 2000). Our data were collected in Thailand, Japan, Australia, and Indonesia each of which have experienced tsunamis to various extents. "Replication is the most important method for achieving external validity, (Woodside, 1974, p. 226)." Hair, Black, Babin, and Anderson (2010) also called for cross validating findings. However, the "publish or perish mentality" underestimates the contribution of replicative studies to knowledge. Yet, research related to risk perception must be replicated before generalization to prevent panic or foreseeable safety negligence.

2. Theoretical frameworks

2.1. Probability

Probability refers to an individual's subjective degree of confidence based on the frequencies of events (Cosmides & Tooby, 1996). Probability is classified as objective probability or frequency-based and subjective probability or belief-based (Donovan, Oppenheimer, & Bravo, 2012). Individuals make judgments of probability from frequency (Kahneman & Tversky, 1972). Yet, when frequency data is absent, unreliable, or difficult to interpret, individuals tend to rely on subjective probability (Donovan et al., 2012).

In social science, "consumers do not always calculate risk probabilities or expected outcomes in the manner of the statisticians (Myers & Reynolds 1967 cited in Woodside, 1974, p. 225, p. 225)". "Rather, consumers deal with perceived risks, risk as they see it subjectively (Woodside, 1974, p. 225)." Real risk is the true situation of danger whereas perceived risk is the situation as sensed by people (Sarman, Scagnolari, & Maggi 2015). Perceived risks, rather than real risks influence tourist decision (Sömmez & Graefe 1998). An individual accepts certain levels of risks within his/her limits of control (Ryan, 2003). His/her subjective acceptable risk threshold shapes his or her perceptions toward risks at a destination (Mansfeld & Pizam, 2006). Thus, relationships between risk perception and disaster evacuation preparations exist (Becken & Hughey, 2013; Fitzpatrick & Mileti, 1991; Ritchie, 2004). Yet, optimistic bias may play a role in risk perception.

2.2. Optimistic bias

According to the theory of the optimistic bias by Weinstein (1984), people tend to underestimate risks exposed to them as less likely to happen as compared to others. Optimism bias tends to be related to risks of low probability of negative outcome (Chapin & Coleman 2009; Weinstein, 1984), little past experience (Trumbo et al., 2011) or little knowledge (Font, Mossialos, & Rudisill, 2009) and close proximity to risk source (Trumbo et al., 2011). Ricci, Barberi, Davis, Isaia, and Nave (2013) found that while residents in a volcanic hazard area had high levels of fear of potential volcanic eruption, they rated their chances of personally suffering serious effects from an eruption lower than they rated the chances of their own town experiencing serious effects.

3. Methodology

3.1. Questionnaire surveys

In this study, we adopt the definition of unperceived tsunami risk proposed by Birkmann et al. (2010). They define unperceived risks as a very low to lack of awareness of tsunami risk due to high uncertainty and the low frequency of tsunamis. Unperceived risk is measured with the tourist perception toward 1) the likelihood of encountering a tsunami while traveling, and 2) tourist perception on the frequency and 3) severity of a negative event modified from Mansfeld and Pizam (2006). Three items were used to operationalize the concept: [How likely is it that a tsunami would happen while you are at beach?] [What is your perception toward (frequency) or (severity) of a tsunami occurrence?]. The ratings were measured on a 7-point Likert scale ranging from 1 (very unlikely) to 7 (very likely).

Meanwhile, decision making is operationalized as selecting an action from a set of alternatives with an uncertain outcome (Mousavi & Gigerenzer 2014) in which risk taking is an important component (Paulus, Rogalsky, Simmons, Feinstein, & Stein, 2003). We modified the questions for the instrument from a previous study by Rittichainuwat (2013). The respondents were also asked to indicate their travel decisions: ['How does a tsunami affect your travel decision?] on four travel decision alternatives which were measured on a 7-point Likert scale ranging from 1 (strong disagree), to 7 (strongly agree). In this study, optimistic bias is operationalized as the tendency of individuals in underestimating