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Behavioral and emotional responses to escalating terrorism threat

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Abstract We conducted an online study of projected behavioral and emotional responses to escalating terrorist threat. The study employed scenarios in which terrorists targeted commercial airliners with missiles at an international airport. An important feature of attacks on commercial flights is that unlike many other terrorist threats, exposure to the risk can be controlled simply be refusing to fly. Nine scenarios were constructed by crossing two between-subjects factors, each with three levels: (1) planned government protective actions and (2) social norm, expressed as variation in airline ticket sales. Scenarios also incorporated descriptions of three increasingly severe attacks; this was a within-subjects factor. After each description, we asked respondents to imagine they had planned a vacation to a destination 2,500 km away, and we examined their projected fear and behavior. Fear increased and more trips were canceled as the attacks escalated. Government protective actions and social norm had little impact on either fear or planned flying.

Keywords Fear · Emotion · Projected behavior · Scenario · Terrorism · Threat

The avowed purpose of terrorism is to achieve political gains by frightening civilians into pressuring their government for changes desired by the terrorists (Post 2007). A step toward achieving those ends is to disrupt lives—not only the lives of victims, but also of those who vicariously experience the attacks. Terrorist threats constitute dread risks (Slovic 1987), in that they are unlikely events in which many

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people will die at once. In this paper, we report how people respond to hypothetical attacks on commercial aviation.

Gigerenzer (2004) argues that people are strongly, perhaps biologically, motivated to avoid dread risks. Some potential terrorist targets cannot be avoided without giving up one's ordinary life. If a person lives near a targeted venue or commutes to a workplace that might be bombed, there is little to be done to reduce exposure short of moving or changing jobs. If people with contagious diseases are dispersed throughout the community, only a hermit can avoid exposure. In contrast, most people can avoid flying, although avoidance may involve inconvenience or sacrifice. We explore that tradeoff.

Sense of safety is a feeling, while taking a flight is a behavior. Feelings and behavior are not independent (Bergstrom and McCaul 2004), but they are separate. One person may elect to fly even while terrified, whereas another might give up a trip or choose an inconvenient mode of travel even while viewing the risk of an attack on a particular flight as slight. Both kinds of responses—feelings and behavior—are important to the terrorists and to those responsible for defense. Behavior after a terrorist event can have dramatic economic impact. The airline industry and its subsidiaries would be crushed if people stopped flying. If people decide their government cannot secure the homeland, pressure for changes in regime and policy is likely to mount. In this laboratory study, we examine both fear and projected behavioral responses.

There have been field studies of emotional reactions after terrorist events (Hall 2005; Lerner et al. 2003; Schuster et al. 2001; Shahrabani et al. 2009; Zeidner 2006), and studies of behavior after terrorist events (Eisenman et al. 2006; Gigerenzer 2006; Lopez-Rousseau 2005). Here we employ factorial forecasting methodology (Weiss 2012), an offshoot of functional measurement (Anderson 1981; Weiss 2006), to examine both kinds of response simultaneously, using scenarios that describe attacks. We ask about fear and we ask about how personal flight plans would be affected. Projected behaviors are nominal responses. We analyze them with NANOVA (Weiss 2009), a technique that provides statistical inferences about factorial influences when the data are nominal.

The perceived severity of a threat depends upon more than the potential consequences of the threat itself. How the authorities respond might be expected to influence emotions and behavior. We expected governmental action to mitigate fear. People also take cues from how others are handling an unfamiliar situation. Social norm (Kasperson et al. 1988) is operationalized in our scenarios by reports that air ticket sales are either steady or declining. We expected decreasing ticket sales to increase fear and make people less likely to fly. We hypothesize that government action and social norm will combine independently in their impact upon emotion and behavior.

Whether to deploy the factors in an independent-groups or repeated-measures design is a controversy with a long history (Grice 1966). Because within-subject variability is usually smaller than between-subject variability, repeated-measures designs provide greater statistical power. Respondents are better positioned to provide orderly data when they know the full range of stimuli to be accommodated. Moreover, repeated-measures control for idiosyncratic use of the response scale

(Birnbaum 1999). On the other hand, exposing each participant to the entire design might elicit contrast effects. The judgment of a given stimulus may depend upon stimuli the respondent has previously encountered (Hsee 1996; Parducci 1995). Additionally, we were concerned that exposure to a series of governmental actions and social cues attached to the same terrorist event would reduce the emotional impact of the attack and make the task an academic exercise. Finally, having to respond to a large number of scenarios might decrease a participant's motivation or ability to maintain focus. Accordingly, we treated government action and social norm as between-subject factors. This decision implies a commitment to recruit larger samples than are customary in functional measurement studies to provide sufficient power to reject an incorrect model.

We did incorporate one within-subject factor. We asked respondents to respond after each of three separate attacks. At each response point, respondents were unaware that further attacks were coming. With multiple attacks, we expected fear to increase as it became less plausible to dismiss an attack as a one-shot occurrence.

Our scenarios involve Man-Portable Air Defense System (MANPADS) attacks (Okpara and Bier 2008). The convenience and damage potential of a MANPADS might make it an attractive option for a terrorist, thereby making the report seem plausible. We told respondents accurately that "a MANPADS is a shoulder-fired missile that can bring down a low-flying aircraft. About the size of a golf bag, it can be carried by one man and concealed in the trunk of a car. Many were distributed to Afghans fighting the Russians during the 1980's. Several thousand remain unaccounted for." We then added accounts of three separate MANPADS attacks on planes near an airport, attributing the plot to a notorious terrorist organization. The effectiveness of the attacks increased each time. Although the scenarios contained details designed to promote a sense of realism, we emphasized that the reports were fictional, to ensure that we did not generate "War of the Worlds" hysteria.

1 Method

1.1 Design

The nine scenarios were defined by crossing three levels of two factors. (1) Forthcoming, but not yet in place, government action: (a) increase airport perimeter surveillance, (b) harden fuselage on airplanes, (c) install electronic countermeasures on airplanes. (2) Social norm: (a) air ticket sales remained steady, (b) decreased by 10 %, (c) decreased by 50 %. Participants were randomly assigned to one out of these nine scenarios. In each scenario, a passenger airplane was fired upon by Al-Qaeda operatives as it was flying near Frankfurt International Airport (FRA). Next came a description of the government action and social norm in accord with the assigned condition.

There was one within-subject variable, escalation of attacks, which had three levels: (a) In the first attack, no one died and 15 of the 146 passengers incurred minor injuries. (b) In the second attack, a week later, all 382 passengers and 15 crew

members on the attacked plane were killed. (c) In the third attack, another week later, two planes were shot down, with all passengers and crew members killed.

After reading a description of an attack, the respondent provided two projected emotional responses (fear for self flying, fear for family and friends flying), one cognitive response (estimated probability of another attack within the next month), and one projected behavioral response (what would be done about a long-awaited planned flight to a family vacation 2,500 km away).

1.2 Dependent variables

Information about participants' sex was available from their sign-up with the online panel. After a participant read the description of each of the attacks, numerical responses for fear for self and fear for others (i.e., friends and family) were gathered using a ten-point scale anchored by "low fear" and "high fear". The subjective probability of another attack within the next month was reported as a number, guided by the phrasing that the number should be between 0 % and 100 %.

The behavioral response was open-ended. Although processing of free responses is less convenient than when forced-choice is employed, there are two advantages. Providing a set of alternatives runs the risk of suggesting an option the respondent had not considered, and also limits the respondent to choices envisioned by the researcher. However, if free responses are analyzed literally, few will match exactly and the nominal analysis will not be informative. After examining the free responses, we determined that four options encompassed all but a few of the responses. These four options were (1) fly on the trip as planned; (2) cancel or postpone the trip until conditions changed; (3) go to the destination using alternative transportation; and (4) undecided and/or consult with family members.

1.3 Participants

We invited 8,745 panelists from a German-speaking online panel comprising people from all walks of life (Göritz 2014) to participate in the study. A total of 2,405 people called up the first page of the study (i.e., 27.5 % response), and 2,093 participants stayed until the final page of the study (i.e., 87.0 % retention). However, not all retainees answered all questions. Within each of the nine conditions, we analyzed the data from the first 85 female and first 85 male respondents to answer all questions. Nominal analysis requires equal group sizes.

2 Results

The fear results are displayed in Figs. 1, 2 and 3. Figure 1 shows that the escalating attacks consistently generated increasingly higher levels of fear among both men and women: $F(2, 3{,}024) = 1{,}198.41$, $p < .001$.

Figure 2 illustrates that fear for others was greater than fear for self: $F(1, 1{,}512) = 418.66$, $p < .001$. The difference was smallest after the third

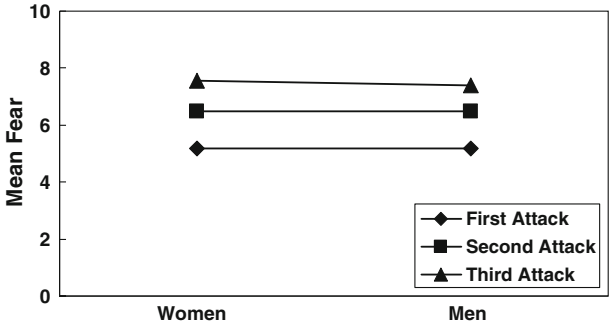

Fig. 1 Mean fear, combining fear for self and fear for others, as a function of escalating attacks and sex. Each point represents 1,530 responses

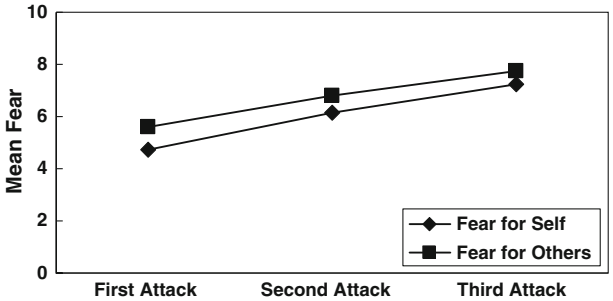

Fig. 2 Mean fear as a function of escalating attacks and target of fear. Each point represents 1,530 responses

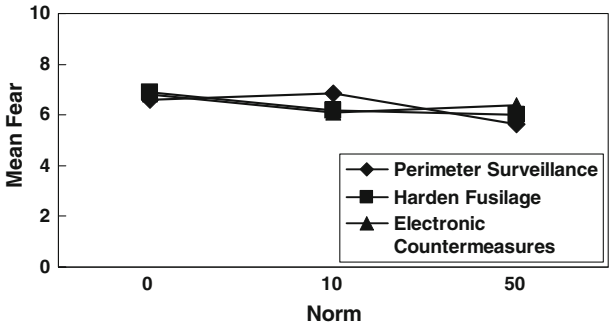

Fig. 3 Mean fear, combining fear for self and fear for others, as a function of social norm (0 = no change in ticket sales, 10 = 10 % reduction, 50 = 50 % reduction) and government action. Each point represents 1,020 responses

attack. This interaction, $F(2, 3{,}024) = 86.33$, $p < .001$, may have arisen because the fear expressed after the third attack was attenuated by a ceiling effect.

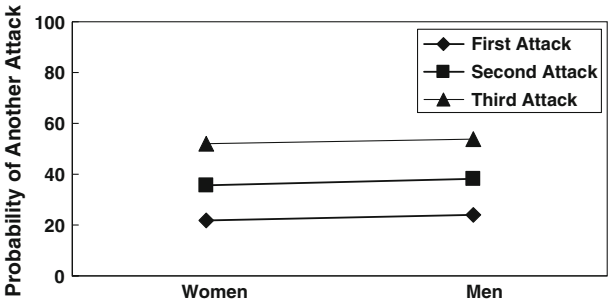

Fig. 4 Mean estimated probability of another attack within the next month, as a function of sex and escalating attacks. Each point represents 765 responses

Figure 3 shows that government action did nothing to mitigate fear: $F(2, 1{,}512) < 1$. Whether other folks were flying affected fear only slightly, although the effect was significant: $F(2, 1{,}512) = 10.63$, $p < .001$. The failure of government action and social norm to markedly influence the responses renders the proposed functional measurement model analysis moot.

Figure 4 shows that escalating attacks consistently increased respondents' estimates of the probability of a future attack: $F(2, 3{,}024) = 1{,}146.09$, $p < .001$. However, even after three attacks, the mean estimate of the likelihood of a subsequent attack was only slightly greater than 50 %.

Government action, $F(2, 1{,}512) < 1$ and social norm, $F(2, 1{,}512) = 1.21$, $p = .30$, did not affect the estimated probability of a future attack, as shown in Fig. 5.

The behavioral responses showed a similar pattern. Escalation of attack dramatically affected projected behavior (*N-ratio* = 1.16, $p < .001$), while government action and social norm had no significant effect. As Fig. 6 illustrates, after the failed first attack, most people maintained their plan to fly. As the attacks continued, increasingly more people canceled the scheduled trip.

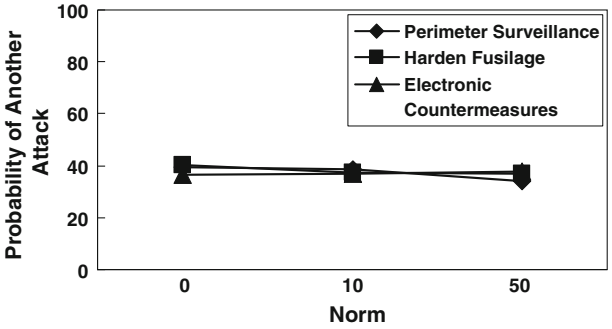

Fig. 5 Mean estimated probability of another attack within the next month, as a function of social norm (0 = no change in ticket sales, 10 = 10 % reduction, 50 = 50 % reduction) and government action. Each point represents 510 responses

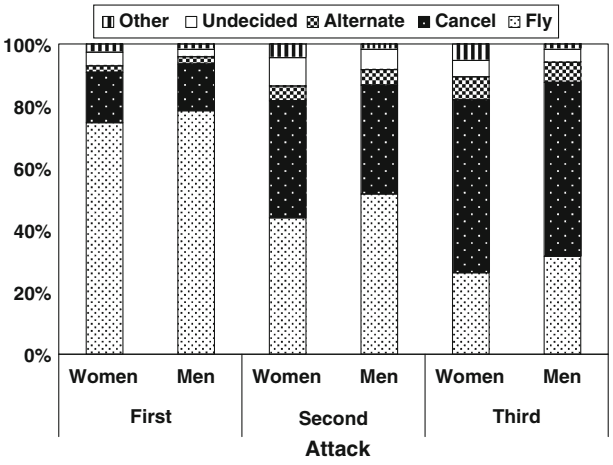

Fig. 6 Nominal responses as a function of escalating attacks and sex. Each stack represents 765 responses

To examine whether fear and behavior are associated at the level of the individual, and whether this association differs for men and women, we dichotomized the projected behaviors into flying as planned or not. Each participant contributed three data points to this analysis. We conducted logistic regression with this dichotomous variable, also entering Personal Fear and Sex into the equation. The more fear people expressed, the less likely they were to fly (OR 1.61, $p < .001$, $N = 4{,}590$). There was no sex difference regarding this association.

3 Discussion

Emotion generally drives behavior (Fischhoff et al. 2004). Our results showed that fear affects projected flying at both the individual and group levels. Of course, the linkage is imperfect. Behavior is constrained by the perceived possibilities, whereas emotion is free to take on any value. For example, if the trip is seen as an important opportunity that will not recur, a person is likely to take it even though fear might be high enough to inspire cancellation in less exigent circumstances. In another study in which flights were threatened with MANPADS attacks, Baumert et al. (2009) found that most respondents would fly to the wedding of a close friend, but almost half would not fly to a planned vacation. Still, our major finding is that increased fear was accompanied by increased cancellation rates, which is consistent with Rottenstreich and Hsee's (2001) perspective that fear affects the probability weighting function. Moreover, Sunstein and Zeckhauser (2010) found that people express willingness to pay to avoid even unlikely dangerous possibilities. After a relatively unsuccessful first attack, most people did not change their flight plans, even though some people acknowledged considerable degrees of fear. It was only after the second attack that the kind of disruption that would have an economic impact on the airline industry occurred.

Classically, fear immediately provokes "fight or flight" responses (Cannon 1932). However, no immediate response is called for in response to the fear evoked by acts that have impacted other people in situations similar to one's own. There is time for reflection before taking action.

The lack of effect for government action means either that all of the protective actions are seen as equally efficacious, or that people pay little attention to governmental reassurances (Hyams et al. 2002). We favor the latter interpretation. We did not consider it plausible to have a control condition in which the government did nothing, because MANPADS attacks would surely provoke some federal response; but we did design the levels of this factor to appear quite different in value. Likewise, our social norm manipulation varied passenger traffic from no change to a 50 % decrease, a public reaction that stretches the limits of plausibility.

A logical possibility for the failure of an effect to evince itself is a lack of statistical power. Here, with many respondents, it seems likely that real effects would evince themselves. Power also depends on the magnitude of the effect. In our data, the means for the various levels of government action and social norm did not differ much, as can be seen in Fig. 3. The failure of the between-subjects factors to produce noteworthy effects meant that we could not determine the cognitive model by which they combine; this is a disappointing outcome from the functional measurement perspective.

Economic impacts of terrorism can be estimated with predictive models (Gordon et al. 2007). As Marshall et al. (2007) observe, avoidance of risk may be psychologically beneficial at the individual level, but at the same time it can be economically harmful at the societal level. A key aspect of any estimation scheme is anticipation of how potential consumers will react to the threat. Our results suggest that a single attack would reduce leisure passenger traffic by 20 %, which is consistent with what occurred after 9/11, whereas repeated attacks in the same location will lead to much more severe reductions in optional flights. The protective actions by the government in our study were promised, but had not been delivered. In our study, it would not have been sensible to describe the actions as having been implemented, because then they would all have been dismissed as ineffective since the attacks continued. We cannot speak to whether government action actually put into place would be perceived as effective. A related gap in the picture is that we did not vary the escalation of the attacks across participants; hence, we cannot address the impact of a constant level of attacks or of de-escalating attacks.

Because the first attack in our study failed to cause much damage, from the perspective of the target population it can be viewed as a near-miss. Dillon and Tinsley (2008) have demonstrated that people fail to see the danger implied by near-misses, regarding them as verification that the system protects them adequately. Their argument provides a satisfying account of our observation that most people did not cancel their planned flight after the first attack.

A question with important economic implications that cannot be addressed by our data, which were collected in a single session, is the longevity of the impact. We did not think people would be able to provide meaningful answers to questions about how they might feel or act as the future unfolds.

It has been argued that risk is subject to social amplification (Burns et al. 1993). In the present context, one might expect cancellations by other passengers to serve as a social cue to riskiness, and thereby to magnify the cancellation rate. However, we found no evidence for the operation of the social norm on projected behavior. Perhaps people assigned to conditions in which the public was reported to have reduced flying (and who themselves had not canceled the trip) thought that airports and planes would be less crowded than usual. It may be the case that norms established via conversations (West and Orr 2005) have more impact than those extracted from news reports such as those included in our scenarios. In our study, people did not have time to discuss the danger with friends or to absorb more reflective media commentary (Burns and Slovic 2007).

Consistent with Sjöberg (2003), we found fear for others to be greater than fear for self. One explanation for that result is that people have less fear for occurrences they can control (Powell and Self 2004), and they can control their own exposure by avoiding the airport altogether. We would expect the difference to disappear only when a respondent cannot conceive of a plausible action that would reduce the risk.

Of course, we cannot be certain that the projected behavior is what respondents would really do if the situation were to arise. The fear aroused by a fictional account may not generate a truly "hot" (Loewenstein 2005) emotion. Still, the high degree of fear expressed by many of our respondents, as well as the insouciance expressed by a minority, suggest that people were engaged in their role. An inherent limitation of a scenario study is that no matter how realistic the presentation, the situation is not real. Results obtained in the laboratory do not always accord with those obtained in the field (Levitt and List 2007), although in other cases, results have been consistent (e.g., de Kort et al. 2008; Gray et al. 1991). Laboratory studies of preferences strongly suggest that consumer purchase patterns are predictable (Louviere 1988).

In the terrorism context, field experimentation is not feasible. But a scenario study is more than a weak surrogate. A primary advantage of the scenario approach over surveys of what people did in the wake of real incidents is that the researcher can systematically explore possibilities that did not occur. Respondent characteristics can be controlled as well, thereby providing information about how specific types of attack might affect particular segments of the population. The scenario approach affords a proactive perspective on what might happen and the effectiveness of potential mitigation strategies. Reality constitutes only one cell in the design.

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