Worth the risk? Terrorism-induced fear of flying *

¿Vale la pena el riesgo? Miedo inducido por el terrorismo a volar

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David J. Weiss
California State University, United State
Richard S. John
University of Southern California, United State
Heather Rosoff
University of Southern California, United State
Thomas Baumert
Universidad Complutense de Madrid, Spain
Mikel Buesa
Universidad Complutense de Madrid, Spain
Javier González Gómez
Universidad Complutense de Madrid, Spain
Aurelia Valiño
Universidad Complutense de Madrid, Spain
Tal Shavit
Open University, Israel
Mosi Rosenboim
Ben-Gurion University of the Negev and Sapir Academic College, Israel

ABSTRACT
We conducted two bi-national experiments regarding emotional and behavioral responses to a terrorist plot against commercial flights, examining both feelings and projected action. The studies employed hypothetical scenarios in which terrorists attacked airplanes with shoulder-fired missiles as they were landing or taking off from an international airport. The scenarios were built around two factorially crossed manipulated variables, each with three levels: (1) government announcements or actions (2) social norm, expressed as variation in airline ticket sales. Each respondent read a questionnaire containing only one of the nine scenarios. Experiment 1 was conducted in Spain and California (n = 360, 50% female), Experiment 2 in Israel and California (n = 504, 50% female). In both studies, fear and flight plans were not differentially affected by governmental response or social norm. Women expressed more fear than men. Experiment 1 examined the purpose of the trip. Most respondents would not change a planned flight to attend a close friend's wedding or important job interview, but a substantial number would postpone a vacation or drive to a different location. Experiment 2 featured escalating attacks. These yielded increased fear and more canceled trips. Within both studies, responses were similar across countries despite national differences in direct experience with terrorism.

Keywords
emotional response, nominal data, projected action, scenario, terrorism.

RESUMEN
Se realizaron dos experimentos bi-nacionales con respecto a las respuestas emocionales y conductuales a un plan terrorista contra vuelos comerciales, examinando ambas cosas: sentimientos y proyectos de acción. Los estudios emplearon escenarios hipotéticos en los que los terroristas atacaron los aviones con misiles disparados desde el hombro, ya que estaban aterrizando o despegando desde un aeropuerto internacional. Los escenarios fueron construidos alrededor de dos variables factoriales cruzadas, cada uno con tres niveles: (1) los anuncios o acciones del gobierno (2) norma social, expresada como la variación en la venta de billetes de avión. Cada encuestado leyó un cuestionario que contenía sólo uno de los nueve escenarios. El experimento 1 se realizó en España y California (n = 360, 50% mujeres), el experimento 2 en Israel y California (n = 504, 50% mujeres). En ambos estudios, el miedo y los planes de vuelo no fueron diferencialmente afectados por la respuesta gubernamental o la norma social. Las mujeres expresaron más miedo que los hombres. El experimento 1 examinó el propósito del viaje. La mayoría de los encuestados no cambiarían un vuelo planeado para asistir a la boda de un amigo cercano o para una importante entrevista de trabajo, pero un número considerable de participantes podrían posponer unas vacaciones o ir en coche a un lugar diferente. El experimento 2 contó con la escalada de los ataques. Estas aumentaron el temor y la cantidad de viajes cancelados. En ambos estudios, las respuestas fueron similares en todos los países a pesar de las diferencias nacionales y la experiencia directa con el terrorismo.

Palabras clave
respuesta emocional, datos nominales, acción proyectada, escenario, terrorismo.

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The freedom of movement permitted in democratic societies makes them inevitably susceptible to terrorism threat. The primary hope of the terrorists is that widespread public fear will constitute political pressure sufficient to induce changes in policy (Post, 2007). Airplanes have proven vulnerable to hijacking and bombing, so they are attractive targets for terrorists. In order to sustain the commercially valuable airline industry, governments try to assure potential passengers regarding their safety. An important feature of attacks on flights is that, unlike biological attacks, attacks upon trucks carrying hazardous material on highways, or bombs in public places, people can control their exposure to the risk simply by refusing to fly.

In these studies, we explore how people respond emotionally and behaviorally to hypothetical scenarios describing a terrorist plot against airplanes at the nearby international airport. The respondent was asked to imagine having already planned a flight when news of an attack, either impending (in Experiment 1), or recently carried out (in Experiment 2) surfaced. The reports were ascribed to NBC News and CNN. The attackers were using a Man-Portable Air-Defense System (MANPADS) (Okpara & Bier, 2008; von Winterfeldt & O'Sullivan, 2006), a mobile shoulder-fired missile that can be carried by one man and set up near an airport. The weapons were accurately described as having been distributed by the U.S. to Afghans fighting the Russians during the 1980's; several thousand remain unaccounted for. The fictional account also added that 300 MANPADS had, according to an intercepted email, been shipped to the target country. The terrorists had mapped out potential launch locations near the airport. Although we assured participants that the scenarios were fiction, the verisimilitude of the accounts was inescapable.

To generate predictions of how the reports would affect projected behavior, we employed factorial forecasting (Weiss, 2012), a methodology based on functional measurement (Anderson, 1981; Weiss, 2006). Embedded in the scenarios were factorially manipulated variables reporting the response of the government and recent trends in passenger load. A downed plane is an example of what Slovic (1987) has termed a dread risk, in that many people will die simultaneously of the same rare cause. We anticipated that how well the authorities were coping with the plot would influence how much fear people felt. The behavior of other

passengers was expected to serve as a social norm (Kasperson et al., 1988); if my peers are reluctant to fly, perhaps I should be as well. These two were between-subject factors; to maintain realism, a respondent was exposed to only one combination of government reaction and passenger load. The nested structure avoids potential contrast effects that might arise if the respondent were to compare levels of the manipulated variables (Weiss, 2014). On the other hand, the design affords fewer response opportunities for an individual than a single-subject design employing the same variables, so there is less likelihood that the stabilizing effect of practice will occur. Accordingly, we employed larger samples than are customary in functional measurement studies in order to provide sufficient power to reject an incorrect model. We are aware that between-subjects analyses also run an additional risk of high variability attributable to idiosyncratic use of the response scale (Birnbaum, 1999); our numerical scales were doubly bounded and anchored to minimize that threat.

Each study included a within-subject factor as well. In Experiment 1, the focus was on the nature of the planned trip. A person might normally be quite reluctant to fly, but will do so under exigent circumstances such as a family emergency. The expectation was that people would be more willing to accept the risk to go to an event that could not be easily scheduled, such as a wedding, compared to one that could be postponed, such as a job interview or a vacation. In Experiment 2, there were escalating attacks. With the terrorists repeating their acts, those who viewed the first attack as a unique occurrence could not maintain the belief that future flights would be safe (Wolff & Larsen, 2014).

Our anticipation was that government reaction and social norm would combine additively. The import of additivity is that the factors combine independently, which means that compensation is feasible. For example, strong reassurance by government might be able to overcome the adverse effect on flying generated by a social norm that discourages passengers.

We employed numerical scales to elicit the degree of fear, using several different terms to explore the emotional reaction. Feelings and behavior have different constraints, even when their focus is similar. Whereas fear is free to range between high and low values, behavior is constrained by the particular circumstances of the situation. Some respondents might acquiesce to a threat, canceling any plans that might put them at risk. Others might exhibit defiance, refusing to be cowed by the threat even though afraid. Numerical responses were analyzed with analysis of variance, as is customary in functional measurement studies.

We asked about anticipated behavior using an open-ended response option, with the respondent free to say anything. Projected behaviors were analyzed with nominal analysis of variance (NANOVA), as presented by Weiss (2009). The analysis associates differences among responses with particular sources of "variance" in the factorial design. A pair of responses either matches or does not. When they do not match, they vary, and that variation is regarded as analogous to variance. Main effects and interactions can be examined, so in principle it is possible to determine whether additivity is obtained in the projected behaviors. Of course, the lack of numerical information in nominal responses means that specific kinds of non-additivity, such as a multiplicative model, cannot be examined.

Although processing of free responses is less convenient than when forced-choice is employed, there are two theoretical 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, innocuous variations in phrasing can lead to few responses matching exactly, in which case NANOVA will not be informative. Accordingly, post-hoc coding is needed to extract the meaning of the response (Weiss, 2010).

Previous experience with actual terrorism is likely to affect how one responds to an attack. Few Americans have had that kind of

personal experience. The university students in our California samples were children during 2001, and most of them were far away from New York City. In contrast, terrorism has been a part of the landscape in Spain and Israel throughout the lifespan of our respondents. Previous research has suggested that people in Israel are unlikely to report being fearful or to act fearfully (Yechiam, Barron, & Erev, 2005). One explanation is that constant exposure to threat induces post-traumatic symptoms that inspire risk-taking (Pat-Horenczyk et al., 2007). Our cross-national studies offer the promise of determining whether those responses are general or are nuanced according to the specific dangers of the situation.

Experiment 1

Participants

In California, university students (n =180; 50% female; 98.8% aged 18-24; 1.2% aged 25-34) were recruited from psychology classes, receiving course credit for participation. Those who chose to participate in this study were given access to a computerized questionnaire posted on Qualtrics, a secure web site. Participants responded at their leisure, unmonitored, from anywhere. Completion of the study took 20-30 minutes. Subjects were assigned randomly by the Qualtrics system to one of the versions of the scenario until a total of 10 eligible males and 10 eligible females had responded to each of the nine between-subject conditions. Students were permitted by the system to participate without restriction; we excluded the data from non-natives and foreign residents.

In Spain, university students (n = 180; 50% female; 55.6% aged 18-24, 18.9% aged 25-34) were recruited in business classes. Participation was optional, and no incentives were offered. The instrument was translated into Spanish by one bilingual member of the research team and checked via back-translation by another. Location-specific aspects of the scenarios were changed to suit the context. These included names of destinations, the terrorist organization, and the airline; distance units were converted from miles to kilometers. The Qualtrics web site was used for data collection, with participants responding in a classroom setting. Completion of the study took 20-30 minutes. As in California, 10 eligible males and 10 eligible females in each of the nine conditions constituted the sample; data from non-natives and foreign residents was excluded.

Design

The nine between-subject conditions were defined by crossing three levels of government response (1) “because this is a serious threat and we have no leads, we will close the airport for three days” (Serious Threat); (2) “we have some leads and are evaluating security, the public is asked to be vigilant” (Investigating); (3) “the ringleaders have been arrested, MANPADS have been confiscated, we recommend business as usual” (Plot Foiled); and three levels of social norm (1) “despite a price cut, air ticket sales have decreased by 40% and 30% of passengers have been no-shows” (Sales Down); (2) “with a price cut, ticket sales have remained steady” (No Change); (3) “with a price cut, ticket sales have increased by 20%” (Sales Up).

After reading the account appropriate to the particular combination of levels to which they had been assigned, respondents reported emotional and cognitive responses. Next, they were asked to imagine what they would do about their plan to attend the forthcoming wedding of their best friend located 1500 miles away. We regarded that distance as sufficient for other modes of transportation to be inconvenient. An open-ended response was elicited. Further open-ended responses were elicited regarding two additional imagined planned trips, also to locations 1500 miles away. One trip was to an interview for a job that would double their salary and fulfill a lifelong ambition; the other was to a long-awaited vacation with friends and family.

Dependent variables . Demographic information (sex, age, cities of birth, and current

residence) was collected from all respondents prior to presentation of the description of the first attack. To maintain anonymity, names were not gathered. Respondents were accurately informed that their instructors would not have access to the raw data and that results would be presented only on a group basis.

Within each of the nine conditions, we analyzed the data from the first 10 female and first 10 male native-born citizens to complete the study. Four emotional responses were gathered, each using an eleven-point numerical scale (0-10) anchored by the terms "low" and "high". Rating scales are usually employed in functional measurement studies because they yield a linear response function (Anderson, 1982). The emotional responses asked about fear ("how fearful would you be"), worry ("to what degree would you be worried"), and two kinds of risk, personal ("to what degree would you feel you were at risk") and societal ("to what degree would you feel the public was at risk"). The response to the cognitive question ("what is the probability of a terrorist attack at an airport within the country during the next twelve months") was entered as a number between 0 and 100%, entered by moving a slider.

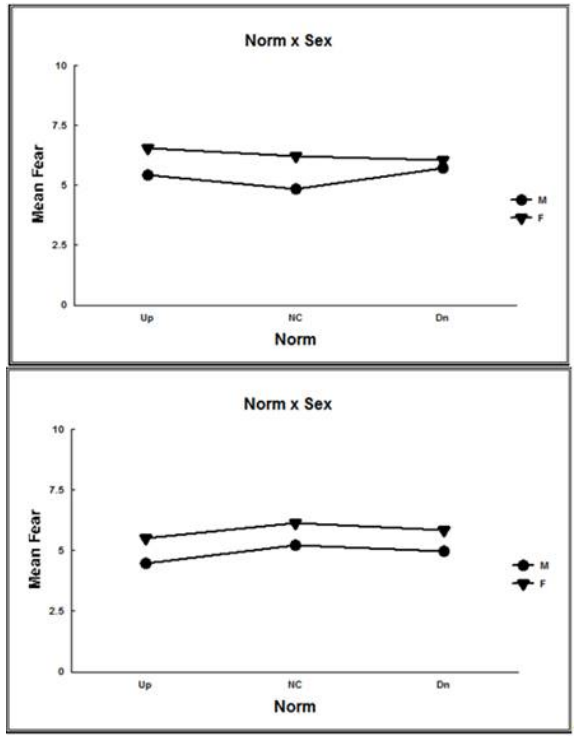
The open-ended responses to the behavioral question ("what would you do about your plans to attend") were coded into one of four responses, which despite a wide variety of verbal expressions encompassed the gist of all typed answers. These were (1) fly on the trip as planned; (2) cancel or postpone the trip until conditions changed; (3) go to the destination using alternative transportation; and (4) undecided and/or consult with family. A few Spanish (but no California) participants occasionally did not enter a response; we coded those as a fifth response, no answer.

Results

We examined the results for Spain and California separately, resisting the temptation to present a combined data set because of the differences in subjects' age and experience. We present results graphically here, so that patterns may be seen. Statistical confirmation was also carried out; the tests confirmed the visual impressions. The set of five tables for Experiment 1 (along with three for Experiment 2).

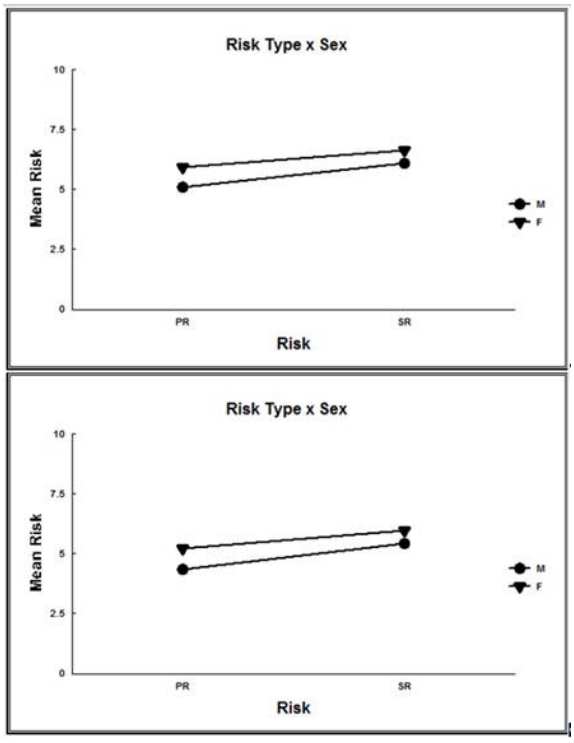
We asked about several aspects of emotional response to the threat. Figures 1 to 3 (Tables 1 to 3) tell essentially the same story. Men report less fear, less worry, and see less risk than women do. The risk to the public is greater than personal risk. Government reaction and social norm yielded no main effects. Accordingly, it would not be meaningful to carry out the usual functional measurement test of whether those factors combine additively or multiplicatively (Weiss, 2006).

Figure 1
Mean fear as a function of social Norm (Up = ticket sales up 20%, NC = no change in sales, Dn = ticket sales down 40%) and sex (F = female, M = male).



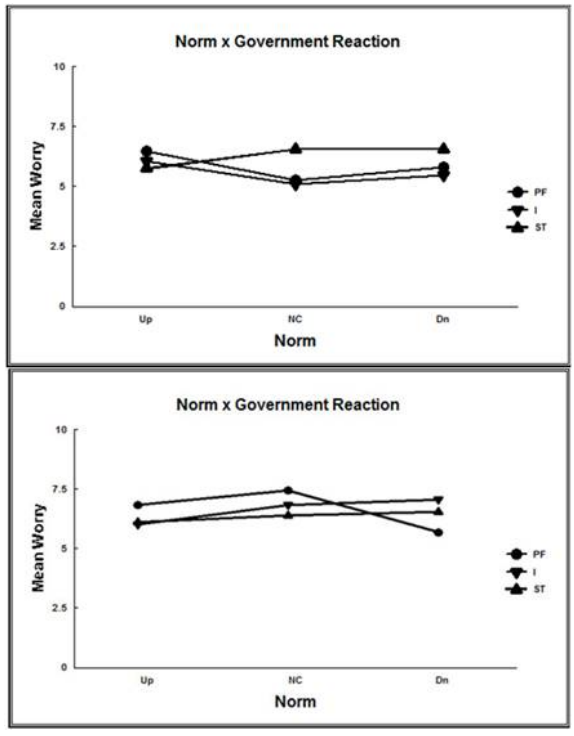
Each point represents 30 responses. Top panel is Spain data, bottom panel is California data.
Source: own work

Figure 2
Mean risk as a function of risk type (PR = personal risk, SR = societal risk) and sex (F = female, M = male).



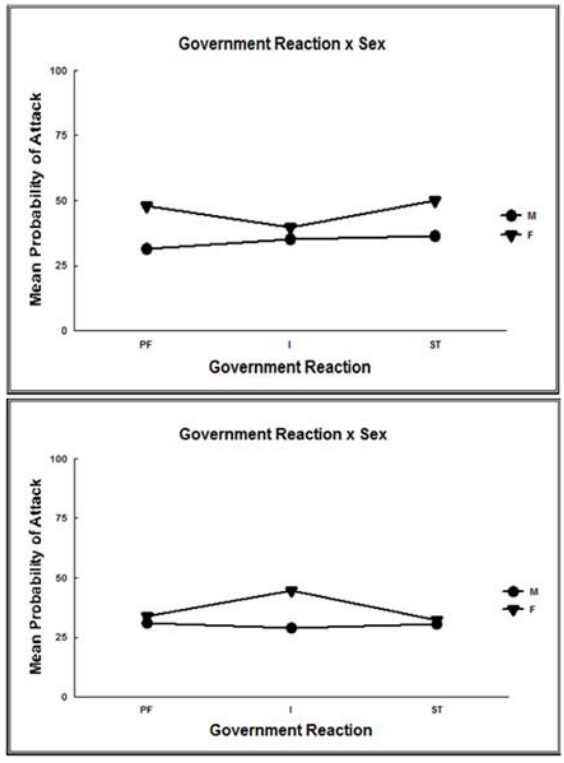
Each point represents 90 responses. Top panel is Spain data, bottom panel is California data. Source: own work.

Figure 3
Mean worry as a function of social Norm (Up = ticket sales up 20%, NC = no change in sales, Dn = ticket sales down 40%) and Government reaction (PF = plot foiled, I = investigating, ST = serious threat).



Each point represents 20 responses. Top panel is Spain data, bottom panel is California data. Source: own work.

Figure 4
Mean estimated probability of a terrorist attack on an airport in the country during the next twelve months, as a function of Government reaction (PF = plot foiled, I = investigating, ST = serious threat) and sex (F = female, M = male). Each point represents 30 responses.



Top panel is Spain data,
bottom panel is California data.
Source: own work

The subjective probability of an attack on an airport in the nation, although in principle a cognitive rather than an emotional response to the threat, presents the same picture. As Figure 4 (Table 4) shows, sex is the only variable that affects the response; women think the attack more likely.

The importance of the trip matters considerably, as seen via responses to the open-ended statement regarding projected action (Figure 5, Table 5). People are less likely to fly to the vacation than to the wedding or job interview. In California, sex does not impact anticipated flying, while in Spain men are more likely to go ahead with the vacation flight.

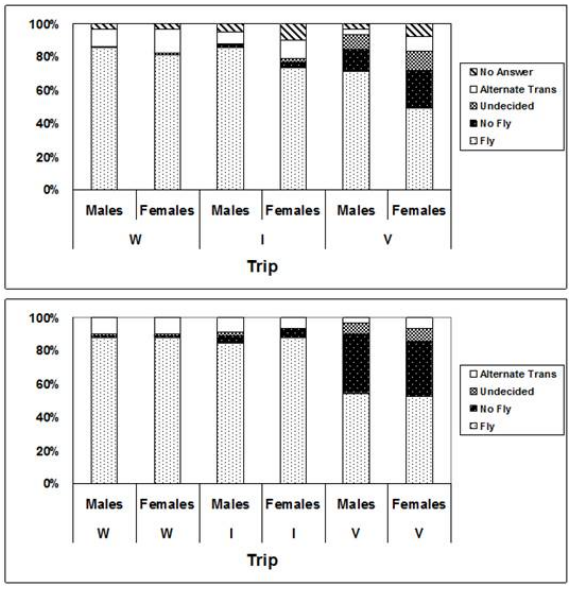
Experiment 2

Participants

In California, university students (n = 252; 50% female; 96% aged 18-24) were recruited from psychology classes, receiving course credit for participation. None had been in Experiment 1. Those who chose to participate in this study were given access to a computerized questionnaire posted on Qualtrics, as in Experiment 1, and assigned by the system to one of the nine versions of the scenario. Completion of the study took 20-30 minutes.

In Israel, university students (n= 252; 50% female; 23% aged 18-24, 71% aged 25-34) were recruited from business classes. Participation was optional, and no incentives were offered. Those who chose to participate filled out a paper version of the questionnaire in the classroom. The instrument was translated into Hebrew by a professional translator. As in Experiment 1, location-specific aspects of the scenarios were changed to suit the Israeli context. Completion of the study took 20-30 minutes. Subjects were randomly assigned to one of the nine versions of the scenario.

Figure 5
Nominal responses as a function of trip (W = wedding, I = interview, V = vacation) and sex (M = male, F = female).



Each stack represents 90 responses. Top panel is Spain data, bottom panel is California data.
Source: own work

In Israel, almost all university students have previously served in the military, while in the United States, most have not. Time spent in the military, along with the fact that many business students have had some time in the workplace prior to pursuing a degree, are the main reasons for the age difference between the two samples.

Design

The nine between-subject conditions were defined by crossing three levels of forthcoming, but not yet in place, government response (increase airport perimeter surveillance, harden fuselage on airplanes, install electronic countermeasures on airplanes) and social norm (air ticket sales remain steady, decrease by 10%, decrease by 50%). After reading a description of an attack, the respondent provided two emotional responses (personal fear regarding flying, fear regarding family and friends flying), one cognitive response (estimated probability of another MANPADS attack within the next month), and one projected behavioral response (what would be done about a long-awaited planned flight to a family vacation 1500 miles away).

Regardless of the condition to which a respondent had been assigned, the description of the attack and its outcome were the same. In each case, a passenger airplane was fired upon by Al-Qaeda (in the U.S.)/ Hezbollah (in Israel) operatives as it was flying near the airport. Next, a description of the factorially manipulated government response and social cue came in accord with the assigned condition, after which responses were gathered. The respondent was not warned that another attack would be forthcoming. The attacks escalated in effectiveness, causing successively greater death and destruction. In the first attack, no one died and 15 of the 146 passengers incurred minor injuries. In the second attack, a week later, all 382 passengers and 15 crew members were killed. In the third attack, another week later, two planes (one arriving and one departing) were shot down, with all passengers and crew members killed.

Dependent variables . Demographic measures (sex, city of residence, and in Israel, personal experience with missile fire) were collected from all respondents prior to presentation of the description of the first attack. To maintain anonymity, names were not gathered. Respondents were accurately informed that their instructors would not have access to the raw data and that results would be presented only on a group basis.

Within each of the nine conditions, we analyzed the data from the first 14 female and first 14 male citizens to complete the study; we had intentionally oversampled so that we could exclude foreign residents and incomplete responders from the analysis. The nominal analysis requires equal group sizes; 14 was the size of the smallest group satisfying the inclusion criteria. After the participant read the description of each of the attacks, numerical responses were gathered using an eleven-point (0-10) scale anchored by the terms “low fear” and “high fear”. Two kinds of fear were elicited:

personal fear and fear for family and friends. The subjective probability of another MANPADS 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; the respondent could type anything. After examining the entries, we determined that despite a wide variety of verbal expressions, four options encompassed all of the responses. These were: (1) fly on the trip as planned; (2) cancel or postpone the trip; (3) go to the destination using alternative transportation; and (4) defer the decision and/or consult with family members. Once the options were established, there were no ambiguities regarding allocation of individual responses. Most responses were either (1) or (2).

Results

The manipulated variable that had the greatest impact, by far, was the escalation of attacks. As the severity of the attacks increased, fear increased and projected flying decreased. The other powerful variable was sex; females consistently expressed greater fear than males. Government action had no differential impact, while the social norm slightly influenced responses in Israel but not in California. All three of the numerical responses were affected by the manipulated variables in the same way, although family fear was higher than personal fear and estimated probability of another attack generated more variability than the fear responses. However, the only primary variable that affected projected action was escalation of attacks.

We show the various results for the two countries separately. Patterns in the data are conveyed graphically, and statistical support for our inferences is provided in the three tables (Tables 6-8) available online.

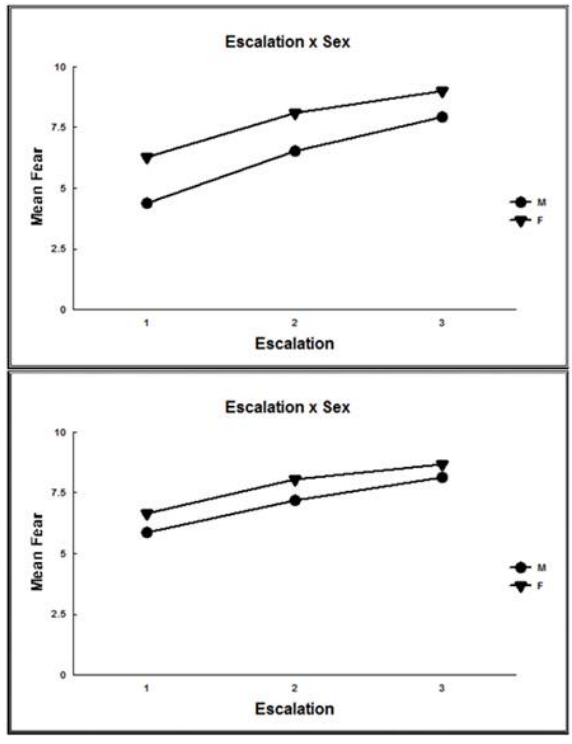
Specific results

The fear results are displayed in Figures 6-8 and supported by the statistical analyses in Table 6. The two most dramatic effects are shown in Figure 6, in which greater fear was consistently expressed by women. The sex difference was greater in Israel, and can be attributed to the lower levels of fear expressed by Israeli men. The escalating attacks also consistently generated increasingly higher levels of fear.

Figure 7 illustrates that family fear was greater than personal fear. The difference was smallest after the third attack. This interaction may have arisen because the fear expressed by the women after the third attack was attenuated by a ceiling effect, as they had already been quite fearful after the second attack.

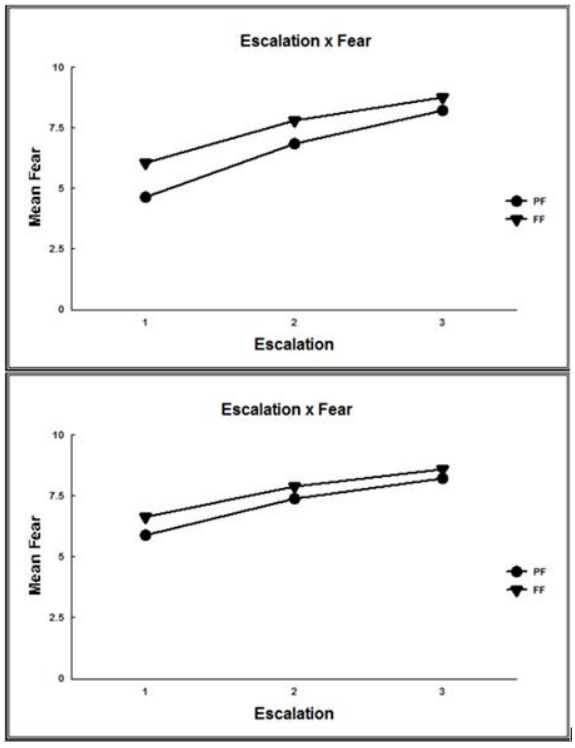
The variables we manipulated between subjects, government action, and social norm, had less dramatic effects. Figure 8 shows that in Israel (but not in California)

Figure 6
Mean fear, combining personal and family fear, as a function of escalating attacks and sex (F = female, M = male).



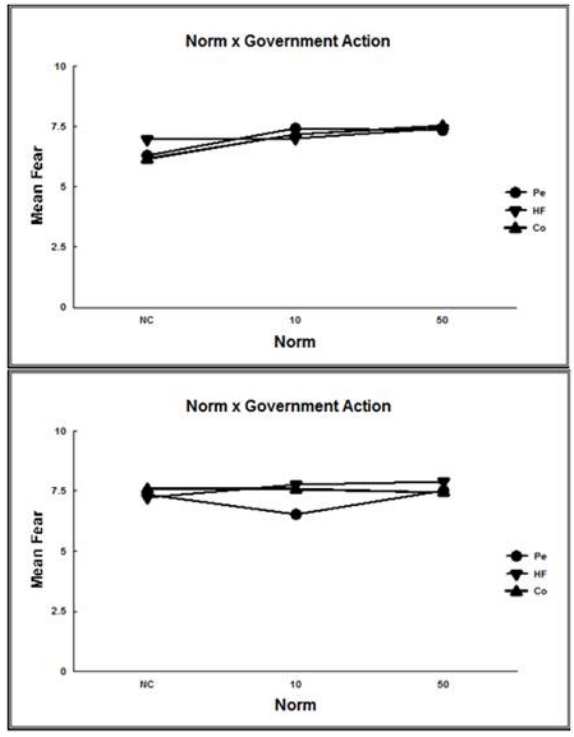
Each point represents 252 responses. Top panel is Israel data, bottom panel is California data.
Source: own work

Figure 7
Mean fear as a function of escalating attacks and fear type (PF = personal fear, FF = family fear.)



Each point represents 252 responses. Top panel is Israel data, bottom panel is California data.
Source: own work

Figure 8
Mean fear, combining personal and family fear, as a function of social Norm (NC = no change in ticket sales, 10 = 10% reduction, 50 = 50% reduction) and Government action (Pe = perimeter surveillance, HF = harden fuselage, Co = electronic countermeasures).



Each point represents 168 responses. Top panel is Israel data, bottom panel is California data.
Source: own work

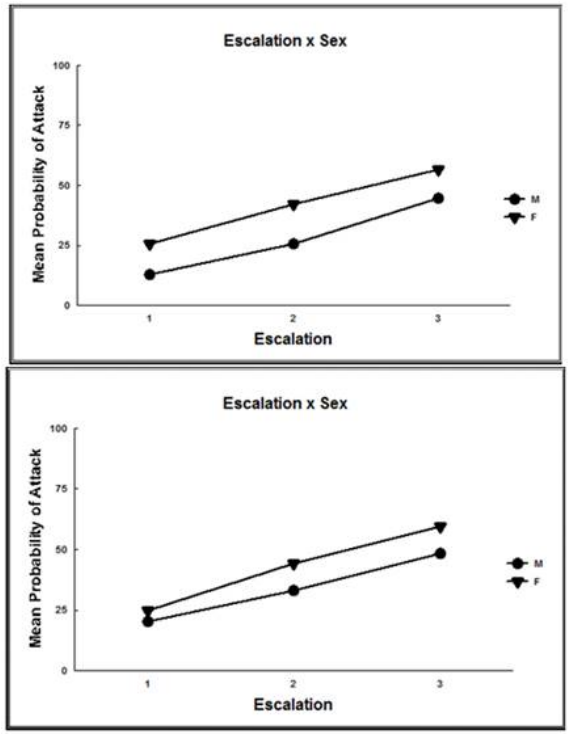
Protective action promised by the government did nothing to mitigate fear in either the Israel or California samples. The variables did not interact, but these results do not constitute support for an additive model because a functional measurement evaluation requires significant main effects.

We did the same analyses and examined the factorial plots separately for personal fear and for family fear (these are not included here). The graphs looked like Figures 6-8 and the significance patterns were the same as for the combined results, reflecting the analysis of variance results that Fear type did not interact with Sex x Escalation or with Government action x Norm.

Rather similar results were observed for the other numerical variable, subjective probability of a future attack. Figure 9, supported by Table 7, shows that escalating attacks increased the respondents' estimates of the probability, and that women thought another attack was more likely than men did. In contrast to fear, the probability estimates for women did not approach the upper end of the response scale, and the interaction between Sex and Escalation was not significant in Israel or California.

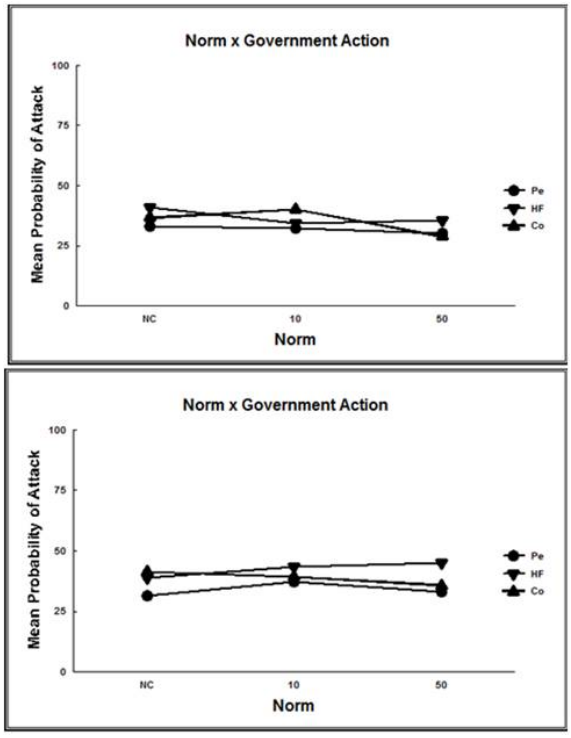
The behavioral responses showed a departure from the pattern we have been observing. While Escalation had its anticipated powerful effect, Sex did not yield a significant main effect, as assessed by the nominal analysis of variance shown in Table 8. There was a significant Sex x Escalation interaction. As Figure 11 illustrates, after the failed first attack, most people maintained their plan to fly. After the second and third attacks, more women than men canceled the trip in both countries. Using alternate transportation is not a viable option in Israel. There is only one international airport, and it is not possible to drive to a distant destination.

Figure 9
Mean estimated probability of another attack within the next month, as a function of escalating attacks and sex (F = female, M = male).



Each point represents 126 responses. Top panel is Israel data, bottom panel is California data.
Source: own work

Figure 10
Mean estimated probability of another attack within the next month, as a function of as a function of social Norm (NC = no change in ticket sales, 10 = 10% reduction, 50 = 50% reduction) and Government action (Pe = perimeter surveillance, HF = harden fuselage, Co = electronic countermeasures).



Each point represents 84 responses. Top panel is Israel data, bottom panel is California data.
Source: own work

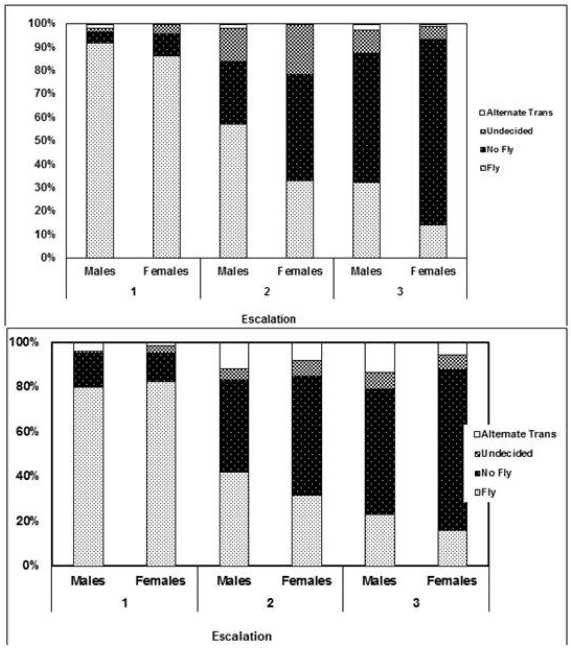
Visually, the effects of government action and social norm appeared similar for the various numerical responses. The patterns in Figure 10 are irregular, as are those of Figure 8. However, perhaps because there was greater variability in the subjective probabilities, the effect of norm did not achieve significance with that measure in either country.

We do not ascribe much importance to the fact that all of the within-group interactions were significant in the NANOVA analyses, attributing that result to a sensitive (i.e., small) common denominator term reflecting increasingly consistent choices across escalation conditions. No one in Israel, and only 10 respondents in California, canceled the flight after an attack and then decided to fly after a succeeding, more severe attack.

Although military service prior to university attendance is nearly universal in Israel, not all soldiers have been personally exposed to missile fire. We explored the effect of that experience on the degree of fear engendered by our hypothetical MANPADS attacks. Slightly fewer than half of the respondents (113 of the 252 Israelis) answered positively to a question that asked whether a missile had ever landed (near to) where they were located. In Figure 12, it can be seen that the experience did not affect fear in our context. Separating the respondents by sex did not alter this outcome.

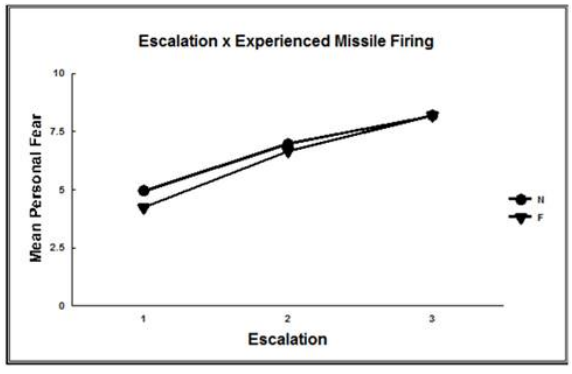
To examine a more personal connection between fear and action, we constructed four post-hoc groups based on projected actions. Fly Group 0 (n = 27 in Israel, 42 in California) consisted of individuals who would never fly under our threat conditions, canceling after learning of the first attack. Fly Group 1 (n = 111 in Israel, 110 in California) would fly after the first attack, but canceled after the second attack. Fly Group 2 (n = 55 in Israel, 48 in California) would fly after the first and second attacks, but canceled after the third. Fly Group 3 (n = 59 in Israel, 42 in California) still planned to fly after the third attack.

Figure 11
Nominal responses as a function of escalating attacks and sex. Each stack represents 126 responses.



Top panel is Israel data,
bottom panel is California data.
Source: own work

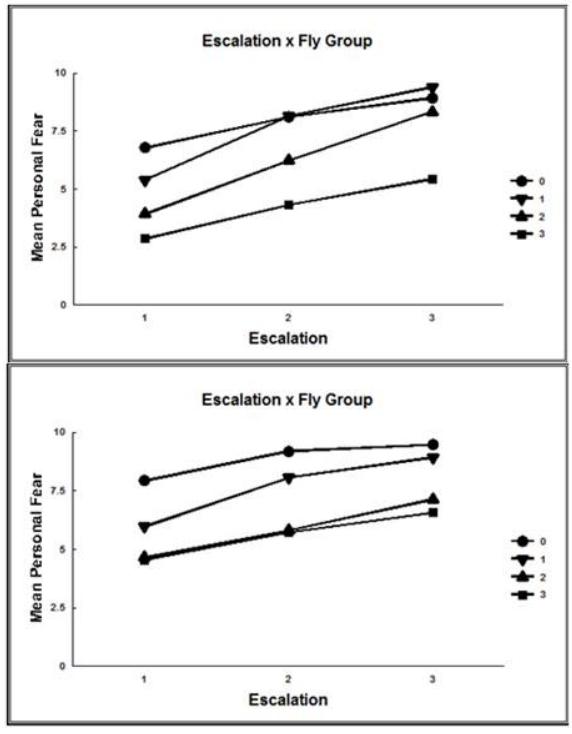
Figure 12
Israel mean personal fear as a function of escalating attacks and personal experience with missile firing (F = fired upon, N = not).



Each point along the Fired upon curve
represents 113 responses, along the
Not fired upon curve 139 responses.
Source: own work

Figure 13 illustrates that generally, the extent of personal fear predicts the behavior. For all groups, fear increased as the attacks continued, but those in Fly Group 3 were on average less afraid after three attacks than were members of Fly Groups 0 and 1 after the first attack. If personal fear reaches seven on the ten-point scale, people change their flight plans.

Figure 13
Mean personal fear as a function of escalating attacks and Fly group (the number of successive flights the respondent would go on as planned).



In Israel (top panel), Fly group 0 is comprised of 27 individuals, Fly group 1 of 111, Fly group 2 of 55, and Fly group 3 of 59. In California (bottom panel), Fly group 0 is comprised of 42 individuals, Fly group 1 of 110, Fly group 2 of 48 , and Fly group 3 of 42 (10 California respondents were inconsistent and could not be classified).
Source: own work

General discussion

As the post-hoc Fly Group analysis in Figure 13 shows, emotion is associated with projected action (Fischhoff, Bruine de Bruin, Perrin, & Downs, 2004). But the connection is imperfect. After a relatively unsuccessful first attack, most people did not change their flight plans

(Figure 11), even though some acknowledged considerable degrees of fear.

In both experiments, women consistently expressed more fear, and assigned a higher probability to a future attack, than did men. The sex difference we observed is consistent with previous research in which males find a variety of negative events less likely and less risky than females do (Flynn, Slovic, & Mertz, 1994). Perhaps women are culturally conditioned to verbalize fear more readily, while men are expected to present a tough exterior. It was only after the second attack that a sex difference in projected action emerged. That difference was maintained across a third attack as well.

It is scarcely surprising that emotion predicts action imperfectly. Action 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. Experiment 1 found that most respondents would fly to the wedding of a close friend, but almost half would not fly to a planned family vacation. The nominal analysis allowed us to see the effect of trip importance quite clearly. Foreseeing an action is a familiar cognitive process for people, so the response is a natural one.

Because Israel and Spain have been under siege for many years, we thought that residents might have become inured to the threat of terrorism. Our results suggest that is not the case. Levels of fear were comparable in the three countries. More tellingly perhaps, within Israel, direct exposure to missile fire did not influence fear. We conclude that the historical record of terrorism of a nation has little impact on anticipated reactions to a novel threat. The similarity of the results across countries has an incidental bearing upon a methodological question raised by Van Acker, Theuns, Hofmans, & Mairesse (2007), who called for future research examining whether functional measurement studies conducted on the web can yield valid results. The data from Israel were collected using paper questionnaires in a classroom setting, while the data from California and Spain were gathered online using Qualtrics. While we cannot guarantee the validity of the current results, we can affirm that the mode of data collection had no apparent impact (cf. Van Acker & Theuns, 2010).

Like Sjöberg (2003), we found fear for others to be greater than personal fear. In our setting people can easily control their own exposure by avoiding the airport, so fear for oneself can be mitigated. Powell and Self (2004) have discussed the connection between controllability and fear in relation to post-9/11 reactions.

Mandel (2005) has expressed concern regarding risk assessments made by laypersons, although other evidence (e.g., Bruine de Bruin, Parker, & Fischhoff, 2007) suggests they can assess probabilities for concrete life events rather well. Our data support Mandel's concern, in that the probability assessments we gathered showed considerable variability. While part of the variation may be attributable to inter-individual variation in numeracy (Peters et al., 2006; Reyna & Brainerd, 2008), it is likely that some was induced by the experimental manipulation. In everyday life, terrorist attacks are usually thought of as low-probability events (Sunstein, 2003), particularly in the US. However, the repeated attacks in Experiment 2 changed that subjective probability. It is likely that some respondents allowed the fictional events to influence the updating more than others.

We treated sex as a controlled demographic factor. We explored its impact, which the literature had suggested would be substantial, because we wanted to illustrate the capability of our factorial scenario methodology to examine demographic variables systematically. In a study that used a nationally representative sampling design, several demographic variables were shown to affect responses to threat (Rosoff, 2009).

In the present research, we elected not to invest in recruitment that would allow us to address other characteristics; one variable is sufficient to make the methodological point. While our decision to use university students as respondents was admittedly influenced by

financial considerations, it did allow us to take advantage of the fact that young people are more than twice as likely to be airline passengers than randomly chosen members of the general adult population (Gallup News Service, 2007). Whether youth renders students more reckless than their elders is debatable (Reyna & Farley, 2006). That fear and projected flying consistently tracked escalation in Experiment 2 suggests that the students were not merely expressing bravado. Responses were aligned with the danger.

We were surprised and disappointed that the between-subject variables, government action and social norm, had no effect. The fact that the response of the government has no effect means either that the actions are perceived as equally effective, or that people pay little attention to them (Hyams, Murphy, & Wessely, 2002). The former is unlikely as the actions in the scenarios were dramatically different. The levels of government announcements in Experiment 1 covered the possibilities in terms of success and the government plans in Experiment 2 ranged from the patently ineffective (increased perimeter surveillance at the airport would scarcely inconvenience an attacker, who would be firing from an unprotected location a few miles away) to the most costly and potentially effective measure that has been discussed publicly (installing electronic defenses on planes).

Likewise, our implementation of the social norm featured wide variations in passenger traffic. The contention that risk is subject to social amplification (Burns et al., 1993; Kasperson et al., 1988) led us to expect that the norm established by reported behavior of other potential passengers might have served as a cue to riskiness. The failure of these norms to affect either fear or action is a challenge to that contention. In fairness to the amplification hypothesis, it may be that norms require conversation (West & Orr, 2005) and reflection in order to take hold. In our paradigm, people did not have time to discuss the danger with friends or to absorb more reflective media commentary (Burns & Slovic, 2007).

A logical possibility for the failure of an effect to evince itself is a lack of statistical power. Because error terms for between-subjects statistical tests are typically relatively large, it can sometimes be difficult to achieve significance. Against that, the sex factor was also a between-subjects manipulation, and there was sufficient power to bring it to light. Furthermore, similar null results have been obtained in an online study of the effect on terrorist attacks on airplanes carried out with a considerably larger sample in Germany (Göritz & Weiss, 2014). The latter employed the same levels of government action and social norm as our Experiment 2.

An alternative explanation is that our considered decision to avoid contrast effects by exposing individual respondents to only one combination of the between-subject variables deprived them of the opportunity to use comparison to form a consistent judgmental context. Hsee and Zhang (2010) have proposed an account of value sensitivity they call general evaluability theory. According to that theory, response mode - whether one is making a single evaluation or a joint evaluation - is a primary determinant of evaluability. A single evaluation yields less value sensitivity than a joint evaluation, because the latter allows one value to serve as a reference for the other(s). The presentation of a full factorial design to a respondent offers many more references than does the nested design.

One can speculate that the variables might have yielded the expected effects if we had employed the single-subject design that is customary in functional measurement studies. Grice (1966) has suggested that independent group designs and repeated-measures designs are essentially different experiments. The theory presented by Hsee and Zhang (2010) offers a satisfying theoretical rationale for that perspective. As to which mode is more appropriate for finding the "true" result in the terrorism situation, it is our view that an experiment calling for single evaluation provides a more realistic analog to what happens in the real world. A terrorist attack will inspire a particular governmental response

and a particular social norm. The multiple combinations that comprise a factorial design arise only in the laboratory.

A consequence of the feeble main effects is that evaluating a proposed model of how these variables are integrated is not possible. The functional measurement thinking that underlies our design included an expectation that an additive model would be obtained, thereby offering the hope that appropriate action by the government might be able to reduce the fear generated by terrorism threat and exacerbated by public reaction. Still, the forecasts stand on their own. Our data project that a single attack would immediately reduce air traffic by 10-20%, which is consistent with what occurred in the United States after 9/11. Repeated attacks of increasing severity would have a more catastrophic impact.

An obvious limitation of our research is that a scenario study is not real. We cannot be sure that people will actually do what they say they will do while in a research setting. Nor can we examine the longevity of the impact (McArdle, Rosoff, & John, 2012). On the other hand, if one wishes to proactively examine situations that have not yet arisen, or to explore mechanisms that might either mitigate or exacerbate emotional and behavioral responses to a disaster, there is little alternative to creating laboratory analogs to the real world. Empirical work in other settings has shown that behavior in the laboratory can be predictive. For example, results from stated choice studies predict consumer behavior in the marketplace (Louviere, 1988). Successful prediction has occurred in the domain of social behavior as well (Gray, Russell, & Blockley, 1991). In the functional measurement context, correspondence between laboratory results and the external world has also been found (Fruchart, Rulence-Pâques, & Mullet, 2007; Levin, Louviere, Schepanski, & Norman, 1983). However, some laboratory results have not matched field observations (Levitt & List, 2007). A challenge for the researcher is to determine the conditions under which generalization is likely to be successful.

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Notes

***** Research article.