

STATEMENT OF WORK

Pseudoinefficacy, a New Approach to Deterrence: Exploiting the Connection Between Perceived Risk, Affect and Self-Efficacy **William J. Burns and Paul Slovic, Decision Research**

This project will develop a new theoretical framework for understanding and facilitating deterrence in the context of threats to domestic targets by exploiting the perceptual and behavioral relationship among affect, risk perception, self-efficacy and motivation.

1. Theme Area: Risk Perception and Communication

2. Principal Investigator: William J. Burns

3. Institution: Decision Research

4. Co-Investigators: Paul Slovic, Decision Research; Daniel Västfjäll, Decision Research and Linköping University.

5. Key Words: deterrence, affect, self-efficacy, pseudoinefficacy, risk perception, risk communication, inoculation theory,

6. Brief Description

This project seeks to develop a novel approach to understanding and facilitating deterrence in the context of domestic threats to commercial aviation and other high valued domestic targets. The end goal is to provide a theoretical framework for enhancing deterrence by exploiting the connection between affect, perceived risk, and self-efficacy. There is an extensive scientific literature that looks at the connection between these three factors and how to correct misperceptions. This is the first proposed study to the author's knowledge that seeks to exploit these inherent biases as a way to deter an adversary from seeking to defeat a security system.

7. Research Objectives

“Beliefs of personal efficacy constitute the key factor of human agency. If people believe they have no power to produce results, they will not attempt to make things happen.” (Bandura, 1997, p. 3)

Objectives. Practically, this effort would seek to provide the theoretical underpinnings to design subtle contextual cues that do the following to an adversary: 1) reduce the perceived likelihood of a successful attack; 2) diminish the belief in their actual ability to carryout attacks; 3) increase the perceived costs of carrying out the attack; 4) increase the perceived costs of getting caught and 5) diminish the perceived benefits of a successful attack.

Core Idea. Consistent with the Bandura quote, the purpose of this research is to develop a theoretical framework and to offer a viable approach to significantly reducing an adversary's sense of efficacy with regard to defeating the security systems of high valued targets. This framework will be based on a substantial literature regarding the connection between affect, self-efficacy and perceived risk. It will also make use of very recent work on the connection between affect and a novel concept referred to as pseudoinefficacy, which has been examined exclusively in the context of understanding pro-social behavior (Västfjäll, Slovic & Mayorga, 2015). In that

context, it was found that various contextual factors allowed inappropriate negative affect to infiltrate and diminish the anticipated good feeling (known as warm glow) that motivates helping behavior. When this happens, it creates an “illusion of inefficacy” and demotivates behavior in situations where a person could actually have been effective. The proposition here is to reverse engineer this illusion to enable a defender to make contemplated terrorist plot feel less exciting, attractive, or effective, thus inducing a feeling of hopelessness with regard to the plot. According to the theoretical cognitive mechanism known as “the affect heuristic” (Slovic, Finucane, Peters & MacGregor, 2002) this should significantly heighten the perceived risk of failure and reduce the critical component of self-efficacy or organizational efficacy necessary to follow through with such plans. *Note, this is different from merely fooling an adversary into thinking a target is better defended than it is. This approach seeks to erode the core motivation for engaging in the behavior by subverting the psychological affective system in a manner unlikely to be recognized.*

Relevance to Stakeholders. This idea occurred to the author immediately following a conference call inside the TSA HQ during the author’s 2014 DHS Summer Faculty Fellowship. Paul Slovic, Richard John and I were at the TSA participating on a conference call discussing a proposed plan to model the adaptive adversary and defender relationship. Immediately following the call a TSA colleague turned to Paul and asked him if his study of public risk perception could be used to influence the perceived risk of terrorists and hence deter them from attacking valued targets. As we were leaving I suggested to Paul that perhaps his study of the factors that prevent people from engaging in pro-social helping behavior (e.g. they feel the problem is too big to make a difference, they experience negative affect in connection with the situation) could be turned ‘on its head’ and help prevent an adversary from engaging in anti-social behavior. I also mentioned that his work had also shown that there appeared to be an inverse relationship between perceived risk and perceived benefit and that affect was the mediating mechanism. He was struck with the possible utility of this approach and thus began a dialog regarding how best to study and implement the idea. It is clear, that the more adversaries who are motivated to carry out a terrorist plot the greater the likely consequences. Hence, it’s very important to reduce the motivation of potential attackers.

Empirical Support-Inducing Perceptions of ‘A-Drop-in-the-Bucket’. Paul Slovic and Daniel Västfjäll in recent years have studied the phenomena of why people often do not engage in helping behavior when in fact they would like to and importantly have the ability to make a difference. In multiple experiments they have manipulated environmental cues in the context of charitable giving to determine the influence of, often irrelevant, cues on pro-social behavior (Västfjäll et al., 2013; Västfjäll et al., 2014). For example, when they conducted experiments in which they asked how much a participant would donate to save the life of one child it made a difference if they also mentioned that the lives of many other children could not be saved. The more lives that could not be saved, the less a participant was willing to donate to save the life of the single child that could be saved. Of course it shouldn’t matter if other lives cannot be saved, that is an irrelevant cue, but it did. The authors concluded that mentioning the number of children that could not be saved depressed the participant’s willingness to help because it induced in the participant a feeling that their efforts would be a “drop-in-a-bucket”. In another study, Small, Lowenstein and Slovic (2007) found that the money donated to a seven-year-old African child facing starvation markedly decreased (actually dropped by half) when the donor learned that the child was one of millions needing food aid. This may be an important psychological mechanism

for decreasing the motivation to participate in acts of terrorism. Consider the widespread appeal of ISIS in which people are persuaded to leave home and country to contribute to what is portrayed as a 'holy war' that promises to achieve a worldwide caliphate. Creating perceptions that such acts of violence domestically or internationally do not in fact represent a jihad but merely a criminal act that will cause very little change in the scheme of things would be important. Perhaps draw attention for example, to the millions that were unharmed and happy following a suicide bombing, minus one less terrorist. This is very different than the current media climate that tends to elevate all acts of political or religious violence to the level of terrorism. *The primary emotions to induce here in connection with participating in 'jihadist' activity would be despair, hopelessness, guilt and regret.*

Empirical Support for Inducing Negative Affect. Västfjäll and colleagues also conducted experiments in which they once again showed a single child whose life was endangered. In these experiments some participants were also, at the same time, shown images that induce negative imagery such as a shark, a menacing gun, toilet seat and so forth. As before, these images are irrelevant to the decision to help save a child. However, they did make a difference. Participants shown the irrelevant negative imagery felt significantly less positive towards engaging in helping behavior than participants shown neutral images. The authors conclude that these powerful negative feelings occur rapidly and are averaged with possible positive feelings, the end result being a dampening of the desire to engage in pro-social behavior. *In addition to generalized negative affect, the primary specific emotions to induce here in connection with participating in 'jihadist' activity would be sadness, distress and worry. I will add another emotion, based on recent conversations with the authors, disgust.*

Empirical Support-Negative Affect and Perceptions of Risk. Social psychologists have long studied the connection between emotion, cognition and goal directed behavior. Learner and Keltner (2001) introduce experimentation that examines the connection between certain emotions and risk perception by noting that emotional processes often guide behavior in goal-directed ways, even when the objects or events that originally caused the emotion have no connection to the current behavior. The authors go on to say that specific emotions are tied to appraisals of events or situations. Specific appraisals lead to specific emotions. For example, fear is associated with an appraisal of uncertainty and that the individual lacks control over outcomes. Anger, on the other hand, is associated with an appraisal of certainty and that the individual feels a great deal of control over outcomes. The key point here is that these appraisals, often irrelevant to the facts at hand, influence the tendencies to act in particular manners. The authors conducted a series of experiments in which they induced specific emotions and then queried participants about their perceptions of risk. They found that when the situations in question were ambiguous in terms of certainty and control, fearful participants were significantly more pessimistic than angry participants. That is, fearful participants had heightened perceptions of risk. Slovic (1987) also notes that there is a strong and positive correlation between uncertainty surrounding events and perceptions of risk. *The primary appraisals to induce here in connection with participating in 'jihadist' activity would be uncertainty and lack of individual control. That is, the cognition and emotion of doubt may powerfully reduce the motivation to commit terrorist acts. It also suggests that, as far as possible, inducing anger is to be avoided because it tends to embolden an adversary and motivate action. Observe the video footage of the newspaper firm in Paris that was attacked and the brazen way the attackers conducted themselves.*

Complementing Ongoing Research. The proposed research complements a body of ongoing work by the author that seeks to improve our understanding of how perceived risk and negative emotions (e.g., fear, anger, sadness) might spread throughout a community and ripple to other parts of the nation following events differing in their risk signal. This ongoing research specifically seeks to understand the public’s comparative response to a wide array of hazards. It also seeks to examine how the effects of risk-communication messaging spread throughout a population, offering protection from counterproductive attitudes and behaviors.

Project Extends Ongoing Research. This proposed project, together with ongoing research, provides the foundation for a broad and fundamental research program that looks closely at the mechanisms that may amplify perceived risk following adverse events. This study would extend this work and now look specifically at how to reduce the motivation of an adversary to engage in terrorist acts. This research contributes to CREATE’s core mission in the themes of Risk Perception and Communication and Costs and Consequences of Terrorism and now the deterrence of terrorism

8. Interfaces to Current/Other CREATE Projects

This project would integrate well with other risk-perception and risk-communication projects and work done with the study of adaptive adversaries and game theory efforts. Hence, it would relate to the research of Milind Tambe, Vicki Bier, Richard John and Heather Rosoff. Because public reaction to near misses is driven by attributions of what caused the near miss (e.g. skill of the defender, lack of skill of the adversary, sheer luck) work on deterrence is also related to important work done by Robin Dillon-Merrill on the perceptions of near misses across an array of mishaps. Vicki Bier has also published work on the connection of target utility and the value of deterrence. This work is also related to research done by Bill Burns, Richard John and Robin Dillon-Merrill on pre-crisis inoculating risk communication, which is discussed below.

9. Previous or Current Work Relevant to Proposed Project

Previous Success With Concept of Efficacy. For a detailed description of previous research accomplishments please see the Progress Report for 2014 below. However, as an demonstration that the risk perception group has already had some success using the concept of self-efficacy please consider Figure 1 below that describes the results of a longitudinal risk communication experiment that was done.

Our team’s joint work investigating the efficacy of inoculating risk communication looks very promising. In Figure 1 below are the experimental results from a longitudinal study involving eight nationwide surveys conducted from January 29 (Day 0) to July 19 (Day 170): (Survey 1, Day 0; Survey 2, Day 6; Survey 3, Day 10; Survey 4, Day 22; Survey 5, Day 45; Survey 6, Day 77; Survey 7, Day 91; Survey 8, Day 170). Described is the change in confidence in DHS’s ability to minimize harm following a terrorist attack. The risk-message group received an inoculating risk message during the second survey and the control group received no message. Both the risk-message and control groups were exposed to a simulated terrorist attack on an airline scenario during survey 3. As expected, the risk-message group’s confidence spiked on Day 6 following the risk message, and both groups’ confidence fell following the simulated attack (Day 10). However, the risk-message group’s confidence never dipped below its original

premessage level as seen in Days 6, 10, 22, and 45, indicating confidence was either maintained or increased over the course of the experiment. Then the Boston attack occurred. Results from surveys with the same experimental panel on Days 77, 91, and 170 tracked response following the Boston attack. Notice that both groups' confidence fell sharply on Day 77 (24 hours after the bombing) but that on Day 91 the risk-message group had a marked recovery in confidence in comparison to the control group. By Day 170, the inoculating effect of the risk message had worn off and both groups had essentially the same level of confidence. Our team also compared the intentions of risk-message and control groups to cancel travel air travel should an attack like this occur. **These were used as input into a CGE model of the airline industry. The economic analysis suggests that exposure to our risk message in advance of a crisis could reduce the loss of airline revenues by over \$400 million.** From a risk-management perspective, pursuing programmatic research to develop such messaging and determine how best to disseminate it would deliver a very high return on investment at all levels of government.

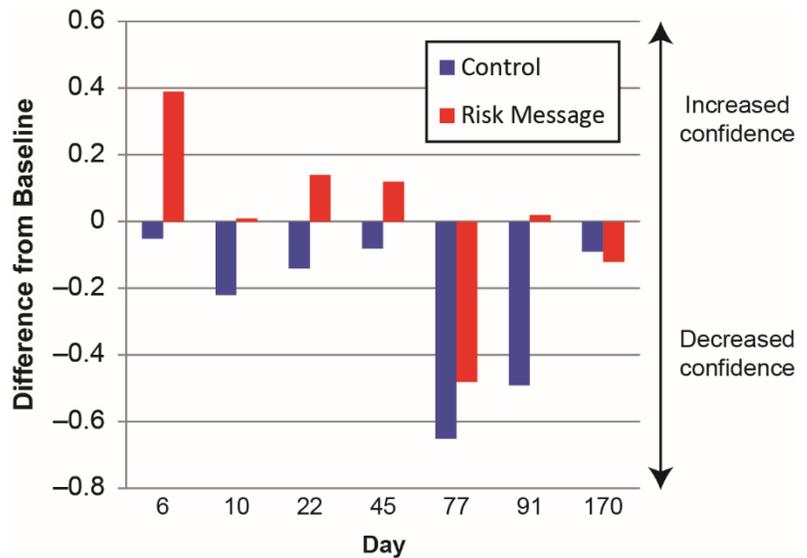


Figure 1. Change in confidence in DHS's ability to minimize harm following a terrorist attack.

10. Major Products and Customers

Products include: 1) A theoretical framework for understanding and facilitating deterrence in the context of domestic threats to commercial aviation and other high valued domestic targets. This framework would enhance deterrence by exploiting the connection between affect and perceived risk and self-efficacy; 2) Provide a compendium of ways to employ the concept of pseudoinefficacy to deterrence and include guidelines for implementation; 3) Technical report summarizing findings; 4) Outline future research program to test framework empirically. **Customers:** Department of Homeland Security, especially TSA, National Counterterrorism Center, FEMA, Department of Defense, Los Angeles Department of Emergency Management.

11. Technical Approach

The research plan is straight forward: 1) Conduct a complete review of the literature on the deterrence of terrorism and extreme violence; 2) Review the literature on risk perception, affect and self-efficacy as it relates to deterrence; 3) Identify and interview key subject matter experts on deterrence both within the security community to determine the viability and application of this approach (e.g. DHS, National Counterterrorism Center) and the academic community; 4) Summarize framework and recommendation in a report.

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13. Major Milestones and Dates (some of these activities can be done concurrently)

Year 12 (July 1, 2015–June 30, 2016)

- a. Literature review of deterrence, affect, risk perception and self-efficacy: November 2015.
- b. Theoretical framework completed and outline for future research validation, March 2016.
- c. Guidelines for implementation, April 2016.
- d. Report, June 2016.

14. CVs

William J. Burns

University of Oregon, Eugene, Oregon, 1986-1990, Ph.D., Decision Science (with a minor in Marketing)

Oregon State University, Corvallis, Oregon, 1986, M.S., Statistics (with a minor in Economics)

Appointments

Decision Research, Eugene, Oregon, 2007 to present, research scientist

California State University, San Marcos, 1999 to present, “part-time” faculty, Statistics, Decision Models, Marketing

University of California, Davis 1997–1998, visiting professor, Full-time and Executive MBA Marketing and Statistics students

University of Iowa 1990–1996, assistant professor, Undergraduate MBA, and Doctoral Marketing and Statistics students

Relevant publications (Years 2010-present)

- Dillon-Merrill, R, Tinsley, C & Burns, WJ (2014). “Evolving risk perceptions about near miss terrorist events”, *Decision Analysis Journal* 11.1, 27-42.
- Dillon-Merrill, R, Tinsley, C & Burns, WJ (in press). “Near-misses and future disaster preparedness”, *Risk Analysis*.
- Geisecke, J, Burns, WJ, Rose, A, Barrett, A, & Griffith, M (2014). Regional dynamics under adverse physical and behavioral shocks: The economic consequences of a chlorine terrorist attack in the Los Angeles financial district. In P. Nijkamp, A. Rose & K. Kourtit (Eds.), *Regional science matters: Studies dedicated to Walter Isard*. Springer: Verlag, Berlin
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Paul Slovic

Date of birth: January 26, 1938

Place of birth: Chicago, Illinois

Education: B.A. (Psychology) Stanford University, 1959
M.A. (Psychology) University of Michigan, 1962
Ph.D. (Psychology) University of Michigan, 1964

Professional positions held

1986–present President, Decision Research, Eugene, Oregon
 1986–present Professor, Department of Psychology, University of Oregon
 May, 1997 Visiting Professor, University of Padova, Italy
 1976–1986 Research Associate, Decision Research, Eugene, Oregon
 1973–1974 Visiting Professor, The Hebrew University, Jerusalem, Israel
 1964–1976 Research Associate, Oregon Research Institute, Eugene, Oregon

Fields of specialization: Judgment, decision making, risk perception, risk assessment

Honorary and professional societies

Phi Kappa Phi

Sigma Xi

American Psychological Association (Fellow in Divisions 1, 3, 8, 21, & 34)

American Psychological Society (Charter Fellow)

American Association for the Advancement of Science (Fellow)

Society for Risk Analysis (Past President, Fellow)

Judgment and Decision Making Society

National Council on Radiation Protection and Measurements

Awards

National Science Foundation Graduate Fellowship, 1961–62

Fulbright Scholar, 1973–74

The Clifford D. Spangler Award, Alpha Kappa Psi Foundation, American Risk and Insurance Association; Outstanding Article 1977–1987

John Simon Guggenheim Memorial Fellowship, 1986–87

Distinguished Contribution Award, Society for Risk Analysis, 1991

Distinguished Scientific Contribution Award, American Psychological Association, 1993

Outstanding Contribution to Science Award, Oregon Academy of Science, 1995

Honorary Doctorate, Stockholm School of Economics, 1996

Honorary Doctorate, University of East Anglia, 2005

The Franklin V. Taylor Award for 2006, presented by Division 21 of the American Psychological Association for Lifetime Achievement in Applied Experimental and Engineering Psychology

The Otto Klineberg Award from the Society for the Psychological Studies of Social Issues in recognition of the paper: If I Look at the Mass I Will Never Act: Psychic Numbing and Genocide.

Who's Who in Science and Engineering

Who's Who in the West

Who's Who in Economics (4th Edition)

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Daniel Västfjäll

Education

B.A. (Psychology) Göteborg University, 1996

M.A. (Psychology) Göteborg University, 1997

Ph.D. (Psychology) Göteborg University, 2002

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Professional Appointments

2011– Director, LiU Center for Behavioral- and NeuroEconomics, Sweden

2011– Full Professor of Psychology, Linköping University, Sweden

- 2003– Research Scientist, Decision Research, Eugene, Oregon, USA
- 2002– Researcher in Psychology, Göteborg University
- 2002– Researcher in acoustics, Chalmers University of Technology
- 2002– Visiting researcher Decision Research, Eugene, Oregon, USA
- 2000–02 Research assistant, Chalmers University of Technology
- 1997–00 Research assistant, Chalmers University of Technology

Synergistic Activities

- i.** Editorial reviewer for: *Organizational Behavior and Human Decision Processes*, *Scandinavian Journal of Psychology*, *Cognition and Emotion*, *Motivation and Emotion*, *Journal of Behavioral Decision Making*, *Musicae Scientiae*, *Journal of Sound and Vibration*, *Acta Acustica*, *Journal of the Acoustical Society of America*, *Psychology and Aging*, *Neuropsychologia*. Co-editor (with Ellen Peters, Tommy Gärling, Paul Slovic) Special issue: "Affect and Decision Making" in *Journal of Behavioral Decision Making*.
- ii.** Editorial board of *Emotion and Psychology of Well-being*.
- iii.** Member: International Society for Research on Emotions, European Society for the Cognitive Studies of Music, Judgment and Decision Making Society, Emotion & Design Society, Association for Psychological Science, European Association for Decision Making, Society for Affective Science
- iv.** Lecturer: Emotion, Cognition, Decision making classes at Linköping University; Acoustics and auditory analysis classes at Chalmers University.

Memberships, Distinctions, Awards

- International Society for Research on Emotions, European Society for the Cognitive Studies of Music, Judgment and Decision Making Society, Emotion & Design Society, Association for Psychological Science, European Association for Decision Making
- Partial List of Major External Research Grants, Role: Principal Investigator (PI)
- 2010-2012 National Science Foundation. "The Life you can save: affective and deliberative factors motivating charitable giving." (Co-PI)
- 2009-2010 National Science Foundation. "Regret regulation across the adult life-span."
- 2008-2010 FAS: "Are older adults rational decision makers?"
- 2008-2010 Swedish Research Council (VR). "Emotion and perception of virtual environments."
- 2007-2009 National Science Foundation, US. "Affect, images and the (in)decision to act."
- 2005-2006 National Science Foundation (NSF), US. "Affect, risk and decision behavior."
- 2004-2007 Swedish Council for Working Life and Social Research (FAS) "Affect and deliberation: Differences in decision making between older and younger adults."
- 2004-2007 Swedish Research Council (VR) "Perceptual optimization of ego-motion perception in virtual reality".