

Analyzing Nominally Expressed Responses to Threat
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This project will test an additive model of the behaviors people expect to carry out and of the fear they expect to feel in response to threats of different levels localized at various targets in the local environment.

Brief Description - The purpose of this research is to examine people whether behave and feel differently as a function of DHS-announced threat levels. Threats will be embedded in brief scenarios that describe possible attacks at different places. The study employs the logic of functional measurement to analyze both projected behaviors and numerical judgments. This work will build on CREATE efforts to understand how people respond to the warnings provided by DHS. It will also feature a new statistical method for analyzing nominal responses.

Sample Data				
Action Taken <i>Degree of Fear</i>				
Threat Level				
Plot Locus				
Reservoir	None 15	None 25	Bottled 60	Bottled 90
Airport	None 20	None 40	Insurance 70	Cancel trip 95
Stadium	None 10	Gun 20	Gun 45	Stay home 60

Objectives - This research will (a) examine the effectiveness of the “colors” mode of conveying risk level on influencing behavioral change; (b) examine the extent to which behavior and feelings each express the response to risk; (c) expand the capability of functional measurement as a tool for cognitive analysis when responses are nominal; (d) develop a factorial analysis of variance for nominal responses.

Interfaces to other Center Projects - This work will maintain a close interface with Dr. von Winterfeldt’s risk analyses.

Interfaces to non-Center Projects - The terrorist plot loci depicted in the scenarios will be guided by risk prioritization results provided by the Infrastructure Protection division of the DHS and the California Office of Homeland Security.

Major Products and Customers - Project deliverables will include a report on whether threat conditions have significant effects and whether they interact with the loci of the terrorist plot described in the scenarios. There will also be a report on the statistical properties of the new Nominal Analysis Of Variance (NANOVA). In addition, a computer program for NANOVA will be developed that features the user-friendly data entry scheme featured in the CALSTAT suite that accompanies Weiss’s textbook on Analysis of Variance and Functional Measurement (Oxford University Press, 2006).

Technical Approach - The experiment will use a functional measurement approach in which the participant reads a scenario describing how authorities have found notes from a terrorist cell describing an imminent attack on a particular, personally relevant target (Factor 1) in the local community, but have not been able to locate the terrorists. DHS has declared a particular threat color (Factor 2) for the situation. The behavioral response called for is the action the participant would expect to take in that situation. The emotional response called for is the degree of fear (0-100) the participant would expect to feel in the situation. Each participant will provide both a behavioral and a numerical response to the same scenario. The additive model predicts that threat levels and plot loci do not interact. It is important to run this

experiment in such a way that the structure of the design does not become apparent to the respondent and thereby artifactually generate an orderly response pattern. The simplest way to avoid that confound is to employ an independent groups design in which a respondent is exposed to only one cell of the factorial design. If the target N is 50 responses per cell, the 3x4 stimulus design described in the illustration on the previous page would require 600 participants, each filling out a brief instrument that can be filled out within 5 minutes. Undergraduates would constitute a suitable population for the study.

A nominal response is the natural mode for describing a choice or projected behavior; people are familiar with telling what they plan to do. However, nominal responses provide less information than numbers afford. A pair of nominal responses either matches or does not, and that is the only information they contain. When the responses do not match, they vary, and that gives to a quantity akin to variance. However, there is no magnitude to the variation and no squaring is involved. The key to NANOVA is the orthogonal partitioning of the pairwise matches established by the factorial structure of the design. In contrast to chi-square and loglinear analyses, the statistics most commonly used with nominal responses, NANOVA does not constrain responses to fit categories and does not inherently (i.e. apart from the issue of power) require the large number of responses needed to generate statistically stable proportions. The effectiveness of these analytic techniques for nominal data will be compared using the data collected in the proposed study.

A possible outcome of the study is that threats affect emotional, but not behavioral responses. That is, people are more frightened by one threat than by another, but they cannot adjust their behavior to suit the threat. Either they cannot think of what to do, or their potential actions seem impractical. The importance of such a result is that putting subjects in a situation where they cannot find an appropriate response to a threat is a recipe for generating the classic phenomenon of learned helplessness. This may provide an explanation for apathetic responses to warnings.

Major Milestones and Dates

- Develop scenarios and begin pilot testing, October 2007
- Conduct case study for response to threat, December 2007
- Write computer program for NANOVA, February 2008
- Elaborate statistical theory for NANOVA (significance, power, comparisons with chi-square and loglinear analysis, historical roots), June 2008