

Information Collection Request for
“Virtual Reality to Train and Assess Emergency Responders”

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May 13, 2013

Part B: Collections of Information Employing Statistical Methods

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1. Respondent Universe and Sampling Methods

According to the National Mining Association (NMA) slightly more than 50,000 individuals currently work in underground coal mines in the U.S. (NMA, 2011). According to the Mine Safety and Health Administration's (MSHA) Reference Guide to Mine Rescue Teams, there were 366 underground mine rescue teams (193 coal and 173 metal/nonmetal) in the United States as of April 2012 (MSHA 2012). A total of 1,462 individuals served on underground coal mine rescue teams and 1,359 individuals worked on metal/nonmetal teams. Each mine rescue team is comprised of six to nine individuals, who perform a variety of duties as mine rescue team members. CDC does not claim that the workers selected for this study are statistically representative of the entire population of U.S. underground miners. It should not be assumed that the findings of this exploratory study are generalizable to other groups of coal miners.

The subjects for this series of studies will be employees from underground coal mining organizations. Individual miners and mine rescue teams will be recruited via stakeholder meetings and previous research field contacts. The participating mining organizations will not be discounted based on accident history, region, union/nonunion affiliation, etc. It is expected that the employees of the participating mines will vary across a number of variables including age, gender, and experience. All employees will be given the option of declining individual participation in the study.

It is expected that a total of 150 individuals will participate in testing of the virtual mine environment and related training exercises. Because of the nature, scope, and complexity of the project, data collection is expected to last 36 to 40 months. Data will only be collected once with each participating miner; this is not a longitudinal study.

Because underground coal mines are scattered across more than a dozen states, random sampling of miners and mine rescue teams is not feasible. The sampling of participants for the present study will be a convenience sampling. Purposive sampling will be used to ensure that the research team gets a broad sample of individuals from the participating mine organizations who will represent different size underground coal mines and different groups within the organization, especially for evaluating mine escape training modules. Convenience sampling will occur based on the availability of mine rescue teams at the point in time when assessments of the mine rescue training modules are conducted.

The data collected for this study will be both qualitative and quantitative in nature. The data will be examined for correlations and internal consistency (reliability) between items. In addition, descriptive statistics (e.g., variability and mean scores for each item across the participants) and tests for statistical significance of group differences will be performed. Demographic information will be collected to describe the sampled group (through means and ranges) and to see if the variables correlate with resilience. Additionally, differences in demography and training outcomes between various subsamples will be examined (e.g., composite and formal rescue teams, rescue and escape participants, pilot test subjects and formal experiment participants, on-site and off-site participants). Observation data will be coded by researchers based on specific themes presented by respondents.

2. Procedures for the Collection of Information

This is a non-intrusive field and laboratory study and no variables will be manipulated. The data collected will help determine the effectiveness of using virtual reality immersive environments for teaching critical mine safety and health skills, determine how miners interface with such virtual worlds, and study the utility of using VR technologies for applicability in other areas of mine safety and health research.

Researchers will collect basic demographic information including age, gender, and experience in mining and/or mine rescue. Data collection for assessment of learning and environment interaction will largely be conducted using direct observation, electronic capture of interactions and paper survey instruments. Survey instrument questions will primarily be close-ended and require respondents to rate their opinions using a Likert-type scale. Members of the research team will enter the quantitative information from the instruments into a data file using the Statistical Package for the Social Sciences (SPSS). These files will be stored on a password protected computer network. Any completed individual data forms will then be destroyed.

3. Methods to Maximize Response Rates and Deal with Nonresponse

It is anticipated that at least 95% of individuals selected to participate in the evaluations will participate. The instruments will be administered in group sessions, which should help to ensure a higher response rate. Due to normal absences from work, a few miners may be unavailable on the particular days that the data collection activities are conducted.

4. Tests of Procedures or Methods to be Undertaken

The survey items were created based on a thorough literature review of using virtual immersive environments in a variety of domains (e.g., military), conventional training assessment and evaluation metrics, as well as past practice utilized by NIOSH researchers when developing mine safety training exercises. To make the items relevant in the mining context, information was gained by reviewing previous NIOSH research and interviews with underground coal miners who survived mine fires at three different mines in the late 1980s as well as interviews with individuals who had firsthand experience in managing a mine emergency or experience in mine rescue.

5. Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing Data

Project staff members will handle the majority of the data management effort. Specifically, Tim Bauerle (listed in Project Staff below) will be in charge of the data management, collection, and analysis. Should the project require further guidance on scientific issues regarding data, other internal resources are available through teams within the project staff's branch.

1Project Staff:

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These are the primary individuals who are leading study design, data collection, and analysis efforts.

1References:

NMA [2011]. U.S. Coal Mine Employment by State, Region, and Method of Mining. Washington, DC: National Mining Association. [http://www.nma.org/pdf/c_employment_state_region_method.pdf].

MSHA [2012]. Mine Rescue Teams Nationwide – Nationwide Listing Excel Spreadsheet. Arlington, VA: Mine Safety and Health Administration. [<http://www.msha.gov/MineRescue/MAP/ASP/minerescuehome.asp>].