

Prepared for:
Department of Homeland Security

Law Enforcement Use of Force SIMEX

Questions and Answers (Q&A)

March 11, 2022

Version 0.1

Document No. MP220154

Approved for Public Release; Distribution Unlimited.
Case Number 22-0801 / DHS reference number 70RDAD20-0208-04

Homeland Security Systems Engineering & Development Institute

The Homeland Security Act of 2002 (Section 305 of PL 107-296, as codified in 6 U.S.C. 185), herein referred to as the “Act,” authorizes the Secretary of the Department of Homeland Security (DHS), acting through the Under Secretary for Science and Technology, to establish one or more federally funded research and development centers (FFRDCs) to provide independent analysis of homeland security issues. MITRE Corp. operates the Homeland Security Systems Engineering and Development Institute (HSSEDI) as an FFRDC for DHS under contract 70RSAT20D00000001.

The HSSEDI FFRDC provides the government with the necessary systems engineering and development expertise to conduct complex acquisition planning and development; concept exploration, experimentation and evaluation; information technology, communications and cyber security processes, standards, methodologies and protocols; systems architecture and integration; quality and performance review, best practices and performance measures and metrics; and, independent test and evaluation activities. The HSSEDI FFRDC also works with and supports other federal, state, local, tribal, public and private sector organizations that make up the homeland security enterprise. The HSSEDI FFRDC’s research is undertaken by mutual consent with DHS and is organized as a set of discrete tasks. This report presents the results of research and analysis conducted under:

70RDAD20FR0000208

Law Enforcement Use of Force SIMEX

DHS Office of Partnership and Engagement, Office for State and Local Law Enforcement.

This document provides a set of questions and answers related to the Law Enforcement Use of Force Simulation Experiment (SIMEX) conducted under HSSEDI Task 70RDAD20FR0000208: Law Enforcement Use of Force SIMEX. The purpose of the task is to provide law enforcement organizations evidence-based data analysis that may be used to revise law enforcement practices to reduce arrest-related fatalities.

The results presented in this report do not necessarily reflect official DHS opinion or policy.

For more information about this publication contact:

Email: hssedisimex@hq.dhs.gov

Homeland Security Systems Engineering & Development Institute

The MITRE Corporation
7515 Colshire Drive
McLean, VA 22102

Email: HSSEDI_info@mitre.org, <http://www.mitre.org/HSSEDI>

Q: What is a SIMEX?

A: SIMEX stands for Simulation Experiment. A SIMEX uses simulated environments and simulated systems with real operators. As an experiment, the outcomes of a SIMEX are not pre-determined. The SIMEX process follows the scientific method, which includes a research statement (often called a problem statement), research topics, hypothesis, experimentation, data analysis, and the reporting of the results i.e., final report). Since SIMEX 21-3 required operators (law enforcement officers [LEOs], mental health professionals, bystanders, etc.) to make decisions in a simulated environment, it is classified as a human-in-the-loop simulation.

At the beginning of each scenario run, the SIMEX operators assume their role within the virtual environment in the form of an avatar. LEOs move their avatars to a location within the virtual environment in response to a 9-1-1 call. They then begin interacting with subjects, and bystanders in the virtual environment as they would in real-world situations. The overall experimental design and concept is conducted in close coordination with the SIMEX sponsors and stakeholders. While the SIMEX environment provides the simulation infrastructure, virtual reality technology, and overall experimental design, the stakeholders provide the domain knowledge and relevant operational expertise.

Q: How is SIMEX distinguished from other modeling and simulation activities?

A: SIMEX is one of several modeling and simulation (M&S) activities that can be used in conducting experiments. A key distinction is that SIMEX uses real operators in a synthetic (i.e., simulated) environment. Simulated environments are used to control things that cannot be controlled in live environments (e.g., weather, number of subjects, number of available LEOs, etc.). SIMEXs may also be conducted with other M&S activities. For example, the results from a tabletop exercise (TTX) may be used to develop the overall SIMEX design. Conversely, the outcomes from a SIMEX activity may be used to inform future TTXs. The diagram below provides a high-level view of different levels of experiments.

Q: Why is an experimental design approach used?

A: The experimental design approach provides the scientific and statistical rigor required to develop the objectives, identify factors (independent variables), analyze the data, and present the results. This approach results in efficient and effective test designs with good statistical properties and defensible and reliable decision-quality products to inform evidence-based decision making.

Q: What is meant by statistical significance?

A: Statistical significance means that an observation was unlikely due to chance. In this SIMEX we used analysis techniques for each measure to determine what factors were main influencers for that specific measure. Significant effects are those that would be very unlikely to happen by chance and would be seen if the experiment is repeated with the same conditions. The statistical determination of significance of effects is influenced by the "noise" in the measurements. The noise in the measurements includes contributions from extraneous variables (i.e., unknown, and not controlled variables) and nuisance variables (i.e., unwanted variables). The general threshold

for statistical significance is a p-value of 0.05. The p-value is a quantitative measure of the probability that the observed difference is due to random chance. If a factor showed a p-value of less than 0.05 we claimed this to be significant (i.e., not due to random chance).

Q: How were participants selected for the SIMEX?

A: The Department of Homeland Security (DHS) recruited and screened LEO and mental health professional (MHP) participants. George Mason University (GMU) recruited and screened the bystanders and subjects. GMU also provided screening and selection support for LEO, dispatch, and MHP participants. To maintain confidentiality and anonymity, GMU maintained participant information. Participant screening included basic demographic questions such as age, gender, race, and ethnicity as well as their current organization, role within that organization, and whether they have any real-world experience in their SIMEX role. Non-law enforcement (LE) participants were screened for prior experience with LE and individuals with potential conflicts were not selected for the experiment. Non-LE participants were screened for psychopathology and psychosocial risk. LEOs were screened for training (including crisis intervention training), experiences with officer-involved shootings, and years in their current role. The goal in LE recruiting was to have a variety of officers participating. Officer backgrounds were accounted for and controlled in the experiment analysis. Race, age, and gender demographics were also accounted for and controlled in the experiment analysis for all participants.

Q: How many people participated in the SIMEX and what was the diversity of the participants?

A: The SIMEX included 33 participants: 12 LEOs, three scenario evaluators, four MHPs, 10 bystanders, and four subjects.

Eight of the officers performed as LEOs, and four of the officers performed as dispatch participants. The LEOs and scenario observers were selected to reflect the diversity of agencies and officers across the United States. LEOs were generally highly trained and, for officers with 10+ years of experience, recent experience as a patrol officer was limited. Patrol experience ranged from six to 19 years, with a mean of 11 years on patrol.

Q: How can we have confidence in the results given the sample size?

A: The purpose of the experiment was to examine the impact the SIMEX factors have on arrest-related fatalities and injuries by placing LEOs, bystanders, subjects, and MHPs in a simulated environment. LEOs and MHPs were asked to respond to the incidents as they would in real-world situations.

The sample size of the experiment was determined by the number of factors (independent variables) selected. For this SIMEX, five factors were selected, and each factor had two possible settings. For example, the factor related to the subject being armed has two possible settings: 1) the subject is not armed, and 2) the subject has a handgun. Five factors with two possible settings equates to 32 unique scenario runs. The SIMEX was conducted with 32 unique scenario runs.

The confidence in the experimental results, that is, the effects seen on the measures by varying the factors, reflects the likelihood that we would see similar results if the same experiment (factors and measures) were repeated with the same conditions (i.e., in a simulated environment with similar LEOs, bystanders, subjects, and MHPs). While the fidelity of the analysis clearly shows repeated and emerging patterns in the data across the 32 runs, we validated these patterns with information obtained from the hot-wash discussions and survey results. That is, the quantitative results were validated with the qualitative results.

The number of LEOs was not a SIMEX factor, and the intent of the experiment was not to measure the variation among LEO groups. Eight LEOs were selected for the experiment to reflect the real-world diversity of gender, race, and organization size. The number of LEOs used in the experiment was constrained by the limited availability of LEOs and the limited availability of travel funds. While having more LEOs was desirable, the SIMEX team determined data could be collected and much could be learned using the eight LEOs along with the three scenario evaluators who participated in the SIMEX. We examined the LEO response patterns for variation and found no significant variations in responses across the 32 scenario runs.

Conducting the experiment in a simulated environment provided additional confidence in the results since the environment was controlled. The SIMEX environment is carefully controlled to minimize the impact on the results due to extraneous variables, such as variations in the performance by LEOs, MHPs, and bystanders due to weather or time of day.

We found additional confidence in the results when we realized the SIMEX data and recommendations are consistent with recommendations on policing from other sources. For example, the SIMEX report recommends investigating "... ways to encourage and provide refresher training and increasing levels of training that are woven into the job and workweek of every LEO. Training should target situation assessment, stress management, communication, and use of force decision making in high-risk situations." The President's Task Force on 21st Century Policing, published in May 2015, has similar findings, stating that "As our nation becomes more pluralistic and the scope of law enforcement's responsibilities expands, the need for expanded and more effective training has become critical. Today's line officers and leaders must meet a wide variety of challenges including international terrorism, evolving technologies, rising immigration, changing laws, new cultural mores, and a growing mental health crisis".

Finally, given the differences in local LE tactics, techniques, and procedures across multiple jurisdictions, not all SIMEX recommendations are applicable to all jurisdictions. Consequently, the intent is not to establish new policies based on the SIMEX results, but instead to share the results with LE stakeholders, discuss how the recommendations are applicable for interested stakeholders, and assist stakeholders in establishing best practices that are uniquely relevant for their jurisdiction.

Q: Did the SIMEX have mental health professionals interacting with subject role players in a virtual reality environment along with the law enforcement officers?

A: Yes. MHPs came from the Fairfax County Community Services Board. The MHPs were Crisis Response Trained MHPs.

Q: Can these recommendations speak to hiring and recruitment factors as well as training? For example, the information about cognitive demand could speak to educational and intellectual requirements, the information about hand-to-hand capability could relate to physical requirements, and the information about capacity for handling stress could speak to psychological requirements.

A: The conclusions and recommendations sections of the report address many of these topics. For example, many officers cited training and experience as critical knowledge sources for managing interactions with subjects. Although trainees pointed to examples of excellent training within LE, reductions in use of lethal force likely require further investment in training to improve proficiency levels across this highly complex and demanding profession. While the SIMEX report recommends evaluating options for improving LEO cognitive load management and acute stress management, this concept could also be extended to developing factors related to hiring and recruitment. More research is needed to identify reliable hiring and recruitment factors related to cognitive demand.

Q: What is meant by cognitive load?

A: Cognitive load refers to the demand on working memory required to perform cognitive activities, including sensemaking, problem solving, decision making, anticipating, and planning. The scenarios used in this study were cognitively demanding. Variety, ambiguity, and unpredictability of the situations add layers of complexity that escalate the cognitive demands.

LEOs are faced with incredible cognitive demands during life and death situations. Substantial training and experience help officers manage the workload, but even experienced and highly trained LEOs encounter situations with extremely challenging cognitive demands. Additional research on cognitive workload for LEOs is highly recommended, and any new techniques, tools, or practices recommended for LE organizations and leadership should first consider how the proposal will impact cognitive workload.

Q: Did the presence of a mental health professional have an impact on law enforcement officer workload?

A: Yes. LEOs cited MHPs as a source of additional workload. Analysis of LEO cognitive load relative to stress-impacted cognitive capacity also indicated that monitoring and protecting the MHP is demanding. However, LEOs emphasized that MHPs are crucial members of the community, especially when working with citizens suffering from a mental health crisis. Universally, LEOs agreed that additional training and/or police-mental health collaborations are needed to effectively engage with mentally ill subjects/civilians. The SIMEX findings recommend LE organizations fund and continue investigating collaboration models between LEOs and clinical mental health service providers.

Q: How can the results of this SIMEX be used?

A: In the SIMEX environment, we have a clear vision of how scenarios evolve. We can quantify the outcomes, and we can compare similar incidents to determine what makes a difference. This information is powerful and drives understanding of complex situations. The results from the

SIMEX should be compared with data collected from real-world events. Consequently, data collected from real-world events should be made available for researchers, citizen review board members, LE organizations, and the public. The SIMEX team recommends the Department of Justice and DHS create and manage a national database that includes all LEO-subject encounters. Delineated for each encounter would be: 1) whether force was used, 2) the kind of force used, 3) the race of the subject, 4) the presence or absence of subject signs of psychosis, 5) the level of subject combativeness, 6) whether the subject was armed, and 7) the presence or absence of an MHP. The real-world events data may also be used to improve the fidelity of future SIMEXs and other M&S environments.

Q: What were the SIMEX results regarding subject race?

A: A central question in this experiment was whether racial cues (as indicated by avatar skin tone) bias LEO decision making.

Establishing the presence or absence of racial bias in actual use of force incidents is highly problematic and findings from SIMEX 21-3 support this complexity. For example, SIMEX participants never cited suspect race as a motivating factor for actions, and LEOs never mentioned the topic of suspect race in qualitative interviews.

Data and the subsequent analysis indicate that the perception of events, including the reasonable application of force, varied between runs with Black and White suspects. While SIMEX 21-3 findings support the Bureau of Justice statistics on use of force, specifically 25 percent of arrest-related fatalities involve African American males, these results raise significant questions about biased, subjective perceptions of evaluations of behavior based on race. The need for subsequent investigations aimed at countering implicit bias, building cultural competence, and encouraging community engagement in understanding and preventing racial inequities around use of force is critical.