



# Law Enforcement Use of Force Simulation Experiment (SIMEX 21-3)

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## SIMEX 21-3 High Level Overview

- Participants and VR Environment
- SIMEX Factors and Metrics

## Experimental Findings

- Force, Psychosis, & Workload
- LEO Utilization of MHP
- LEO Cognitive Load and Decision-Making

## Recommendations and Future Research

## Questions and Open Discussion

SIMEX – Simulated Experiment  
UoF – Use of Force  
VR – Virtual Reality  
LEO – Law Enforcement Officer  
MHP – Mental Health Professional

# SIMEX 21-3 High Level Overview

**Goal:** Deter and reduce arrest-related fatalities and injuries due to LE applied force through an understanding of the factors that go into the officer's decision-making process when conducting arrest and detention-related encounters.

**Objectives:** Provide Law Enforcement (LE) organizations and related stakeholders with evidence-based data to: inform policy, procedures, training efforts, and future research and improve situational awareness in the area of LE applied force.

**Design:** Using a simulated virtual reality (VR) environment, data was collected on multiple performance metrics (responses) for 5 binary experimental factors which were selected by SIMEX Sponsors. Qualitative research methods provided further insight into how and why an impact may have occurred.

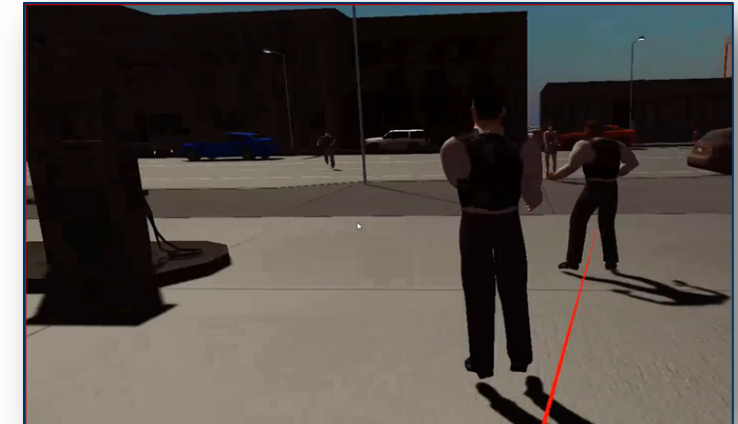
# SIMEX Scenario Participants & Virtual Environment

- Law enforcement officers (LEOs; n=8), dispatch (n=2), and scenario observers (n=2) reflected diversity of agencies and officers across the U.S.
- Mental health professionals (MHPs; n=4), subjects (n=4), and bystanders (n=10) were GMU students or local residents
- 2 weeks (April 5-16, 2021)

## Each scenario included the following participants:

- Two LEOs
- One dispatch operator [not in VR]
- One MHP\*
- One subject
- Three bystanders

## Law Enforcement Officers



## City Street Views



\* Due to the experimental design, not all runs include an MHP

# SIMEX Virtual Environment

LEO (selected)



Objects (selected)



Suspect Avatars (selected)



Subject & Bystanders

The Simulation, Experimentation, and Analysis Lab (SEAL)

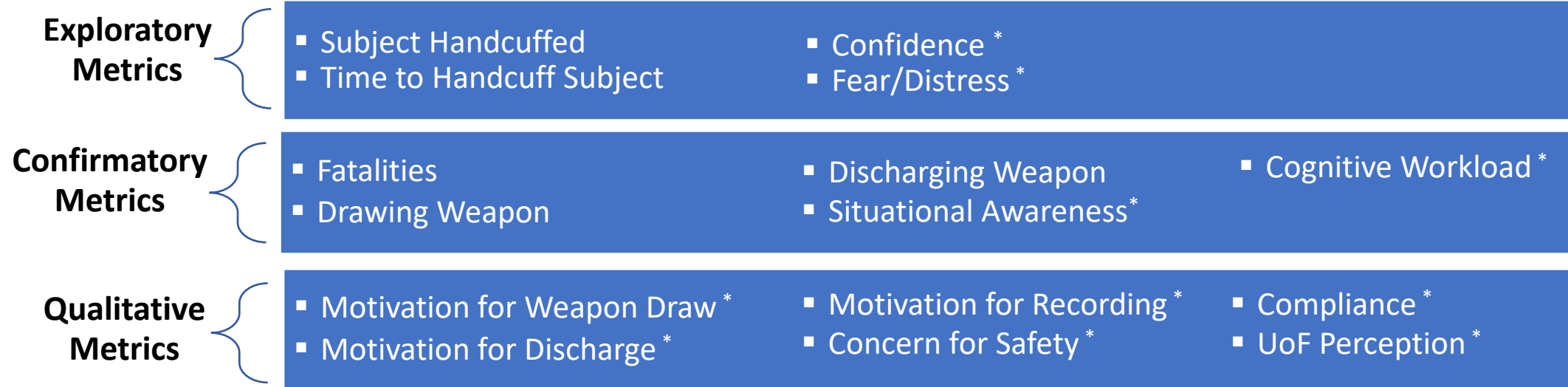
# SIMEX Experimental Design: Factors

- Factorial design, spanning 32 runs, explored five binary factors.
- Factors were randomized to determine if the factor levels had a statistically significant effect on UoF metrics. Factor interactions were also examined.
- Other key findings were derived from overarching themes in the qualitative data, collected using qualitative metrics (i.e., survey measures, open-ended questions, and LE interviews).

Factor	Level 1 ( <i>n</i> =16)	Level 2 ( <i>n</i> =16)
Subject Armed	Not armed	Handgun
Subject Resistance	Not combative	Combative
Altered State	No psychosis	Psychosis
Mental Health Professional	No MHP	MHP
Subject Race	Darker tone	Lighter tone

# SIMEX Experimental Design: Metrics

*How do the scenario factor settings affect the metrics below?*

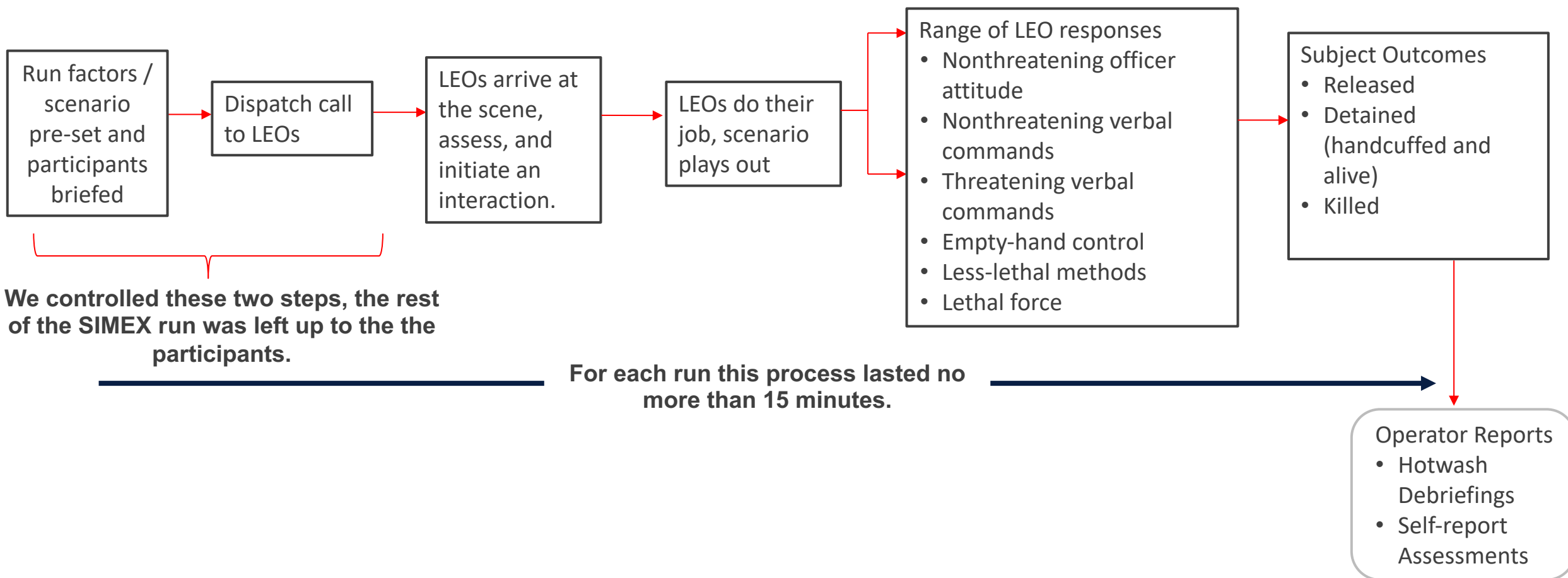


*\* Qualitative self-report survey items (i.e., SART [situational awareness], NASA-TLX [workload], SUDS [stress], open-ended questions)*

Run ID	LEO Team	Armed	Psychological State	Subject Resistance	MHP Presence	Subject Race
107	2	Handgun	Psychosis	Physically combative	No MHP	White
108	2	Not armed	Psychosis	Physically combative	No MHP	Black

**...plus 30 additional runs**

# Progression of an Event





## Findings in Brief

When LEOs are presented with a scenario that has clearly defined CONOPS their actions are consistent.

When situations are ambiguous, unpredictable, or the LEO perceives the potential for escalation is high, there is more variability in LEO decision-making, questions around reasonableness of force; higher cognitive demands and stress for officers, and lower utilization of MHPs.

# Findings Summary

1. **Armed and Resistance**: The biggest factors driving use of force measures were subject armed and resistance (number of weapons drawn, weapons discharged, and fatalities).
2. **Psychosis**: When the subject is exhibiting signs of psychosis, LEOs are more likely to report using lethal force, less confident in decision-making, and often viewed psychosis as non-compliance
  - Runs were more stressful and challenging for LEOs
  - Use of less-lethal methods and threatening verbal commands was more likely during runs when the subject was not exhibiting signs of psychosis.

“Subject had a firearm in his hand. In a mental health crisis. He pointed weapon at my partner, LEO, and I and fired at us. We returned fire until the threat was stopped” (LEO 110)

## Findings Summary (cont.)

- Lethal force & Psychosis**: Significant interaction between armed and psychosis and fatalities.
  - Subject was armed in 6 out of 16 fatal runs – in **5 of these the subject exhibited psychosis**
  - **4 out of 8 runs were fatal** when the subject was **combative** and **exhibited psychosis**
- LEO Workload**: Significantly higher when the subject was armed, physically combative, and when an MHP was present (dispatched by LEOs).
- MHP**: LEOs used MHP differently when the situation was unpredictable. If LEOs engaged MHP, they had an additional civilian to be concerned about.
  - LEOs prevented MHP from contacting subject when combative or armed (for MHP safety).

**LEOs agree additional training in de-escalation and improved police-MH collaborations, with clear approach/disengagement protocols, are needed when working with mentally ill subjects.**

# Findings Summary (cont.)

6. **Cognitive Load**: Numerous cognitive demands and stressors, both acute and chronic, placed on LEOs reduce their decision-making capacity.

## **LEOs Identified:**

- Ten cognitive demands contributing to cognitive load (e.g., thinking ahead, UoF, protect others)
- Seven sources of acute and chronic stress (e.g., safety, gravity of actions, public scrutiny);
- Five mitigation strategies to increase cognitive load (e.g., task shedding, cognitive shortcuts);
- Nine stress management strategies (e.g., stall tactics, communication, soft controls); and
- Four training requirements to enhance performance under high cognitive demand/acute stress (e.g., exposure to variety, event debriefs, personal preparation).

“Best you can do is keep an open mind but stay safe...there’s nothing routine about what we do. If you think it’s just another speeding ticket and then you get shot in the face...” (LE104)

# Open Discussion & Questions

# Supplemental Information

## Cognitive Load and Capacity

# Cognitive Load and Decision-Making

## LEOs Identified:

**Ten cognitive demands** contributing to cognitive load that reduce cognitive capacity and add to cognitive demands.

1. Thinking ahead; poised to respond
2. Decide to pull trigger/tase/go hands- on
3. Strategize to calm down, manage subject via talking
4. Assess subject
5. Monitor own response to stress
6. Team Coordination/Communication
7. Mentor inexperienced partner; give partner situation awareness
8. Monitor and protect partner and others' safety (bystanders and MHP)
9. Consider how actions will stand up to public scrutiny
10. Manage attention; ensure all cognitive activities are given attention



# Acute Stress Factors & Mitigation Strategies

## Acute Stress Factors

1. Gravity of Actions/Decisions
2. Presence of a Weapon
3. Responsibility for Bystanders Safety
4. Unpredictability of Subject & Environment
5. Requirement for Rapid Decision-Making
6. Requirement for Use of Force
7. Public Scrutiny of Officer Actions (new)
  - LE112: And now you're thinking about liability, too. Will I be on the news? Will I live up to my training? It's a stressor every day: Am I gonna be that cop that's gonna be on the news?

## Strategies to Increase Cognitive Load

1. Team Collaboration
2. Task Shedding
3. Taking appropriate cognitive shortcuts (via high levels of experience and training); being mindful of bias or poor decision making
4. Creating more time to assess and manage the situation by taking cover
5. Removing bystanders to reduce attentional requirements



# High Cognitive Demand: Experience Over Training

LEOs attributed proficiency to experience rather than training, but highlighted training required for supporting performance under high cognitive demands/acute stress

## Skill Requirements to Increase Cognitive Capacity

1. Situation Assessment
2. Stress Response Management
3. Stall Tactics
4. Subject Communication (non-triggering)
5. Team Coordination (avoid conflicting communication)
6. Patience
7. Confidence (via experience)
8. Physical Touch/Soft Control (non-tactical)
9. Establishing Initial Control

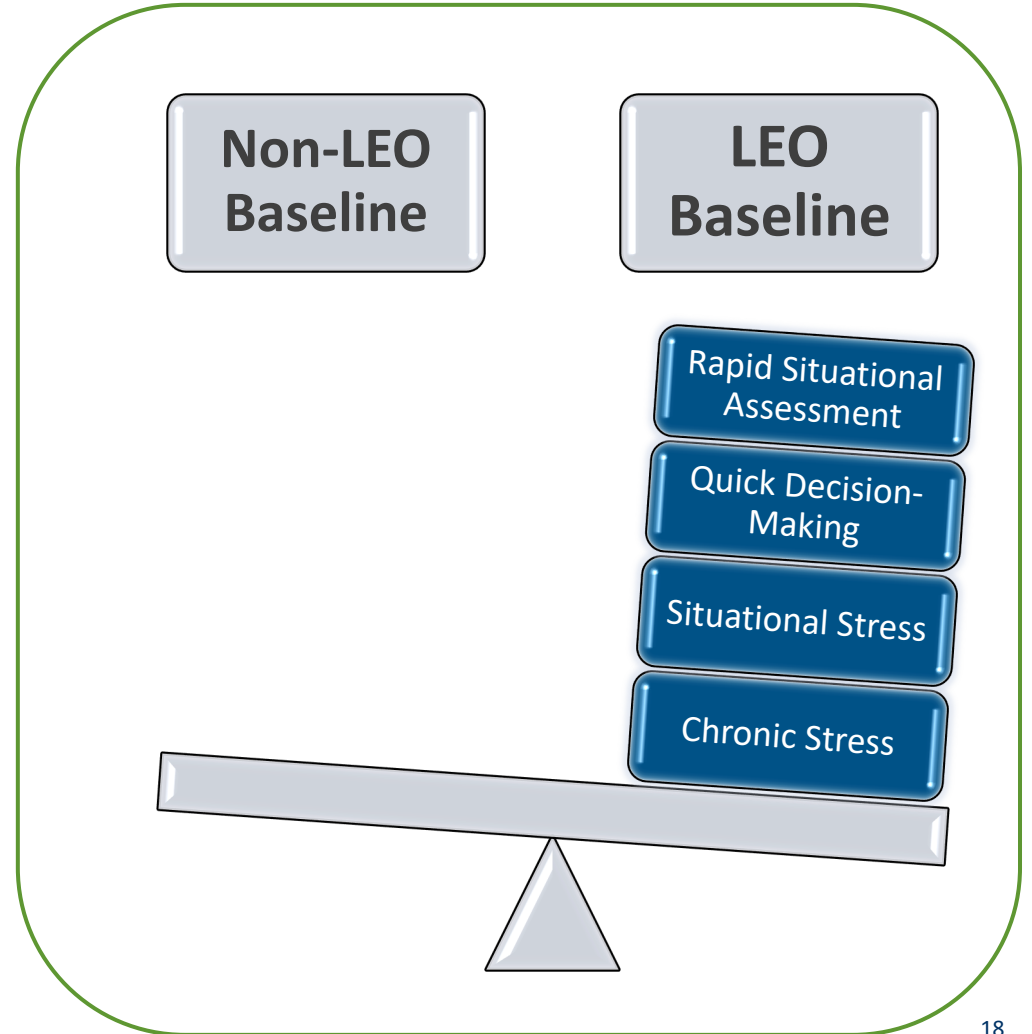
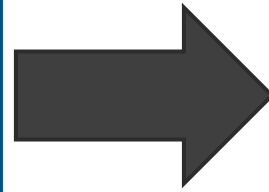
## Training Requirements to Increase Cognitive Capacity

1. Repetitive Training
2. Exposure to Variety (e.g., Tough Case Time Compression & Event/Scenario-Based Training)
3. Event Debriefs
4. Personal Preparation (Physical Preparation/Stress Management)

# Cognitive Load & Capacity Explained

*LEOs perform cognitive activities in a compressed time period under high-stress conditions (repeatedly)*

- **Cognitive capacity is limited** when multiple tasks require more than peripheral attention.
  - *We can drive a car and talk on the phone until driving requires acute attention.*
- **Acute and chronic stressors** reduce cognitive capacity and add cognitive demands.
- **Cognitive demands for LEOs** far exceed baseline (i.e., not increased by training or experience) human cognitive capacity.
- **LEOs increase cognitive capacity by automatized procedures**; decision heuristics (cognitive shortcuts); and experience-based knowledge structures (schemas)
- **Sometimes these are not sufficient** for a given situation - continuous training for performance in high-stress conditions supports modification.



# Results: Cognitive Load (MHP example)

LEOs used MHP differently when the situation was unpredictable. If LEOs engaged MHP, they had an additional civilian to be concerned about. Workload / stress also increased. Similar results for psychosis.

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"Suspect approached MHP after refusing to listen to any commands. Did not know the suspects intent on why he was quickly approaching MHP" (LEO 105)

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"Because he is part of the team (technically innocent civilian) there is always some concern for their safety. However, it was minor and very manageable in this scenario" (LEO 111)

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"I was concerned for the MHP. He could have gotten hurt in the scenario" (LEO 119)

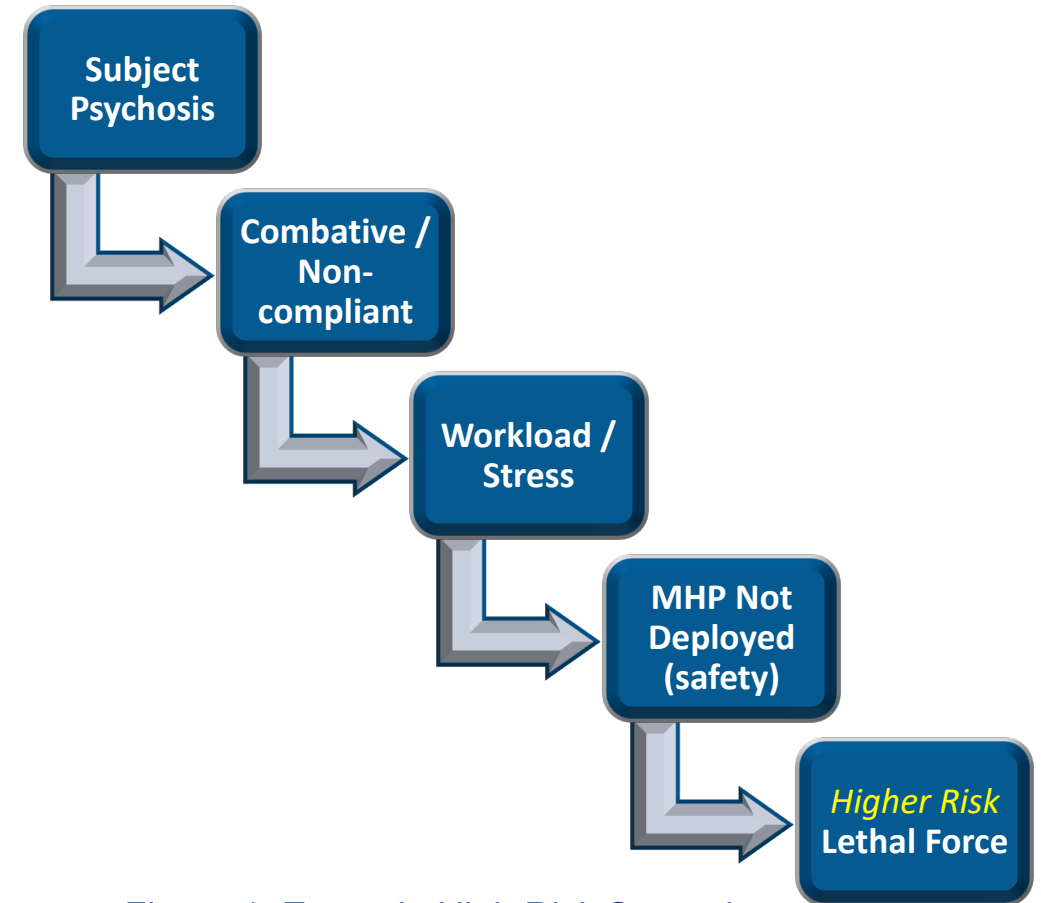


Figure 1: Example High Risk Scenario