

**Driving scenarios:  
Translating experiences of stress and distraction  
into simulator experiments and training tools**

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# Project background

- Issue
  - Crashes in privately owned vehicles are the number one cause of Soldier death outside of combat
- Goal
  - Develop a validated training tool to help reduce vehicle crash mortality among Soldiers
  - Focus on drivers in their 20s and 30s, who are still at significantly higher risk for accidents than drivers in their 40s and 50s
- Approach
  - Use realistic driving scenarios for experiments and training
    - Driving skill, especially risk assessment, is a type of tacit knowledge
      - Learned through experience
      - Difficult to articulate, study, and train
    - Scenarios are a proven way to train tacit knowledge
    - More engaging than “death by PowerPoint” training
  - Highlight realistic strategies rather than generic “just say no” messages

# Military driving culture

- Competing messages: safety vs. invincibility

“It’s highly motivated individuals who are confident of their abilities, their skills, their training, and their leadership. But that just doesn’t turn off at 5pm.”

- Major (Ret)

- Heavy on life stressors
  - Multiple deployments
  - Combat stress
  - Relationship/family problems
  - Depression
  - Etc...

# Stress and driving

- Stress is a significant source of driver distraction and inattention that can lead to a substantially increased crash risk.
  - Major life stressors
    - Divorce
    - Job loss
    - Family illness
    - Military deployment
  - Situational stressors
    - Running late
    - Getting lost
    - Fatigue
    - Unfamiliar conditions
  - Emotions
    - Frustration
    - Anger
    - Anxiety
    - Sadness

# Studying stress

- Knowns
  - Divorce, family illness, fatigue significantly increase accident risk
  - Multiple factors & conditions are often at play in causing accidents
- Unknowns
  - Little data on the experience of driving while coping with a major life stressor
    - What actually happens when you get in your car?
  - Ill-defined relationships between major life stressors and situational and emotional stressors
- Consequence
  - Difficult to manipulate major life stressors in a driving simulator
    - How do you translate “Getting a divorce” into a simulator experiment?
  - Difficult to train wisdom: there’s no single correct answer
- Approach
  - Develop realistic scenarios around life stressors to frame experiments and training

# Scenario development strategy

- Identify common life and situational stressors
  - Literature review
- Explore personal experiences of stress and driving
  - Critical incident interviews
- Consolidate experiences into a realistic scenario
  - Review details in focus groups
  - Collect response data
- Validate responses
  - Subject matter expert scoring
  - Natural language processing analysis
- Implement scenario in experiment and training tool

# Interview data

- Work backwards: the “bullet points” we already know become our questions
- Divorce example:
  - Emotional pain
  - Financial decisions
  - Custody of children
  - Moving/losing home
  - Generally overwhelmed
- End up with the “messy” details of how they’re actually experienced:

*“The goal of ethnography is not to start out with a hypothesis, but to end up with one.”*

*–Michael Agar, “The Professional Stranger”*

“Oh, there were a *huge* amount of tasks! And my lawyer, he would put work on me that would just overwhelm me. If you’ve never been divorced, you have to fill out this paperwork on everything you make. It’s all this financial disclosure stuff, and it goes on *forever*.... It got real ugly, so I had to start lining up witnesses and all kinds of really ugly stuff. Oh, and then the most stressful was in March when he took me back to court because he—I told him I was getting this job. As soon as I knew I told him. So he took me back to court because he didn’t think I was going to make any money. By then he was paying me some maintenance and he assumed I would try to live on that maintenance and I would lose the house and everything. It got really nasty and my lawyer kept me so busy.”

*– 54 year old woman*

# Interview data

- What you wind up with:
  - Stories of emotional and contextual stressors
    - Driving to “let off steam”
    - Driving to new/unfamiliar places (new job, e.g.)
    - Dealing with legal tasks
  - Reported reactions to stressors (often unsolicited)
    - “Wrapped up in my own head”
      - Entire focus is on life stressor details
      - Unaware of speed, location, road conditions, other vehicles
    - Cell phone calls to supportive family and friends viewed as less upsetting, distracting than ruminating alone in car

“Yeah. I was doing some outrageous speeds and things like that. But I wasn’t even cognizant of how fast I was going until I actually looked. It’s just because I was so wrapped up in everything else and reviewing like all of the arguments or disagreements, or what I could have done differently in the relationship. So I was so wrapped up in my own head, while driving, that I didn’t even realize I had driven that far. I also didn’t realize how fast I was going.”

– *40 year old man*



# Scenario development

- Develop ideas
  - Use interview data to develop composite stories
  - Similar to “personas” used in product development
  - Enough detail for people to visualize themselves in the story
  - Open-ended enough for people to visualize their own personal reactions and outcomes
- Refine in focus groups
  - 2 groups, 6-8 participants each
  - Test realism
  - Correct, add details
  - New scenario ideas

“I like the [driving home on] leave [scenario]. Anyone who’s got family on the other side of the country knows that one. I don’t think anybody here’s not driven, like, 10 hours, 12 hours across the country just to get home on leave.”

“Especially when you’ve got, you know, six days. You’re like, ‘Man, I’ve got to get home quick.’”

– *Focus group discussion, Fort Carson*

# Sample scenario responses

- Collect responses to the scenarios in which drivers describe how they might handle similar experiences in their own life
- Significant differences between younger and older drivers to a common driving stressor (“late to work”), in written responses (and also later in the simulator experiment)

## Younger driver

“I would honk my horn at the person in front of me, flashing my lights, in an attempt to persuade them to pull over. I would take any opportunity I could to pass them. I would also call someone at the office to help set up the meeting room. I would then call my boss and tell them my predicament with traffic but tell them I have someone else in the office setting things up in the mean time.”

## Older driver

“I’d say to myself, ‘I’ll get there when I get there; if it doesn’t start on time, then it doesn’t start on time.’ I’d also start thinking of who I could call at the office to help me out on some of the things my boss said have to be done; I would also call a colleague at the office to step in to greet attendees, get them to the different room, and let them know we will start late. I might also start to think about which portions of the presentation are most important, and if we start late, what portions I could skip. I might also think about someone in the office who could swap some time with the presentation and do some other dog-and-pony show first while I get caught up when I get into the office.”

# Simulator experiments

- Initial experiment scenario: “late to work”
  - Hazards linked to increased crash risk
  - Reported/observed use of strategies linked to reduced crash risk
  - Older drivers are safer
- Design
  - 5 drives per participant, all included either passenger or cell phone, all included time pressure for frustration/stress, all included tactical scanning task.
  - Half of participants were 20-35 yrs. and half were 40-55 yrs.
  - Drive 5 was a free drive -- participants were allowed to drive normally, and try to get to work on time to get a \$5.00 bonus.

# Simulator experiments

- Evidence for driving tacit knowledge:
  - Older drivers handled unexpected events better by decelerating earlier and swerving to avoid obstacles
  - Older drivers also reported strategies that involved thinking ahead about potential hazards

**Drive 5 results**

<b>Age</b>	<b>Group</b>	<b>Took calls</b>	<b>Hit LV</b>	<b>Didn't react to child</b>	<b>Didn't react to car</b>
<b>Younger</b>	<b>Cell Phone</b>	67%	80%	100%	40%
<b>Older</b>	<b>Cell Phone</b>	44%	33%	50%	33%
<b>Younger</b>	<b>Passenger</b>	50%	67%	33%	17%
<b>Older</b>	<b>Passenger</b>	61%	50%	0%	0%

# Simulator experiments

- Second experiment: Student driving to internship interview
- Hazards
  - Major Life Stress: graduating with unclear job prospects
  - Anxiety: interview
  - Unfamiliar route/location
  - Radio: News story about lack of jobs for graduates
  - Weather conditions: heavy rain
  - Time pressure
  - Student-related stressors
  - Traffic
- Data analysis underway...

# Next steps: scenario scoring

- Automated scoring
  - Use NLP and machine learning technologies to analyze responses
  - Possible approaches
    - Centroid: determine which are closest to the average response representing the consensual wisdom of all responders
    - Use the similarity of responses to expert drivers as an indicator of response quality
    - Create a set of “ideal” responses to each scenario that represent all the best possibilities, and compare new responses to these
  - Provide immediate expert feedback based on analysis of missing good strategies from responses to increase learning
- Subject matter expert scoring
  - Validate computer scoring

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