

**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*

## Late to Work scenario




It's Monday morning, and you are on your way to work. You've left the house late and you are feeling pressed for time. You have 20 minutes to get to the office in order to give an important presentation to your boss, and there's a lot on your mind.

As you start your drive, your cell phone rings. It's a coworker of yours who shares responsibility for the presentation and who is running late. He asks you to remember to do a few things for him when you get to the office so that everything will be ready in time. He lets you know that the room for the presentation has changed to 127, that Dr. Jim Gerard will be attending unexpectedly and will need to see all of the data behind the sales figures, that Sarah needs to install Quicktime on the presentation computer in order to give her demo, and that the refreshments will have to be moved to the west annex in order to be closer to the new presentation room.

As you continue with your drive, an old Buick pulls in front of you, cutting you off. The Buick then proceeds to go about 5 miles under the speed limit. The road you're driving on is in an urban area with enough cross traffic to make passing dangerous. You have drivers behind you who seem as anxious to get to their destination as you are.


Three more times during the drive, various coworkers call. In the first call, the coworker tells you that the room for the meeting is going to require additional setup to support Internet access. In the second call, a different coworker who is co-presenting is in a mild panic, wondering when you're going arrive at the office. In the third call, the coworker who's running late lets you know that he's finally left the house and he's on his way.

Meanwhile, you've got your own concerns. You have been back from Iraq for a few months and have been having trouble trying to shake a recent memory of a suicide attack during one of your dismounted patrols that killed a fellow Soldier and friend. Oddly, the suicide bomber was wearing a gray-blue "Got Soccer?" t-shirt, a detail you can't seem to erase from your mind. Every time you drive in densely populated areas, you find yourself scanning people, looking for people wearing gray-blue.

[HOME](#)
[SCENARIOS](#)
[FEEDBACK](#)
[STATUS](#)
[FAQ](#)
[LOG OUT](#)

[FRIDAY NIGHT OUT](#) ✓  
[DRIVING BACK TO BASE](#) +  
[DRIVING HOME ON LEAVE](#) -  
[LATE FOR WORK](#) ✕  
[STATUS](#) +  
[RESULTS](#) +



PLEASE MAKE SURE YOUR SOUND IS TURNED ON.

## START HERE

It's the end of a long month of training, and you're on your way home to spend your five days of leave with your family. You're really looking forward to seeing them - it's been nearly a year since you've been back home to Kansas. Since you're currently stationed at Fort Huachuca in Arizona that means you've got at least a fifteen hour drive ahead of you.

You've done this drive a few times since being moved to Fort Huachuca. You tried to plan ahead for the trip, going to bed early last night and even inspecting your car before you left the base. You managed to get an early start this morning, leaving about 7:30am. You figured that if you can manage without too many stops, and don't hit any bad traffic, you should be able to make it home before midnight.

But now it's after 10:00, and thanks to an accident on the highway you've still got about three hours to go before you make it home. The last month of training, and the long drive today, are starting to catch up to you. You notice that you're having trouble concentrating on the road, and are wishing that you could just fall asleep. You begin to think about stopping to take a nap, or maybe spend the night in a motel. You were really looking forward to seeing your family tonight, but maybe it's not worth driving straight through. Or maybe a cup of coffee would be enough to keep you alert for the rest of the drive.

As you consider what you to do, you pass a sign for an upcoming exit. It's a full service stop, with motels and fast food restaurants, and is only a mile away. You can't remember how far it is to the next, and don't have much time to decide whether to stop of this one.

### DRIVING HOME ON LEAVE

Take a minute to think about your state of mind. What are you most worried about right now? What thoughts are going through your head?

Be as detailed as possible in describing what you would do.




Consider everything that's happening as you drive to work. Being as realistic as possible, how would you deal with this situation? Please be specific about what actions you would take. You are not limited to things described in the scenario.

Be as detailed as possible in describing what you would do.

Now think about the last time you found yourself in a similar situation (running late to work, too much to do, your cell phone ringing, and traffic). What did you do? How do you normally handle situations like this?

Be as detailed as possible in describing what you would do.

[GET FEEDBACK](#)

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# 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**

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



# With thanks to:

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

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# Divorce scenario

You are in the process of getting an uncontested divorce from your spouse. What the two of you thought would be a simple process with a single day in court turned into an intense and costly property dispute including your house. You know that if you cannot work out an agreement about dividing the property, the court will divide it up for you using “equitable distribution,” which may mean that your ex is going to get more than they should. You’ve moved out of the house you bought together while your ex is still in the house. You have tentatively agreed to sell the house but haven’t agreed on an asking price. In the meantime, you are still paying half the mortgage plus the rent on your new apartment.

You’re on your way to a 9:00 a.m. meeting with a mediator to help you and your ex come to a final agreement on the asking price and other particulars of selling your house. The mediator is in the town in which you both lived, but he is located in a newly built up section of town with which you are unfamiliar. You’ve printed out directions and a map and expect it to take about half an hour to get there.

This morning as you were getting ready to drive to the mediation, your spouse called and said that they changed their mind and want to stay in the house permanently. This means that the negotiation process has to start all over again and is going to continue to cost more money each month than your rent!

The fight with your ex has made you late for the mediation, and now the situation is fresh in your mind and extremely frustrating. As you drive to the mediation you can’t stop thinking about the divorce and everything your ex is putting you through. How are you supposed to move on with your life if you’re spending all the money you need to get your life back in order? Now there’s no end in sight because you’re back at square one. Yet another expense piled on top of the rest! You are having trouble concentrating on driving because you keep having thoughts about the fight. You glance at the dashboard and notice that you’re driving a lot faster than you normally do on this kind of road.

It’s now 8:50 a.m and you suddenly realize that you’re lost. You’re not sure if you missed a turn or if the directions your ex gave you are wrong. You expect to be in a built-up area, but find yourself in a neighborhood. You call your ex to tell them you’re lost and they tell you that they accidentally gave you the wrong directions. Yeah right – accidentally. Your ex then proceeds to give you the correct directions. You notice that it’s starting to rain heavily. Now it’s going to be even more difficult to find the mediator’s. You tell yourself to pay close attention so you don’t get lost again. If you’re late there won’t be time to get things straightened out today and you don’t think you can take this dragging on any longer!

Prompts:

1. Take a minute to think about your state of mind. What are you most worried about right now? What thoughts are going through your head?
2. Consider everything that’s happening as you drive to the meeting. Being as realistic as possible, how would you deal with this situation? Please be specific about what actions you would take. You are not limited to things described in the scenario.
3. Now think about the last time you found yourself in a similar situation (frustrated and angry, following directions to a new location). What did you do? How do you normally handle situations like this?

## Driving Home on Leave Scenario

It's the end of a long month of training, and you're on your way home to spend your five days of leave with your family. You're really looking forward to seeing them – it's been nearly a year since you've been back home to Kansas. Since you're currently stationed at Fort Huachuca in Arizona that means you've got at least a fifteen hour drive ahead of you.

You've done this drive a few times since being moved to Fort Huachuca. You tried to plan ahead for the trip, going to bed early last night and even inspecting your car before you left the base. You managed to get an early start this morning, leaving about 7:30am. You figured that if you can manage without too many stops, and don't hit any bad traffic, you should be able to make it home before midnight.

But now it's after 10:00, and thanks to an accident on the highway you've still got about three hours to go before you make it home. The last month of training, and the long drive today, are starting to catch up to you. You notice that you're having trouble concentrating on the road, and are wishing that you could just fall asleep. You begin to think about stopping to take a nap, or maybe spend the night in a motel. You were really looking forward to seeing your family tonight, but maybe it's not worth driving straight through. Or maybe a cup of coffee would be enough to keep you alert for the rest of the drive.

As you consider what you to do, you pass a sign for an upcoming exit. It's a full service stop, with motels and fast food restaurants, and is only a mile away. You can't remember how far it is to the next exit, and don't have much time to decide whether to stop of this one.

# Driving to Internship experiment scenario

You are a student at UIUC close to graduating. You have been worrying about what you will do after graduation. What will you do about housing? Will you be able to get a job? How will you pay off your student loans? Luckily, an opportunity for a great internship has come up. If you get the internship it will cover your summer housing and income, plus it would likely lead to a job. Other students who have interned there have gone on to be very successful – the company has some of the best people in field and working there would really build up your professional network. You thought you had a pretty good chance of landing the position, but you just found out that another student in your department is also being interviewed, and their advisor has connections with the company. So, now you're concerned that you won't get the position.

To make things more stressful, it's finals week and your hardest exam is tomorrow. You have been torn between preparing for the interview and studying for the exam and ended up putting both off with the result that you don't feel prepared for either. Still worse, as part of your interview you were asked to prepare a short talk and public speaking makes you very nervous. Mr. Smith, the boss, sounded like a really serious person, and he said there will be about 15 people in the audience.

Your potential employer is located in a town you're not very familiar with – an office park about half an hour from the University. The receptionist left a long message on your machine with the driving directions and the address. You've been so busy and did not double-check the directions on Mapquest. The directions sounded straightforward and you just drew a map to help you remember. You did bring the receptionist's phone number though. Just in case.

You've borrowed your roommate's car for the drive. It's got a dashboard like a 747 so you can't figure out how to turn the radio off, and your roommate listens to news radio all the time. So you're stuck listening to a radio show about how bad the job market is, and how much trouble college graduates are having paying back student loans. Great. Just what you need to think about right now. You're nervous enough already, and you're having trouble focusing on the road because you keep thinking about what will happen if you don't get the internship and who else is interviewing for the job.

As you get close to the office park it starts to rain, making it more difficult to read the street signs and building numbers. You have about 15 minutes to get to the building, go through security, and set up for your talk. The receptionist calls and it turns out she gave you the wrong building number, and you need to look for 4929 Radio Lane, instead of 4949 Radio Lane. Some of the streets are one-way, so it is a bit confusing. You hope that you will find the building in time.

Pre-recorded message from the receptionist:

"Here are the directions you need to take to come to our building. Take Interstate 57 North. I think there may still be construction, so be careful about the speed limit. Then take Exit 67 and get onto Kensington Avenue. When you see a gas station, turn right onto Florida Road and drive pass 3 blocks. Then make a left onto Williams Avenue and go all the way until you see the bus station on your right. You will see the entrance sign for the office park on your left. Take that and then follow Technology loop. Turn left onto Radio Lane. Our address is 4949 Radio Lane; it's a bright yellow building! You won't miss it. If you get lost, don't panic, just loop around. You'll find it. OK? We are looking forward to seeing you. Oh, try to arrive 15 minutes earlier so I can get you checked in. I think that's it. Oh, I almost forgot, in case you miss Exit 67, take the next one, take University Avenue, then turn left onto California Road, then turn right onto Main Street, then when you see the school on your left, turn right onto Research Avenue. This will get you to the other entrance of the office park. Then it's the same—follow Technology Loop and turn left onto Radio Lane. The last two interviewees missed Exit 67 and did not get here until 20 minutes later. So I thought I had better tell you the directions from both exits."

Second message from the receptionist:

"I am just calling to see where you are. You are coming, right? I thought I asked you to come 15 minutes earlier. Anyway, I hope you are close. Our address is 4929 Radio Lane. I did sav 4929. right? Mr. Smith iust called me to see if vou arrived vet. He thought vou would be here bv now. See vou verv soon. I hope."