NHTSA Alcohol Impaired Driving Research on the National Advanced Driving Simulator (NADS)

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Why Use the NADS?

- The NADS offers high-fidelity, real-time driving simulation in which the driver is immersed in sight, sound and movement so real that impending crash scenarios can be convincingly presented with no danger to the driver.

Research Team

- NHTSA
- Prime Contractor: NADS, University of Iowa
- Subcontractors
  - Battelle HFTC
  - Pacific Institute for Research & Evaluation
  - Southern California Research Institute
  - University of Iowa, Center for Computer Aided Design
  - University of Iowa, Department of Statistics and Actuarial Sciences
  - Virginia Tech Transportation Institute
- Independent Reviewers
  - Human Factors North, Inc.
  - TRC

NADS Alcohol Impaired Driving Research Program

- NHTSA is sponsoring a series of experiments to be conducted on the NADS over 3 years to investigate the nature and degrees of impairment of driving behavior and performance associated with
  - Varying levels of Blood Alcohol Concentration (BAC) – No alcohol condition, BAC = .02 to .10
  - Driver Demand
    - Driver task demand (visual, cognitive, auditory, biomechanical)
    - Situational demand (heavy traffic, unexpected events, construction zones)
    - Environmental demand (visibility, roadway conditions, weather)
    - Diurnal variations and fatigue
  - Individual differences associated with driver demographics (age, gender, drinking practice)

Phase I Objectives

- Determine NADS readiness to conduct studies involving alcohol dosing

- Develop and test baseline scenarios sensitive to
  - Alcohol at BAC levels from .00 to .10
  - Various driver demands

- Design and implement a large scale baseline data collection that will serve as a comparison across all future phases

Phase II Objectives

- Examine the relationship between driver task demands, driver demographics, & BAC
  - Driving and Non-driving task demands
    - "Drive home" to include lane keeping, velocity maintenance, gap acceptance, car following, and response to emergent and non-emergent events
    - Realistic, in-vehicle tasks such as wireless communications, audio system interactions, or manual tasks like eating or conversing with a passenger
  - Demographics
    - Gender
    - Age (21-24, 25-34, & 35-55 years)
    - Drinking practice (light, moderate, & heavy)
  - BAC
    - 0.00%, 0.02%, 0.05%, 0.08%, 0.10%

Phase III Objectives

- Examine the relationship between driver task situational and environment demands, driver demographics, and BAC

  - Demands
    - Environmental – visibility, roadway conditions, weather
    - Situational –   heavy traffic, sudden unexpected conflict events, construction maintenance zones

  - Demographics
    - Gender
    - Age (21-24, 25-34, & 35-55 years)
    - Drinking practice (light, moderate, & heavy)

  - BAC
    - 0.00%, 0.02%, 0.05%, 0.08%, 0.10%

Phase IV Objectives

- Examine the relationship between diurnal variation, fatigue, driver demographics, and BAC
  - Diurnal variation and fatigue
    - Nighttime driving scenes
    - Late evening and early morning sessions (8 PM, 12 AM, 4 AM)
  - Demographics
    - Gender
    - Age (21-24, 25-34, & 35-55 years)
    - Drinking practice (light, moderate, & heavy)
  - BAC
    - 0.00%, 0.02%, 0.05%, 0.08%, 0.10%

Challenges in this Research

- Development of scenarios representing the type and magnitude of alcohol-related crashes
  - Scenarios should tax capabilities affected by alcohol while representing actual driving situations (decision making, event detection, and divided attention)
  - Big step from identification of candidate scenarios based on crash data to implementation of exact, controlled scenarios
  - Trade-off between naturalistic/realistic scenarios and experimental control to ensure precise and consistent comparison of measures
- Non-driving tasks must also be measurable, controlled, trainable, and consistently carried out (i.e., willingness to perform)

Some Key Issues for Phases I-IV

- Development of meaningful, sensitive scenarios and measures for use throughout series of studies

- Need to identify and resolve potential confounds between NADS effects and alcohol effects

- Identification of surrogate and workload measures for alcohol impairment

- Transfer of knowledge and scenario from Phase I to Phases II-IV

- Definition and implementation of various forms of demand

Thanks for your attention!

Questions?
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