

# NEUROPHYSIOLOGICAL CORRELATES OF HAZARD DETECTION

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## Background

- Hazard Perception: ability to predict dangerous situations on the road.<sup>1</sup>
- Clear evidence that hazard perception skills distinguish novice from experienced drivers; poor skills linked to collision involvement.<sup>2,3</sup>
- Experienced drivers twice as likely to demonstrate anticipatory skin conductance response when watching videos of hazardous driving; autonomic arousal may be able to distinguish experienced from novice drivers.<sup>4,5</sup>
- Suggests skin conductance response could represent biomarker for driving experience and indicate a measurable route for intervention development to reduce crash risk.
- Identify a sample of naturalistic driving videos to develop an experiment to assess hazard detection skills to identify neurophysiological correlates of hazard detection.

## Methods

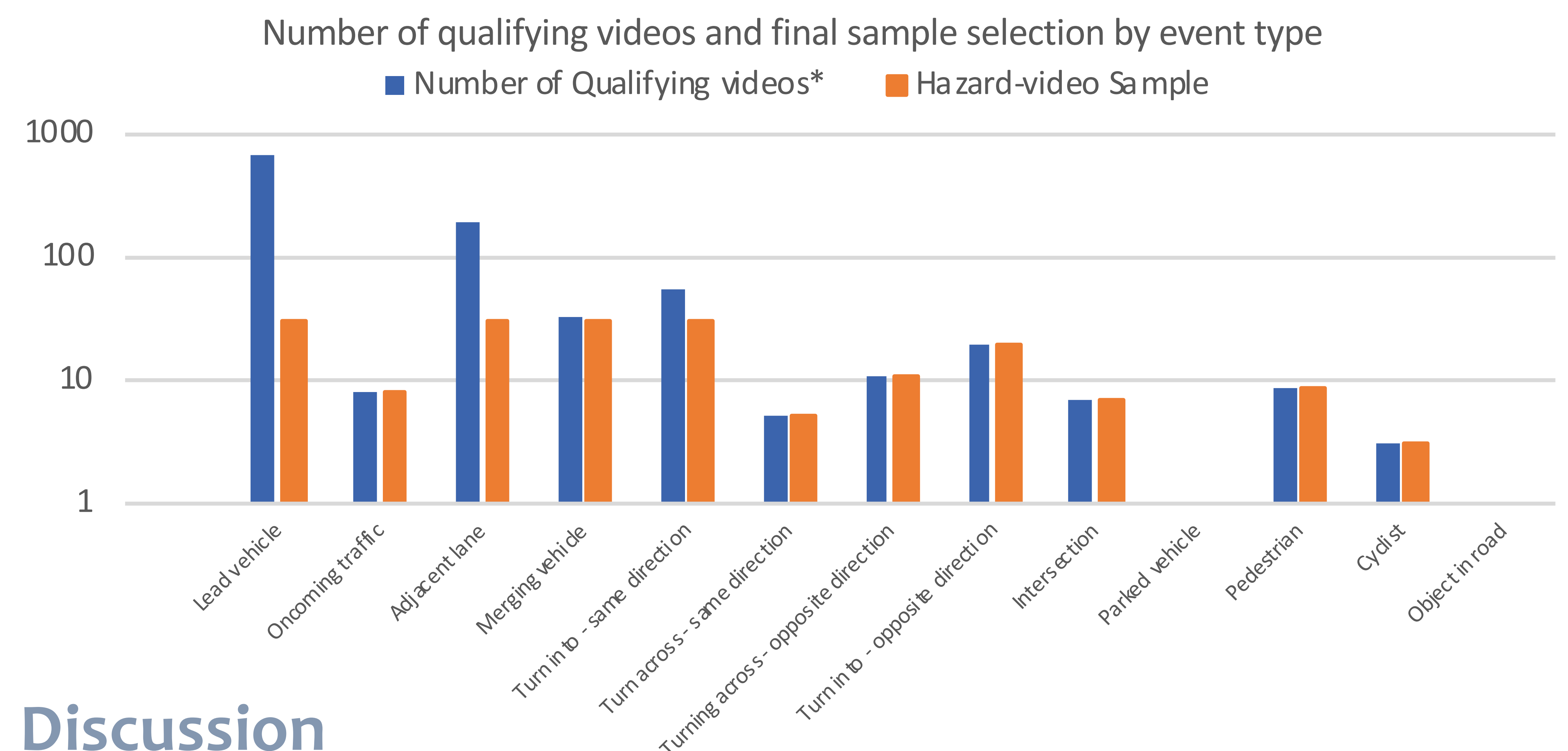
- Developed and executed searches using SHRP2 database to identify naturalistic driving videos that would generate high measures of autonomic arousal.
- Selection requirements included variety of hazards not due to the driver's actions, occurred on different road types, and had an event duration that was long enough to result in measurable autonomic response.
- Videos needed to contain sufficient lead time to even that allowed for measurement of pre-event autonomic response.
- Events that resulted in a crash were not included because discontinuation of driving would prevent measurement of post-event autonomic response.

Example frames from driving hazard video (SHRP2)<sup>6</sup>:



## Results

- As of March 2018, the SHRP2 insight database contained 41,479 30-second videos containing both hazardous and routine driving.
- Queries were developed using multiple criteria:
  - Near-crash events with event window of 4 seconds or longer
  - No risky driver behavior or impairments apparent.
  - Pre-defined driving conflict types:
    - Lead vehicles, oncoming traffic, at intersection, with parked vehicle, pedestrians, cyclists, and with objects in road.
  - Crash events were excluded and single vehicle conflicts were excluded.
  - Final query produced 1034 hazard events.
    - For each conflict type, a random sample of 30 videos were extracted
    - If fewer than 30 available, all were included.
- Final Sample contained 183 hazard events.
- Matched set of non-hazard videos were extracted based on locality, road type and time of day.



## Discussion

- First application of naturalistic driving videos to an experimental study examining autonomic arousal in response to driving hazards.
- Demonstrates that SHRP2 database is a tool for researchers beyond the field of road safety and transportation.

### Future Research

- Following the validation study a study of 36 teenage novice and experienced drivers will test skin conductance during hazard detection.
- A third study of 36 teenage novice and experienced drivers will test neurological activity during hazard detection.

## Acknowledgements

This research was supported by the Science of Learning Institute at Johns Hopkins University