Cell phone conversations while driving a heavy vehicle: risk as a function of event type

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Prior Naturalistic Research Regarding Heavy Vehicles

- No significant difference in the odds of a safety critical event (SCE) with handheld cell phone use vs. no cell phone conversation (Hammond et al., 2021; Hickman et al., 2012; Olson et al., 2009).

- Significantly lower odds of a SCE with hands-free cell phone use vs. no cell phone conversation (Hammond et al., 2021; Hickman et al., 2012; Olson et al., 2009).

- These studies combined different event types (e.g., rear-end, sideswipe, head-on).

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Prior Naturalistic Research Regarding Heavy Vehicles

- What if you stratified the data by event type?

- Victor et al. (2015) found the odds of a rear-end crash or near crash were significantly lower with cell phone vs. no cell phone conversation.

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Goal of the Current Study

- Exploratory study to evaluate the potential odds of a safety critical event (SCE*) during a cell phone conversation compared to no cell phone conversation, **stratified by event type**, in a sample of CMV drivers using existing annotated data.

  *SCEs include:
  1) crashes
  2) **near crashes:** Any circumstance that requires a rapid, evasive maneuver (e.g., hard braking, steering) by the subject vehicle or any other vehicle, pedestrian, cyclist, or animal, in order to avoid a crash.
  3) **crash-relevant conflicts:** Any circumstance that requires a crash-avoidance response on the part of the subject vehicle, any other vehicle, pedestrian, cyclist, or animal that was less severe than a rapid evasive maneuver, but greater in severity than a normal maneuver. A crash-avoidance response can include braking, steering, accelerating, or any combination of control inputs.
  4) unintentional lane deviations

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Method- Datasets Used

- Olson et al. (2009)
  - Continuous naturalistic driving data from CMV drivers in 55 instrumented trucks (all Class 8 tractor trailers)
  - 4,452 SCEs
  - 19,888 random baselines

- Hammond et al. (2021)
  - Continuous naturalistic driving data from 172 CMV drivers in 182 instrumented trucks
  - 2,363 SCEs
  - 7,880 random baselines

Method- Dataset Annotations

- Annotations for SCEs included:
  - event type
  - driver ID
  - severity (crash, near crash, or crash-relevant conflict)
  - specific secondary task performed

- Annotations for baselines included:
  - driver ID
  - specific secondary task performed

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Method- Data Stratification by Event Type

1. Road departure

2. Rear-ending a stopped vehicle

3. Rear-ending a slower or decelerating vehicle

4. Side-swipe

5. Forward impact with a moving vehicle in the opposite direction

6. Forward impact with a vehicle moving in the same direction, pedestrian or pedacyclist, parked vehicle, fixed object, construction barrier or construction cone

7. Turning or crossing paths at an intersection

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Method- Data Stratification by Event Type

Event types were determined based on coding in the datasets corresponding to the "Accident Types" described in Olson et al. (2009), Appendix A.

Source: Thieriez, Radja, and Toth (2002)

Method- Excluded Data

- Struck-by events in the rear-end and forward impact with vehicle moving in the same direction categories

- Events for which it was ambiguous as to whether the subject vehicle was striking or struck-by

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Analysis

- Odds ratio (OR) estimates calculated for handheld and hands-fee cell phone conversations by event type.

- Evaluated for significance based on a 95% CI.

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Results

Hands-free cell phone use

Event Type	OR	95% CI
Rear-end stopped	0.205*	0.065-0.646
Rear-end slower/decelerating	0.778	0.576-1.052
Road departure	0.364*	0.285-0.465
Forward impact (same direction)	0.265*	0.098-0.716
Forward impact (opposite direction)	0.098*	0.024-0.398
Sideswipe	0.713*	0.515-0.987
Turning	0.455*	0.266-0.778

Handheld cell phone use

Event Type	OR	95% CI
Rear-end stopped	0.180	0.025-1.293
Rear-end slower/decelerating	0.877	0.622-1.124
Road departure[1]	1.233*	1.018-1.495
Forward impact (same direction)	0.669	0.312-1.436
Forward impact (opposite direction)	N/A	N/A
Sideswipe	0.490*	0.306-0.785
Turning	0.299*	0.133-0.671

1 Road departures are indicated when a vehicle has crossed, or is projected to cross, a roadside delineation such as a lane edge (going into the shoulder or median), curb, or the edge of the pavement.

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Discussion

- Results are largely consistent with prior CMV studies showing that cell phone conversation did not significantly increase the odds of a SCE compared to no cell phone conversation.

- Results are consistent with FMCSA regulations for CMV drivers which allow for hands-free conversation.

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Thank you!

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