

# 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).

# Prior Naturalistic Research Regarding Heavy Vehicles

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- 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.





# Goal of the Current Study

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- 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



# Method- Datasets Used

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- 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

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- 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



# 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

# 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.

Category	Configuration	ACCIDENT TYPES (Includes Intent)										
I. Single Driver	A. Right Roadside Departure	01 	02 	03 	04 SPECIFICS OTHER	05 SPECIFICS UNKNOWN						
	B. Left Roadside Departure	06 	07 	08 	09 SPECIFICS OTHER	10 SPECIFICS UNKNOWN						
	C. Forward Impact	11 	12 	13 	14 	15 SPECIFICS OTHER	16 SPECIFICS UNKNOWN					
II. Same Trafficway Same Direction	D. Rear-End	20 	21, 22, 23 	24 	25, 26, 27 	28 	29, 30, 31 	(EACH - 32) SPECIFICS OTHER	(EACH - 33) SPECIFICS UNKNOWN			
	E. Forward Impact	34 	35 	36 	37 	38 	39 	40 	41 	(EACH - 42) SPECIFICS OTHER	(EACH - 43) SPECIFICS UNKNOWN	
	F. Sideswipe Angle	44 	45 	46 	47 	(EACH - 48) SPECIFICS OTHER	(EACH - 49) SPECIFICS UNKNOWN					
III. Same Trafficway Opposite Direction	G. Head-On	50 	51 	LATERAL MOVE			(EACH - 52) SPECIFICS OTHER	(EACH - 53) SPECIFICS UNKNOWN				
	H. Forward Impact	54 	55 	56 	57 	58 	59 	60 	61 	(EACH - 62) SPECIFICS OTHER	(EACH - 63) SPECIFICS UNKNOWN	
	I. Sideswipe/Angle	64 	65 	LATERAL MOVE			(EACH - 66) SPECIFICS OTHER	(EACH - 67) SPECIFICS UNKNOWN				
IV. Change Trafficway Vehicle Turning	J. Turn Across Path	68 	69 	70 	71 	72 	73 	(EACH - 74) SPECIFICS OTHER	(EACH - 75) SPECIFICS UNKNOWN			
	K. Turn Into Path	74 	75 	76 	77 	78 	79 	80 	81 	82 	83 	(EACH - 84) SPECIFICS OTHER
V. Intersecting Paths (Vehicle Damage)	L. Straight Paths	86 	87 	88 	89 	(EACH - 90) SPECIFICS OTHER	(EACH - 91) SPECIFICS UNKNOWN					
VI. Miscellaneous Etc.	M. Backing Etc.	92 	93 	OTHER VEHICLE OR OBJECT			98 OTHER ACCIDENT TYPE	99 UNKNOWN ACCIDENT TYPE	00 NO IMPACT			

Source: Thieriez, Radja, and Toth (2002)





# Method- Excluded Data

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- 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



- Odds ratio (OR) estimates calculated for handheld and hands-free cell phone conversations by event type.
- Evaluated for significance based on a 95% CI.



## 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 <sup>1</sup>	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.



# Discussion

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- 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!**

