



Distracted Driving: An Overview

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A disclaimer



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- There is a huge literature on distracted driving, e.g. the literature review by Kircher et al. (2011) covered 132 items
- This talk is aimed not at covering all this literature but rather at some salient issues

What is distracted driving?



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Can be defined as:

“Insufficient attention to the roadway and traffic because of some competing activity”



“An epidemic”



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D!STRACTION.GOV
Official US Government Website for Distracted Driving

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US

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A MESSAGE FROM SECRETARY LAHOOD

Every single time you take your eyes off the road or talk on the phone while you're driving - even for just a few seconds - you put yourself and others in danger.

Distracted driving is an epidemic on America's roadways. You see it every day: Drivers swerving in their lanes, stopping at green lights, running red ones, or narrowly missing a pedestrian because they have their eyes and minds on their phones instead of the road. Yet, people continue to assume that they can drive and text or talk at the same time.

The results are preventable accidents. In 2011, 3,331 people were killed, and an estimated additional 387,000 were injured in motor vehicle crashes involving a distracted driver.

The U.S. Department of Transportation is committed to ending distracted driving, but we can't do it alone. So we created

EVENTS



ONE TEXT OR CALL COULD
WRECK
IT ALL



Jay Winsten [Become a fan](#)
Associate Dean, Harvard School of Public Health



Stopping Distracted Driving: What Will It Take?

Posted: 11/01/2013 10:11 am EDT | Updated: 01/23/2014 6:58 pm EST

The Washington Post

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Dr. Gridlock

Can comedians end distracted driving epidemic?

Voices: Distracted driving hits home — hard

John Siniff, USA TODAY 12:47 p.m. EDT August 4, 2014



(Photo: LM Otero, AP)

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This nation's talking/texting-while-driving epidemic caught up with me this past weekend in the most violent way.

Moments after leaving USA TODAY's offices in suburban Virginia on Saturday evening, I hopped on Interstate 66 for a quick drive home. The skies were overcast, a light mist was falling, and the sun was beginning to set.

A young woman speeding along in the lanes behind me was lost in a phone conversation when the 2,500 pounds of metal she was piloting slammed into my vehicle from behind.

TAKE TWO
EAR
NIGHT
AT OVE

Driven to Distraction

With virtually every American owning a cellphone, distracted driving has become a threat on the nation's roads. Studies say that drivers using phones are four times as likely to cause a crash as other drivers. Yet Americans have largely ignored that research. Device makers and auto companies acknowledge the risks, but they aggressively develop and market gadgets that cause distractions. Police in almost half of all states make no attempt to gather data on the problem. The federal government warns against talking on a cellphone while driving, but no state legislature has banned it.

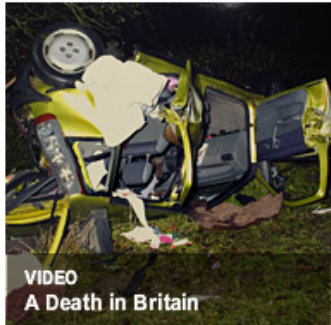
Through articles, videos and interactive features, The Times has examined the risks of talking and texting behind the wheel. The series also explores the extent of the problem, its origins, and the pressures people feel to stay connected while driving. And the series shows the political, regulatory and scientific dimensions of an issue that has prompted conversations and action across the country, from the Oval Office and statehouses to corporate boardrooms and kitchen tables.

The New York Times

CBS NEWS

POLL

POLL
What Americans Think



VIDEO
A Death in Britain

Dear Governor:

(DRAFT LETTER)

As you know, the wireless communications industry has Today there are more than 147 million cell phone subscribers in the United States. According to a survey by the National Highway Traffic Safety Administration, 6% of daylight driving time – up from 4% in 2003 – is spent on the phone. That translates into more than 200 million in-

However, the primary responsibility of the driver has always been to drive safely. It is a task that requires full attention and concentration, whether associated with the use of technology or not.

NHTSA estimates that driver distraction contributes to 16% of all crashes. Though all distractions are a concern, we have seen a significant increase in cell phone use while driving. While the industry has argued that the use of cell phones has contributed to an increasing number of crashes, injuries and

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The Pulitzer Prizes

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The 2010 Pulitzer Prize Winners National Reporting

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Works

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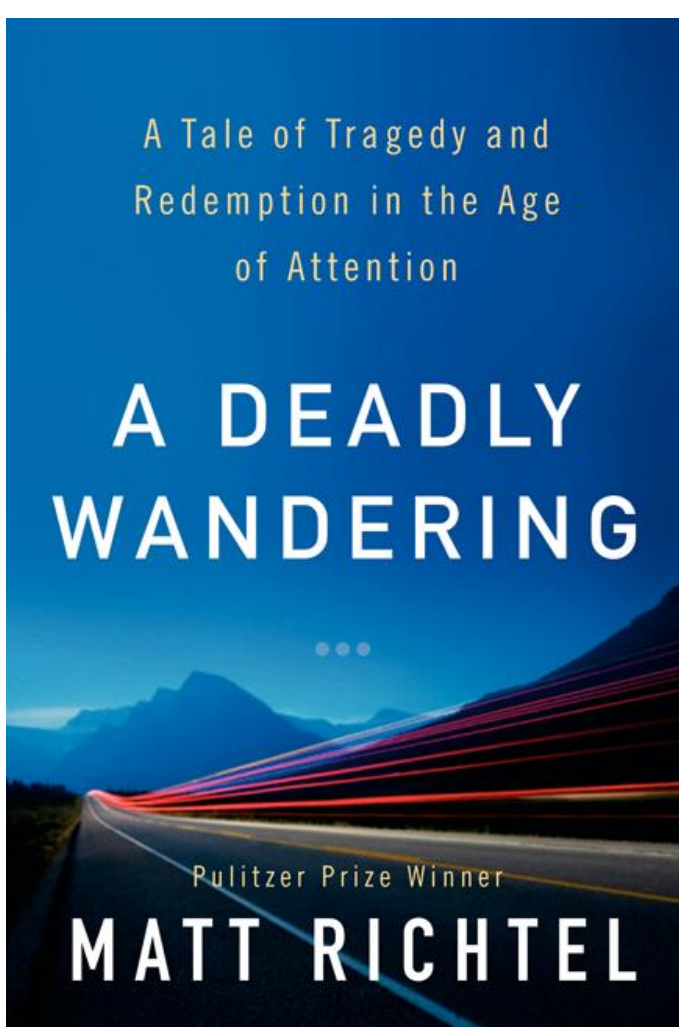
For a distinguished example of reporting on national affairs, in print or online, or both, Ten thousand dollars (\$10,000).

Awarded to **Matt Richtel** and members of **The New York Times Staff** for incisive work, in print and online, on the hazardous use of cell phones, computers and other devices while operating cars and trucks, stimulating widespread efforts to curb distracted driving.

The New York Times



Lee C. Bollinger, President of Columbia University (left), presents the 2010 National Reporting prize to Matt Richtel of The New York Times.



YouTube GB



Reggie Shaw's It Can Wait Story

0:05 / 10:09

Texting While Driving Story -- Reggie Shaw

AT&T

Subscribe 47,639

18,287

This is a YouTube video player interface. The video title is "Texting While Driving Story -- Reggie Shaw". The video is from the channel "AT&T", which has 47,639 subscribers. The video has 18,287 views. The video player shows a blue background with a hand icon and the text "TEXTING & DRIVING... it can wait". The video is currently at 0:05 of a 10:09 duration.



FROM ONE SECOND TO THE NEXT

A FILM BY WERNER HERZOG



23:31

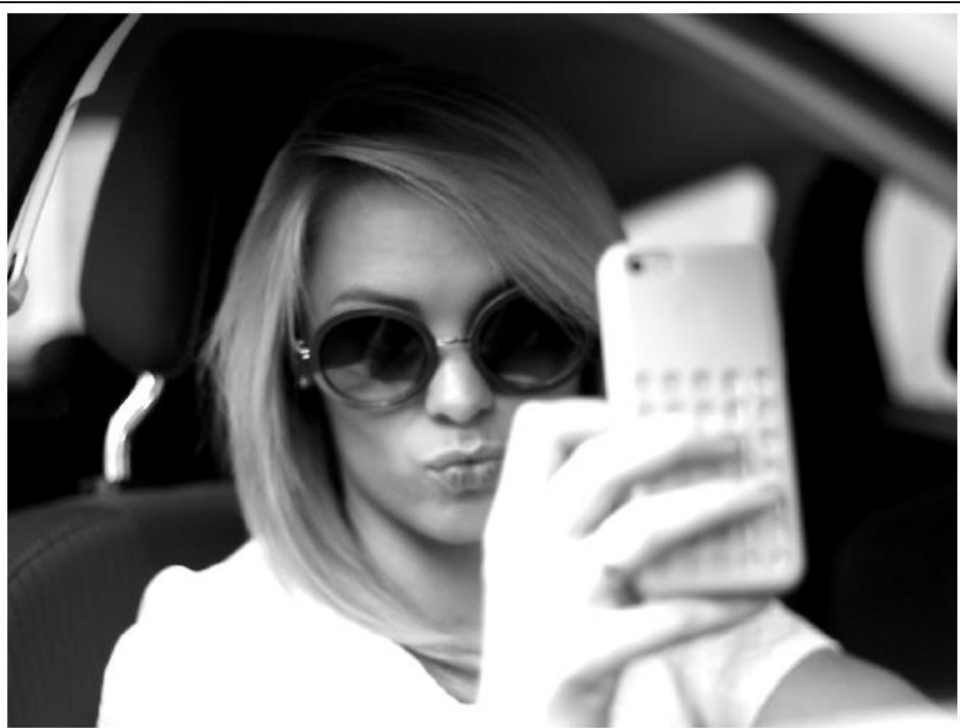
0:05 / 34:55

This is a YouTube video player interface. The video title is "FROM ONE SECOND TO THE NEXT" by Werner Herzog. The video is currently at 0:05 of a 34:55 duration. The video player shows a dark background with the title and author's name. A small thumbnail of the video content is visible in the bottom right corner, showing a person on a road. The video is currently at 23:31.

Is it all hype?



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07-Aug-2014 | BRENTWOOD, Essex

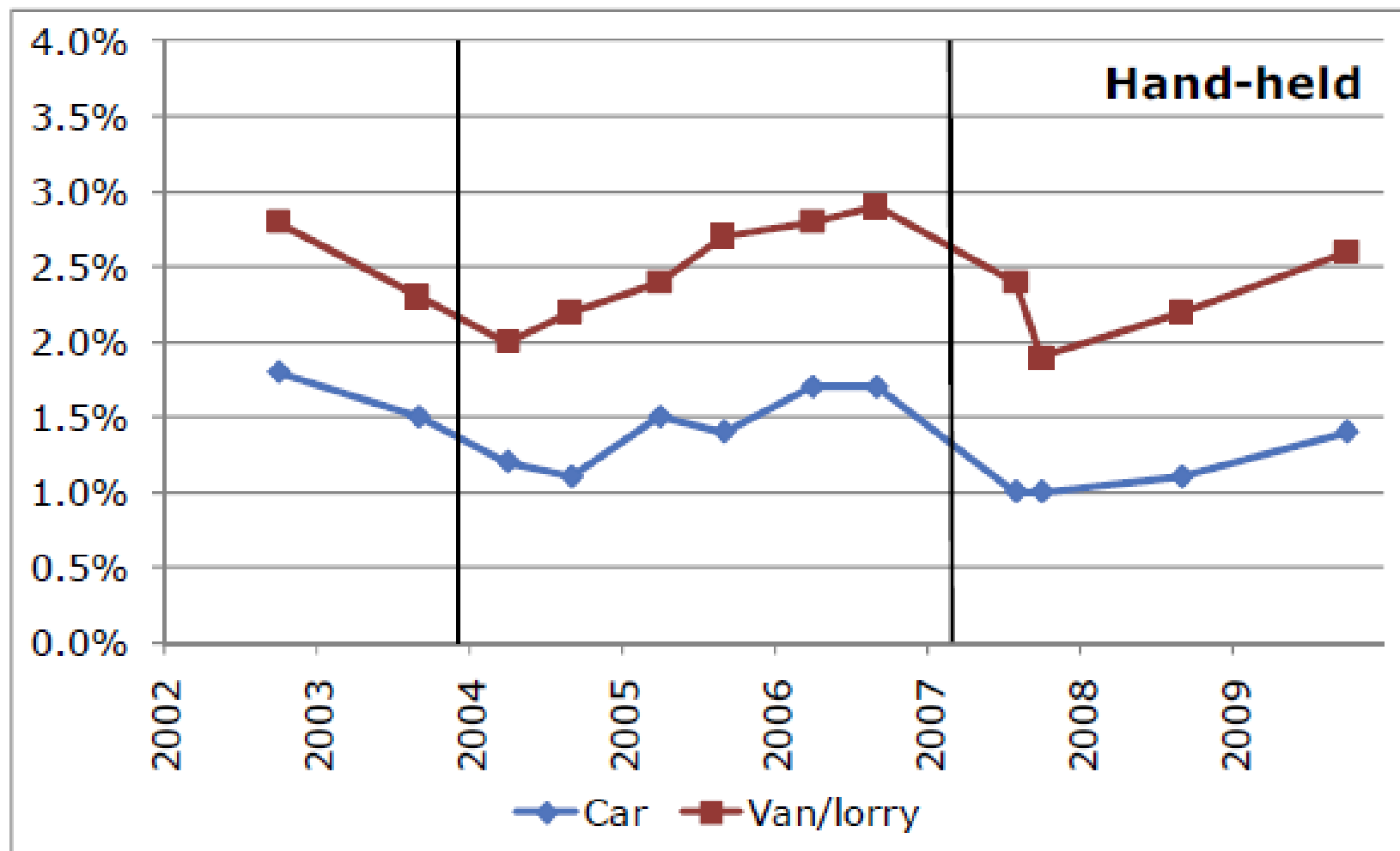
FORD REVEALS THAT ONE IN THREE YOUNG BRITS HAVE TAKEN A 'SELFIE' WHILE DRIVING



Surveys of phone use while driving in south-east England



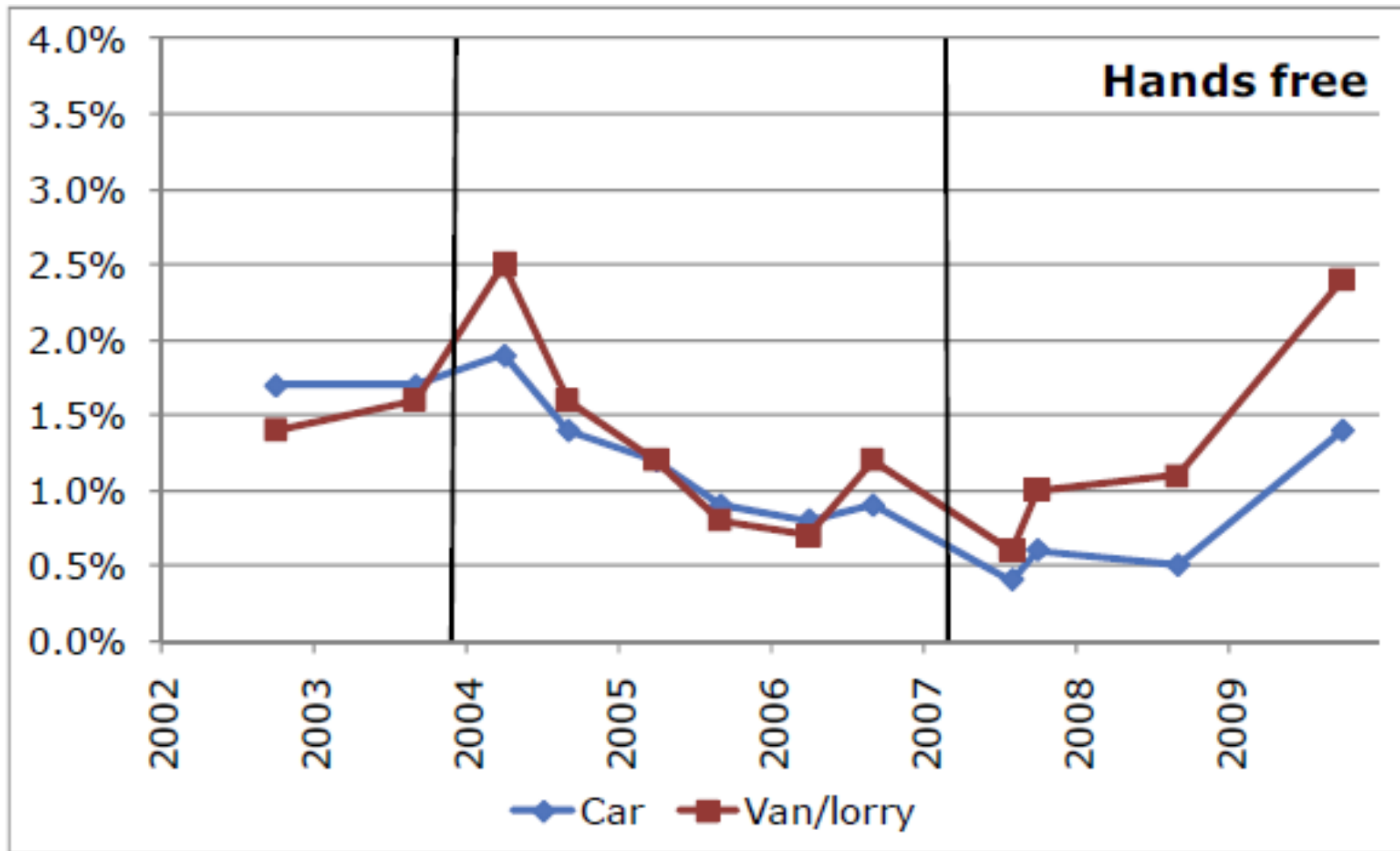
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Surveys of phone use while driving in south-east England



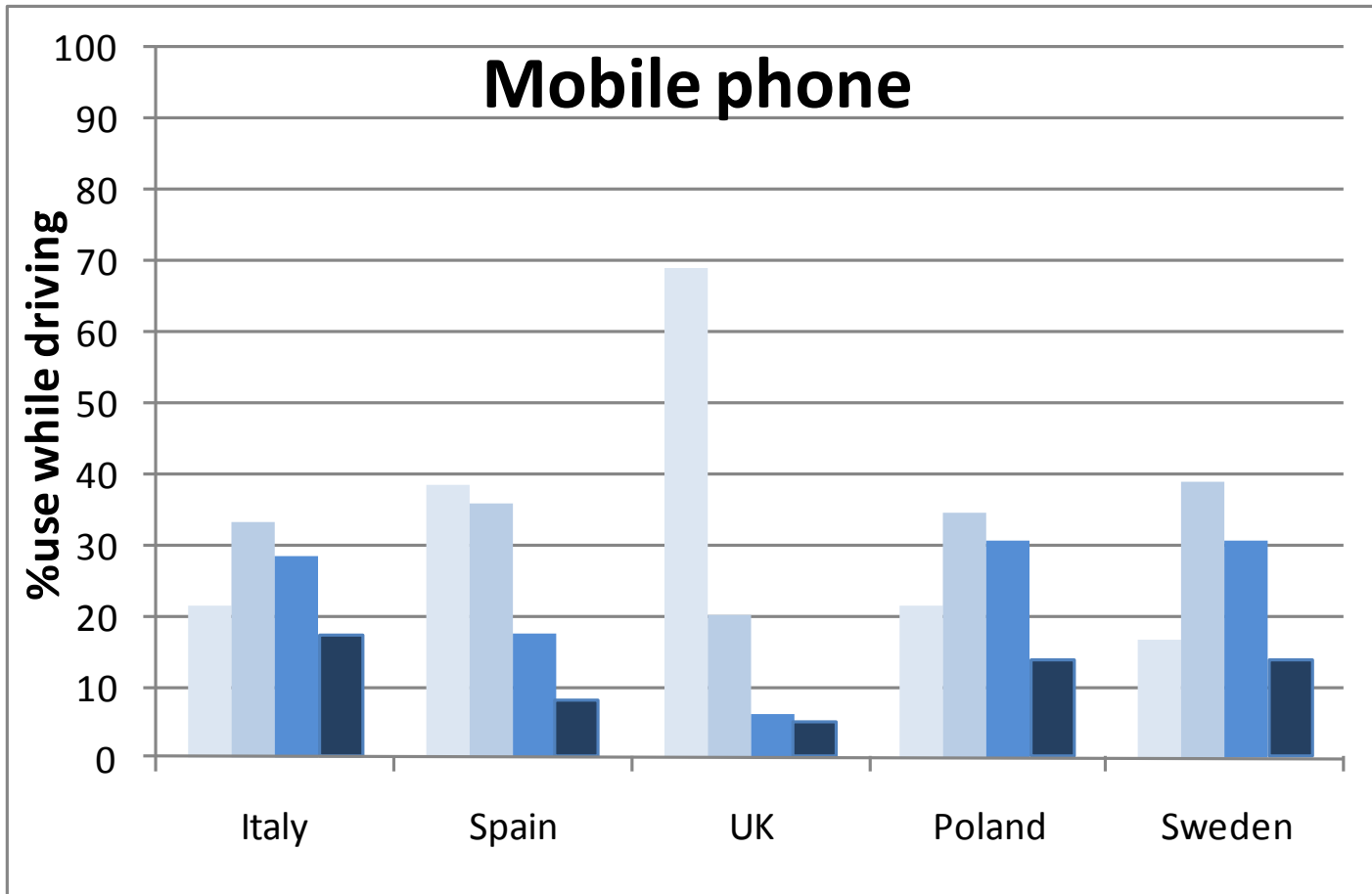
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Use of nomadic device (survey in 2010)



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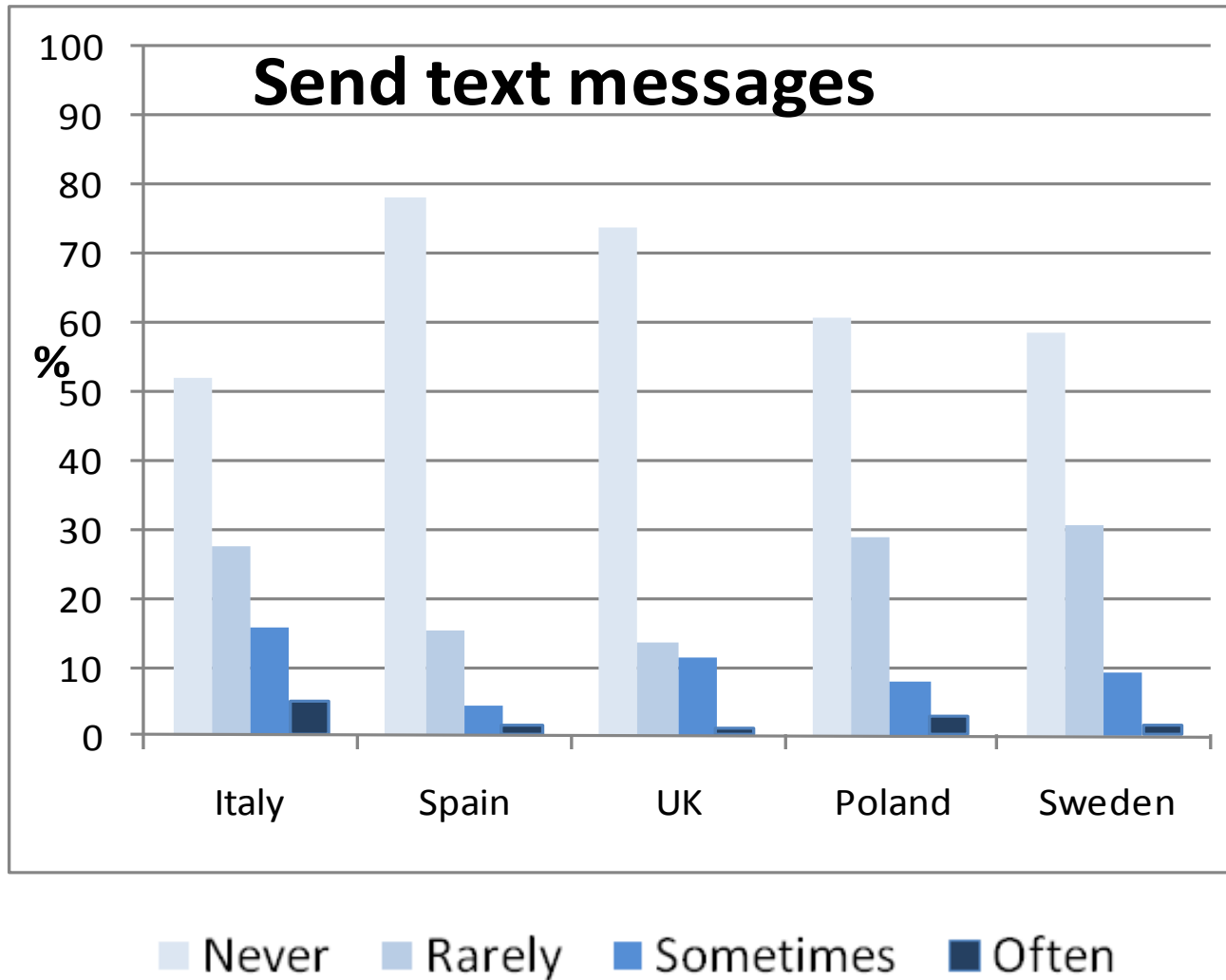


■ Never ■ Rarely ■ Sometimes ■ Often

Use of nomadic device (survey in 2010)



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Is distraction dangerous?



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Three methods have been used to investigate:

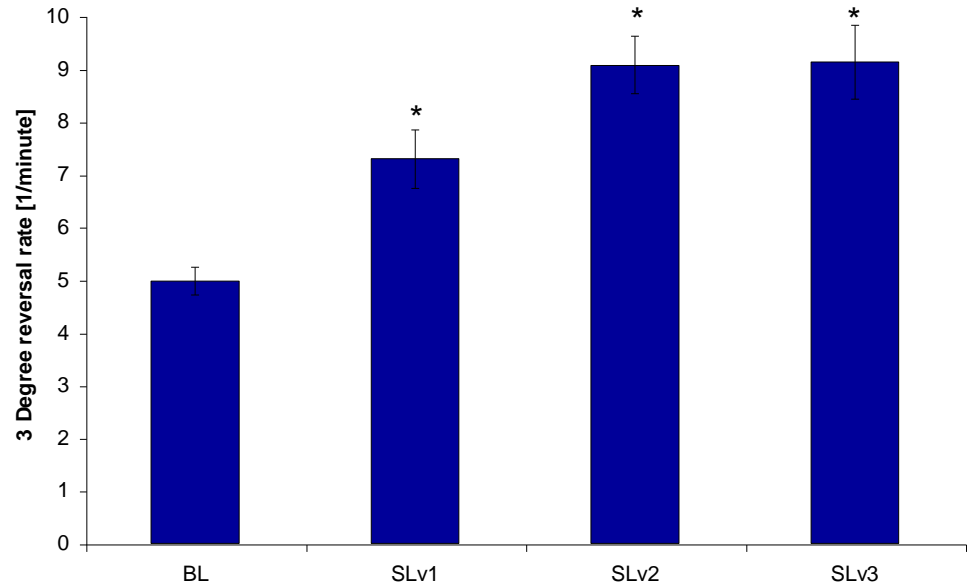
1. Experimental studies in driving simulators
 - Compare driving with distraction to driving without
2. Naturalistic Driving Studies (NDS)
 - Identify critical events and calculate risk of occurrence in distracted vs non-distracted driving
3. Statistical analysis of accident data, sometimes using a similar methodology to NDS



Visual

- Affects steering behaviour and lateral control

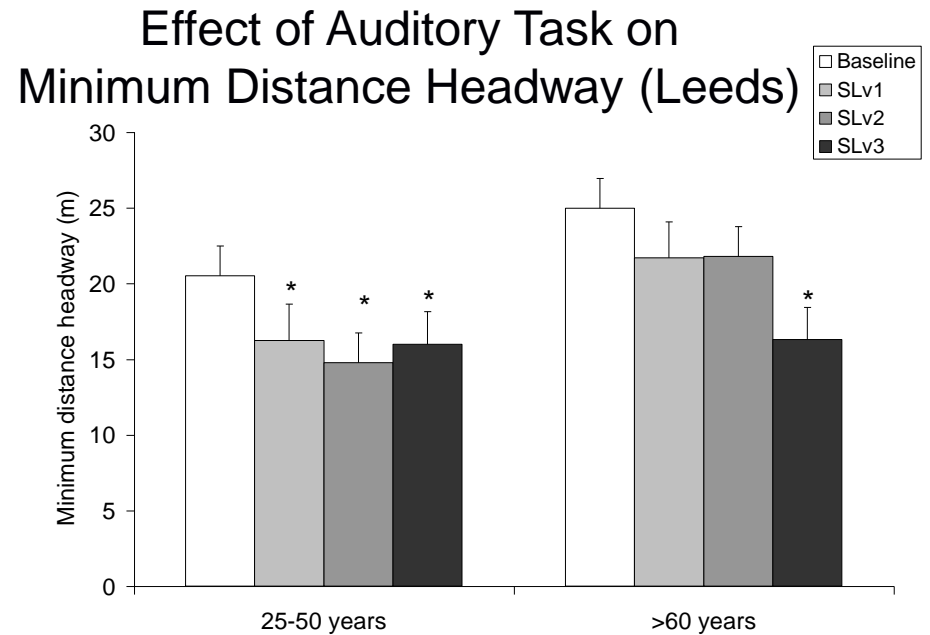
Effect of Arrows Task on 3° Steering Reversal Rate (Leeds)



* $p < .05$

Auditory/cognitive

- “Improves” steering behaviour
- Affects longitudinal control

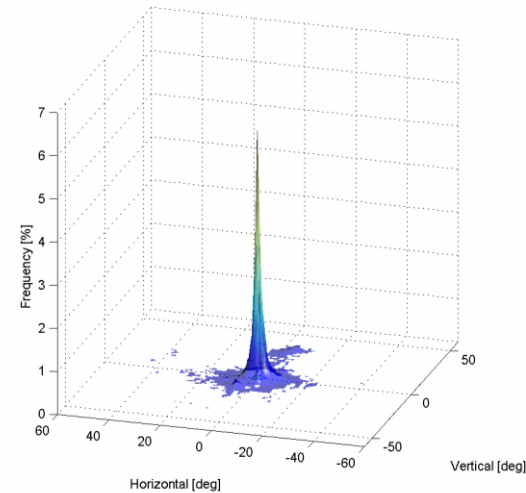


Changes in gaze patterns with the auditory/cognitive task

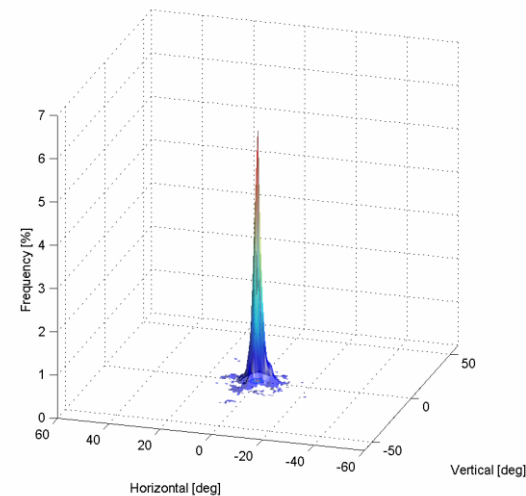


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- Increased eye focus on road straight ahead
- Probably = gazing ahead without processing



Baseline



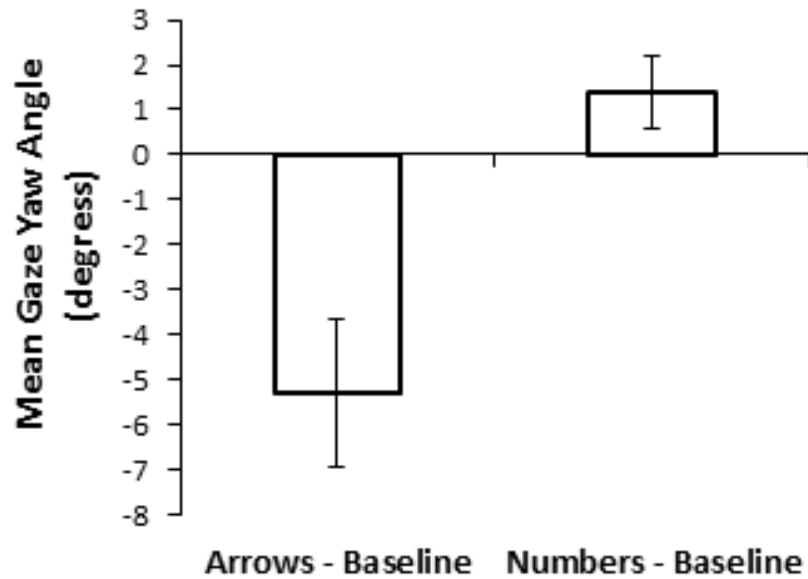
High Level of cognitive distraction

Upward shift in gaze with cognitive distraction (FORWARN project, 2014)

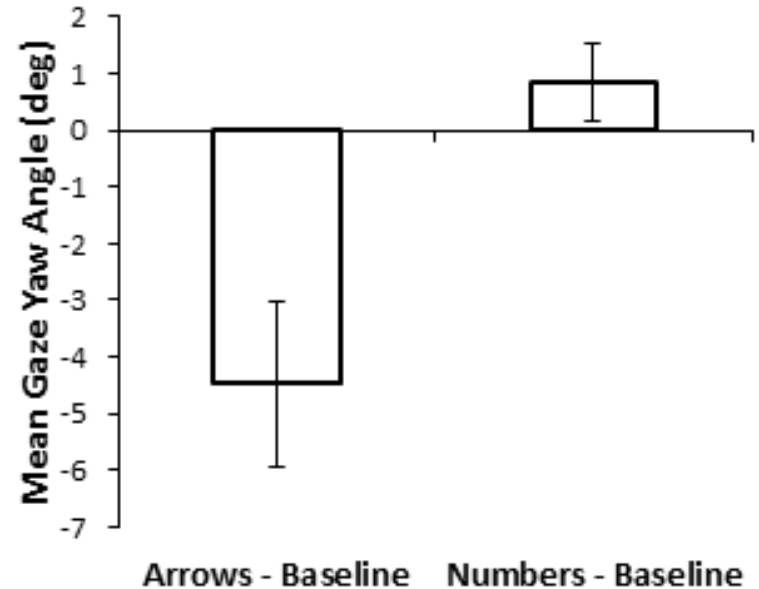


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Experiment 1



Experiment 2



Another simulator study (Parkes et al., 2007)



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- Hands-free conversations impair driving performance more than:
 - Talking to a passenger
 - Handling the radio
 - Handling the climate controls



The “discovery” of distraction: *100 Car Study* (Dingus et al., 2005)



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- 100 highly instrumented cars driven in “naturalistic” circumstances for a year in Virginia
- Particular focus on young drivers
- Covered both near-misses and crashes (many of which were very low severity)
- Almost 80% of crashes and 65% of near crashes involved the driver looking away from the forward roadway just prior to the onset of conflict
- Inattention, including secondary task distraction, was a contributory factor in 93% of the incidents with lead vehicles
- The rate of inattention-related incidents decreased dramatically with age
- Mobile phone and PDA use was a major factor in incidents



- One of the most cited case-control studies compared mobile phone use for drivers attending hospital in Perth, Australia following a crash with phone use on a matched previous trip (McEvoy, 2005)
- Results was an odds ratio of 4.1 for use of a mobile phone
- No difference between handheld and hands-free

However, these results have been criticised on methodological grounds (Young, 2011)

- U.S. NHTSA has found that 17% of all police-reported crashes involved some type of driver distraction in 2010
- This compares with 5% of U.S. drivers observed to be using an electronic device in 2010

[Of course, there is potentially more distraction than just from electronic devices]

- Distraction increases risk
- Hands-free is not necessarily safer than handheld
- Texting is particularly risky, especially writing texts
 - Reed and Robbins, 2008, found a 91.4% increase in Standard Deviation of Lateral Position when writing a text
- It is hard to identify the overall number of crashes related to distraction



Back to cognitive distraction

(\approx talking on a hands-free mobile phone)

Naturalistic studies of U.S. driving



Activity	Odds Ratio of a Safety Critical Event			
	Truck (Olson et al., 2009)	Truck and Bus (Hickman et al., 2010)	Car (Fitch et al., 2013)	Car (Victor et al., 2014)
Text message on a mobile phone	23.24*	–	1.73*	5.6*
Interact with/use a dispatching device	9.93*	–		
Dial mobile phone	5.93*	3.51*	0.99	–
Use/reach for electronic device	6.72*	4.43*		1.7
Talk or listen on handheld phone	1.04	0.89	0.99	
Talk or listen on hands-free phone	0.44*	0.65*	0.73/ 0.71	0.1*

The cognitive contradiction



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- Simulator studies consistently find that cognitive distraction leads to a deterioration in performance
- The naturalistic studies consistently find listening on a hands-free phone to be “protective” (decrease risk)

Why might talking on a hands-free phone be protective?



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Explanation 1: Talking could help drivers to stay awake at night

Explanation 2: Talking on a mobile phone interferes with other risky activities e.g. eating or fiddling with the entertainment system



- The NDS studies have focused almost exclusively on forward events relating to the risk of a rear-end collision
- Eyes off the road at the critical moment when the lead vehicle brakes leads to high risk of an event or collision
- But cognitive distraction most likely does not lead to failing to detect the looming (visual expansion) of the lead vehicle

My hypotheses about the impact of cognitive distraction (CD)



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- CD leads to gaze concentration so that drivers will be impaired in detection of threats in the periphery
- CD leads to increased workload so that drivers will be impaired in high-demand situations such as intersections and interactions with vulnerable road users

Evidence

- Neyens and Boyle (2007) analysed 449,049 crashes involving teenage drivers in the U.S. They found that CD and passenger-related distraction led to large increase in the probability of certain types of intersection crash.
- Harbluk et al. (2007) carried out observations of experienced drivers using a hands-free phone on an urban route. They found that the more difficult cognitive task affected intersection driving. With the task, there were decreased inspection glances to traffic lights and reduced scanning of intersection areas to the right.



Solutions and policy



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- Publicity on the dangers of mobile phone use is generally ineffective
- Banning the use of mobile phones is only partly effective, particularly without strict enforcement
- Fleets can potentially accomplish a lot but there are major concerns about the usage of fleet management devices particularly in trucks
- Technology may provide the answer, i.e. provide the means to block risky activities



To what extent are drivers managing their distraction?



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UDRIVE

European Naturalistic
Driving Study

- Visual and cognitive distractions lead to different effects but both are harmful to safety
- Cognitive distraction leads to problems in higher workload situations
- Effective policy interventions are currently lacking



Thank you for your attention!

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