



In vehicle distraction: is cognitive distraction a safety problem?

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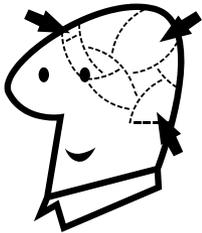




Visual distraction: tasks that require driver to focus visual attention away from the roadway



Manual distraction: tasks that require the driver to manipulate a system



Cognitive distraction: tasks that divert the driver's mental attention away from vehicle control, vehicle manoeuvring and interaction with other road users

- Some research is now claiming to show that hands-free mobile phone conversation is safe

NHTSA notice of proposed distraction guidelines, 24 Feb 2012



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The screenshot shows the Federal Register website interface. At the top, there is a navigation bar with links for Sections, Browse, Search, Policy, Learn, and Blog, along with a search box for articles. Below this is the Federal Register logo and the text "FEDERAL REGISTER The Daily Journal of the United States Government". A blue banner highlights the word "Notice". The main title of the notice is "Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices". Below the title, it states "A Notice by the National Highway Traffic Safety Administration on 02/24/2012" and includes social media icons for email, Twitter, and Facebook. The "SUMMARY" section begins with "The National Highway Traffic Safety Administration (NHTSA) is concerned about the effects of distraction due to drivers' use of electronic devices on motor vehicle safety. Consequently, NHTSA is issuing nonbinding, voluntary NHTSA Driver Distraction Guidelines (NHTSA Guidelines) to promote safety by discouraging the introduction of excessively distracting devices in vehicles." On the right side, there are navigation links for "Previous Article" and "Next Article", a "LEGAL DISCLAIMER" box, "Font Controls" with plus, minus, and font size buttons, and a "PUBLIC INSPECTION" section with icons for PDF, XML, and PRINT.

What do these proposed guidelines state about cognitive distraction?



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‘It is clear from naturalistic driving research that the secondary tasks with the highest risk odds ratios tend to have primarily visual-manual interaction means with only a relatively small cognitive component.... Only the secondary tasks, “Interacting with Passenger” and “Talking/Listening on Hands-Free Phone,” are almost exclusively cognitive in nature. Both of these secondary tasks have risk odds ratios that are statistically significantly less than 1.00 (at the 95 percent confidence level). These two heavily cognitive secondary tasks appear to have protective effects.

For this reason, and because it is far less clear how to measure the level of cognitive distraction, the NHTSA Guidelines will initially only apply to the visual-manual aspects of devices’ driver interfaces.’

VTTI Studies of truck and bus driving (Olson et al., 2009; Hickman et al., 2010)



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Activity	Odds Ratio of a Safety Critical Event	
	2009 Study	2010 Study
Text message on a mobile phone	23.24*	–
Interact with/use a dispatching device	9.93*	–
Dial mobile phone	5.93*	3.51*
Use/reach for other electronic device	6.72*	4.43*
Talk or listen to handheld phone	1.04	0.89
Talk or listen to hands-free phone	0.44*	0.65*



A host of experimental studies show cognitive distraction (as from mobile phone conversation) to have detrimental effects, e.g.:

- Beede and Kass, 2006
- Kass, Cole and Stanny, 2007
- Strayer and Drews, 2007

- and the results of the HASTE project, 2002–2005

From the HASTE project: distraction type



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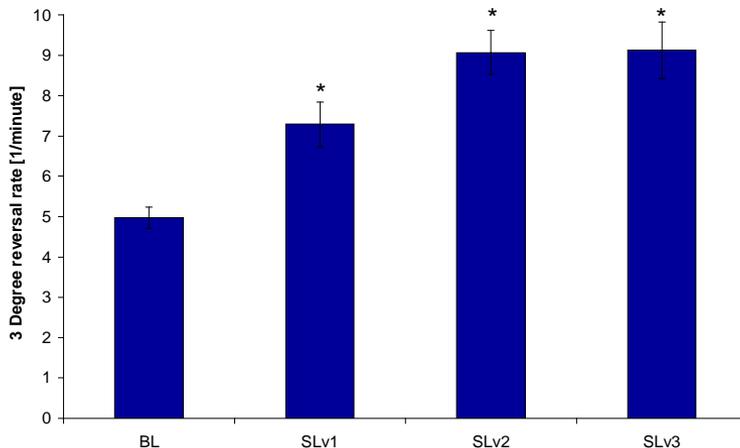
Visual

- Affects steering behaviour and lateral control

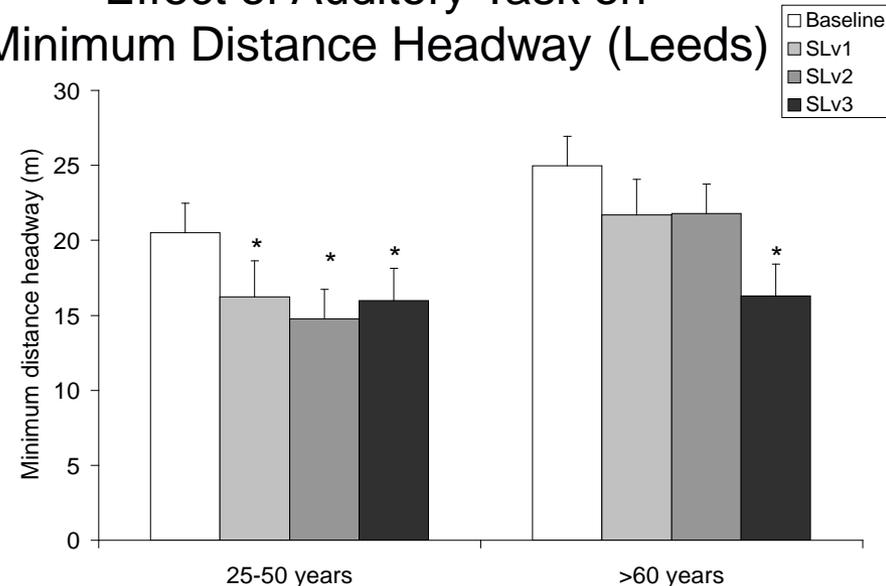
Auditory/cognitive

- “Improves” steering behaviour
- Affects longitudinal control

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



Effect of Auditory Task on Minimum Distance Headway (Leeds)

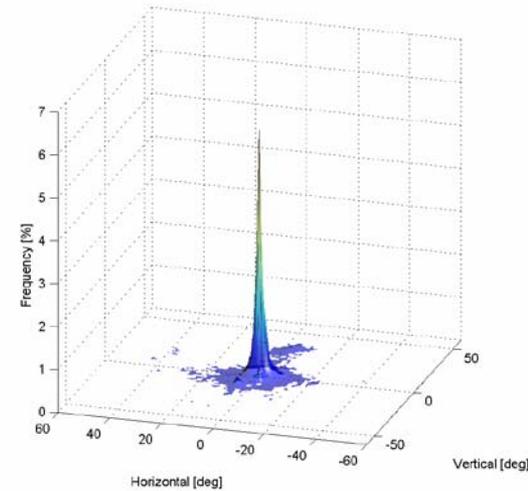


Explanation for curious effect of auditory/cognitive task

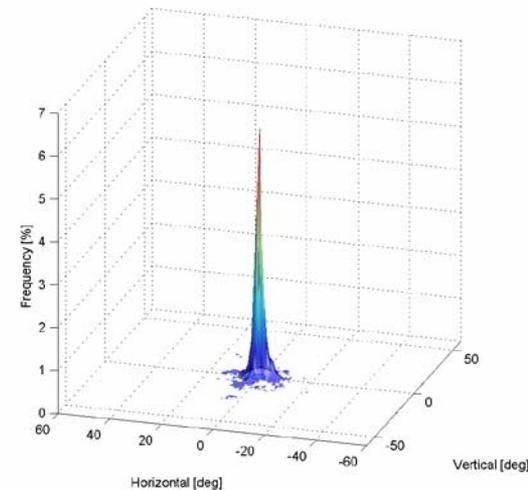


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- Increased eye focus on road straight ahead
- Probably = gazing ahead without processing
- We know that drivers tend to track in the direction of their gaze angle



Baseline

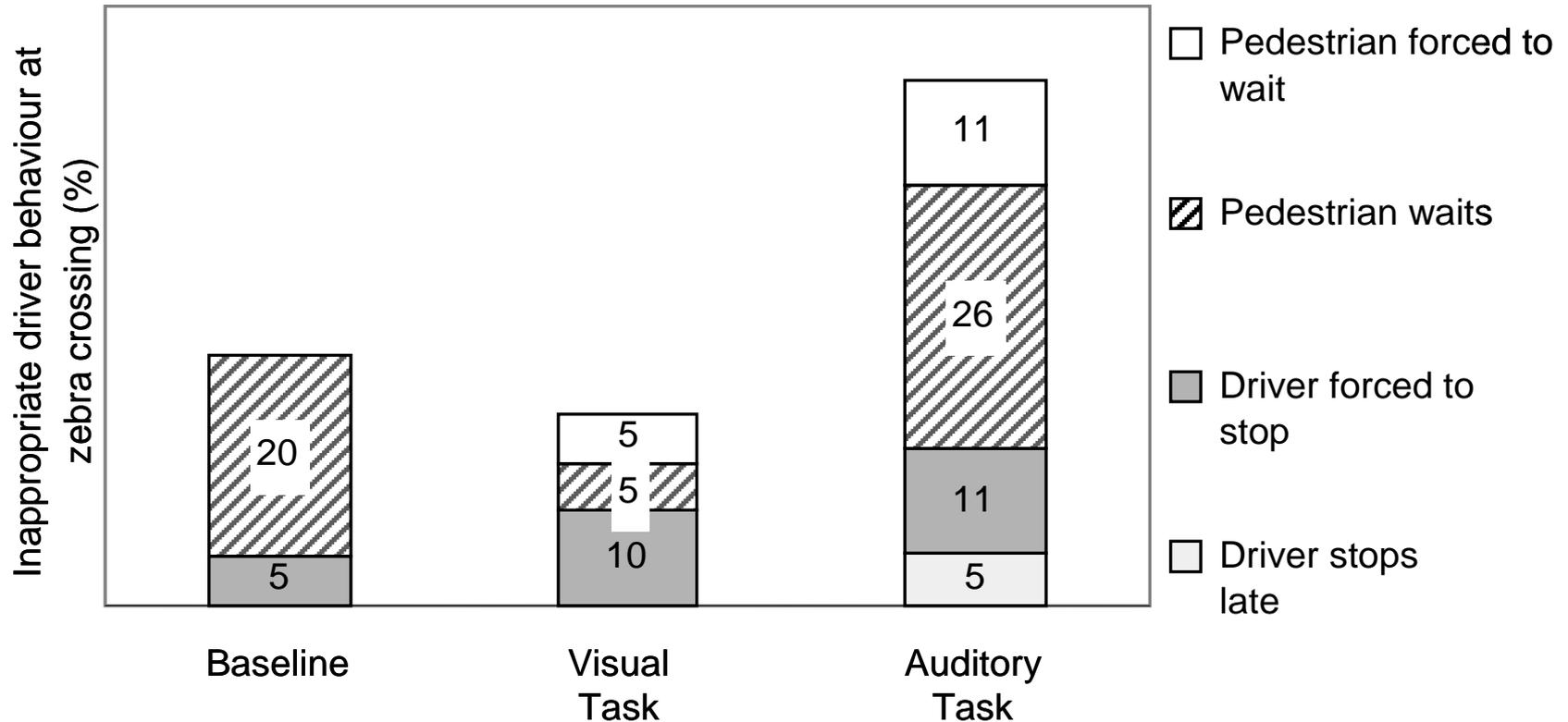


High Level of cognitive distraction

The effects are there in real-road driving too



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Interaction with pedestrians at zebra in Helsinki
(from Östlund et al., 2004)

Let's look at how the naturalistic results were calculated collected



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Method applied by Olson et al. (2009) [Hickman et al. (2010) is similar]:

1. Continuous data collection with sensors and video in large trucks
2. Filter data for safety-critical events — crashes, near-crashes, crash-relevant conflicts (less severe near-crashes), and unintentional lane deviations → 4452 events
3. Analyse the video for 6 secs — 5 secs before an event and 1 sec after
4. **Randomly** select 6-sec baseline epochs → 19,888 epochs
5. Calculate odds ratios by comparing events with baseline epochs

Is the method valid?



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- What if the critical events and the “randomly selected” baseline epochs have different distributions in terms of:
 - Road type
 - Traffic flow
 - Link or intersection
- In other words, do professional drivers chose to engage in mobile phone conversations at random or in certain situations that they judge to be safe for such activities?

We need new methods for analysing naturalistic data



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Research questions should be:

- When and where do drivers choose to engage in distracting activities?
- Is there a difference between received phone calls and self-initiated calls in terms of their distribution by roadway type, intersection or link driving, traffic density, etc.?
- Who is engaging in distracting activities?
- Can we observe a deterioration in the quality of driving while (or after) engagement in distracting activity?
- Then we might know if the experimental and naturalistic findings are really contradictory

A final word





Thank you!

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