



Mobile phones, distraction and driving

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4 Summary

Transport Research Laboratory

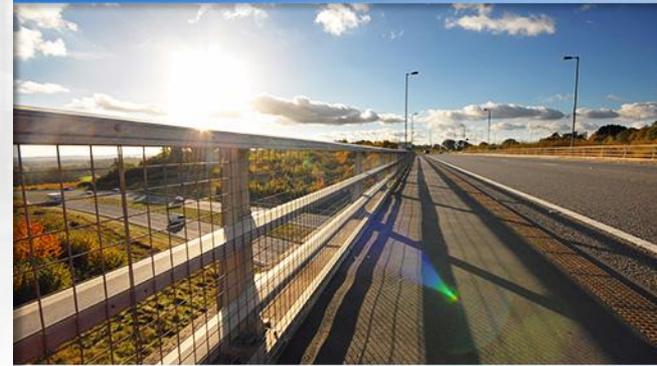
- Established 1933
- Privatised in 1996
- 400+ staff including world recognised experts
- Head office in Crowthorne, Berkshire, UK
 - Offices in Scotland, Wales, Dubai, Bahrain, Qatar
 - Project offices overseas



Transport Research Foundation

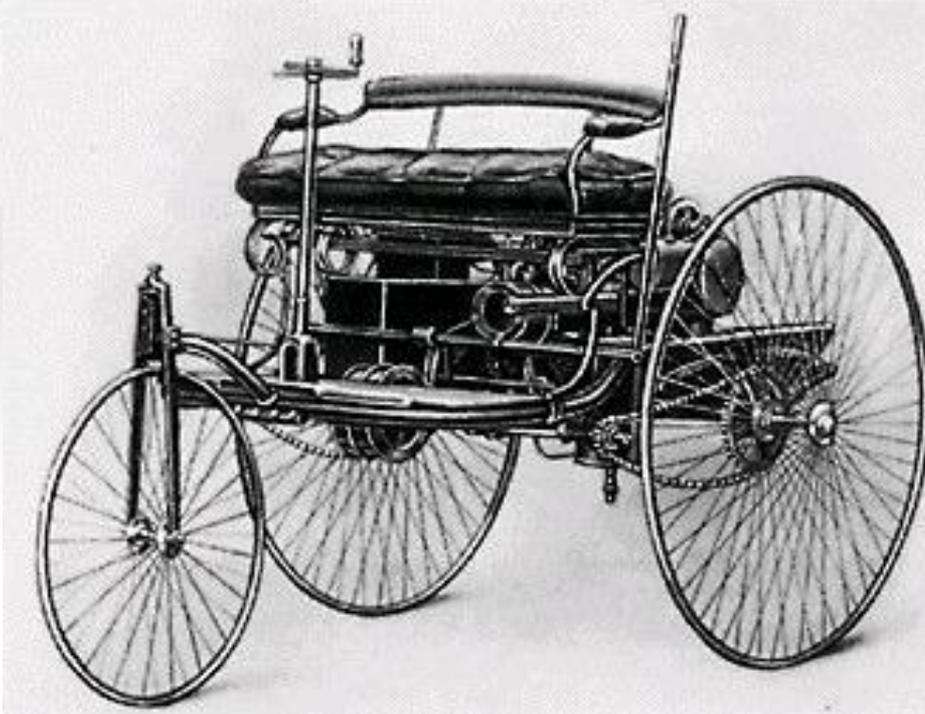
Parent company of TRL

- Created 1st April 1996
- Impartial and commercially independent
- A company limited by guarantee, with sector members and no shareholders
- Non profit distributing company
- Re-investment of funding enables TRL to undertake original Scientific Research
- Ensures that TRL knowledge and consultancy is based on evidence, not vested interests

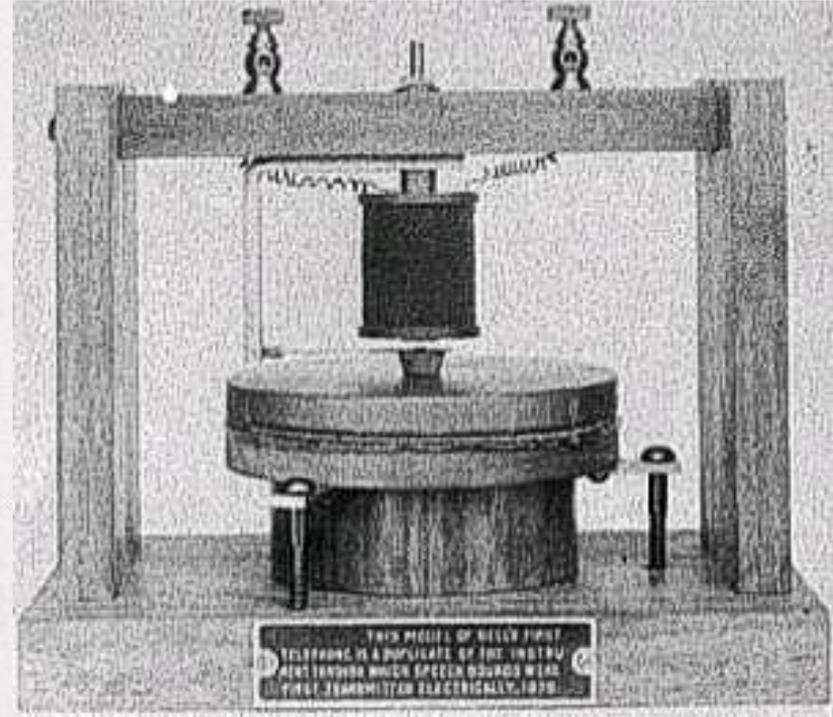


A little history

19th century



1885 Benz Patent-Motorwagen



1876 Bell telephone

The present

21st century



1981 DeLorean Time Machine



2011 Samsung Galaxy S2

1946 First mobile phone call





Distraction and driving – the evidence



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2.1 What does cognitive psychology tell us?

2.2 How important is hazard anticipation skill?

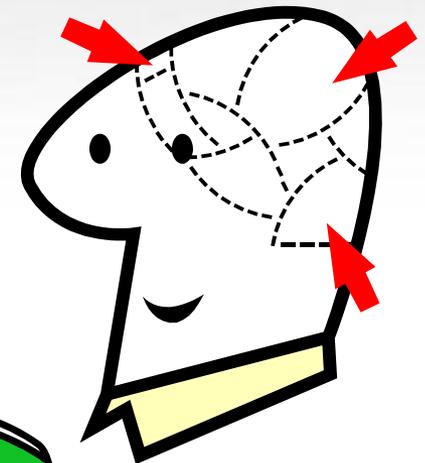
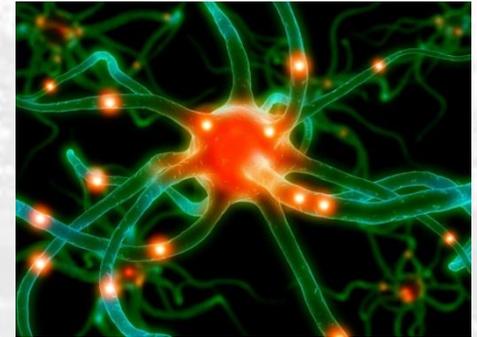
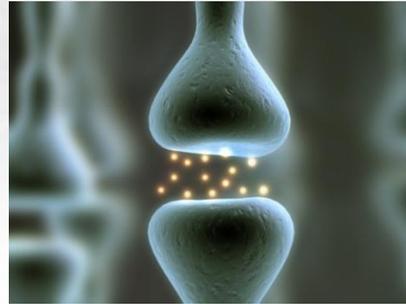
2.3 What do simulator studies of driving say?

2.4 What about data from the real world?

Cognitive Psychology

Driving as a cognitive task

- Cognitive psychology is the study of internal, mental processes, e.g.
 - Learning
 - Memory
 - Skilled performance
- We know a lot about these different internal mental processes
 - There are limits to all of them
 - E.g. '7 plus or minus 2'



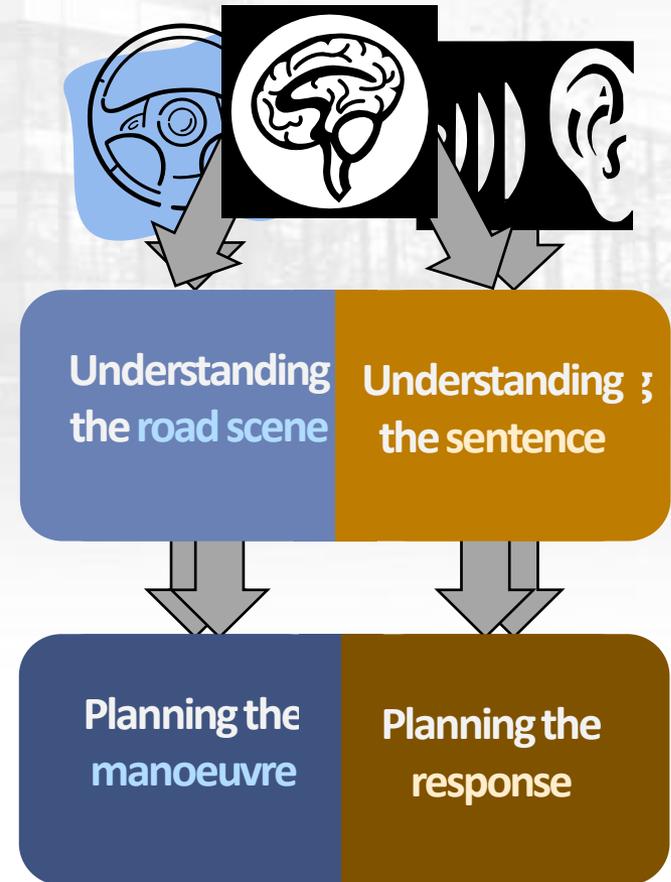
Modality in the brain and mind

- We know from studying the brain that different brain structures do different things
- Many mental processes are reliant on specific brain structures, or combinations of them
- Driving is a complex skill utilising many mental processes and different areas of the brain



Interference between tasks

- We know that tasks do not need to match perfectly and ‘obviously’ to compete for the use of these mental processes and brain structures, or for ‘general’ capacity
- The same basic cognitive processes are often required in seemingly different tasks
- For example, both ‘reading the road’ and ‘having a conversation’ will involve some elements of ‘understanding’ and ‘planning’
 - Understanding the meaning of a road scene / sentence
 - Planning a manoeuvre / planning a response



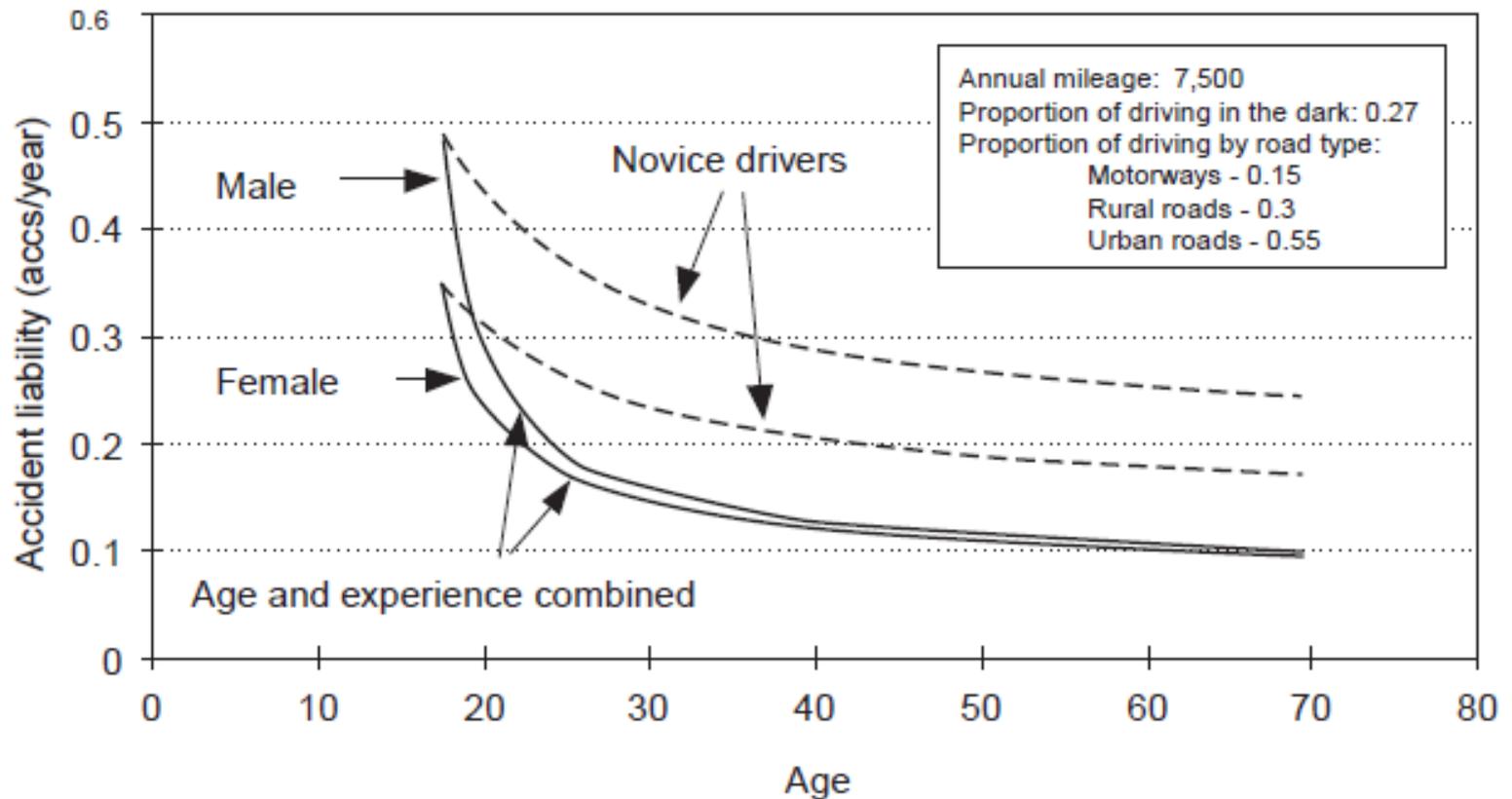
Evidence from cognitive psychology

- Cognitive psychologists have studied ‘task interference’ and ‘task switching’ for many years
- **They have concluded that tasks almost always interfere with other tasks carried out simultaneously – even when they do not overlap in obvious ways – true ‘multi-tasking’ is a myth!**
- **If you do more than one thing at once, your performance suffers as you struggle to divide your attention between them**
- *But what about evidence from the driving domain?*

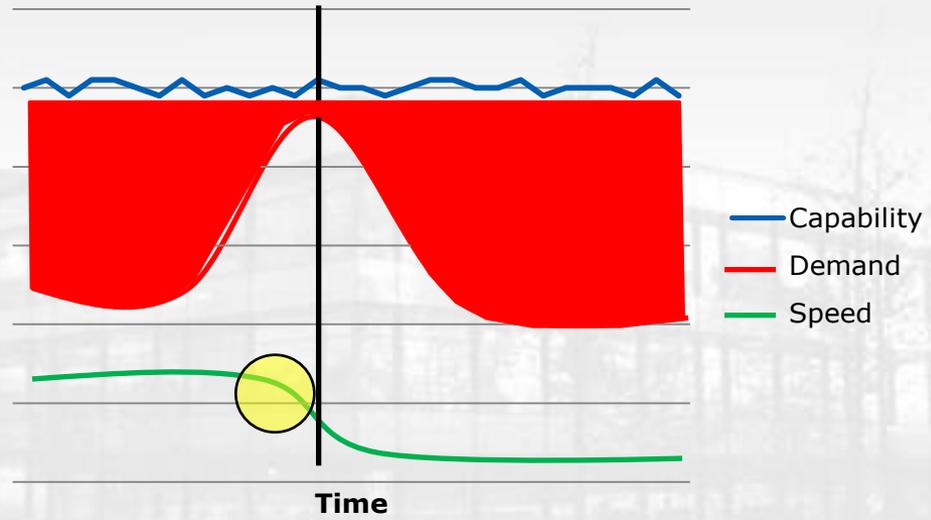
Hazard anticipation skill

Driving experience

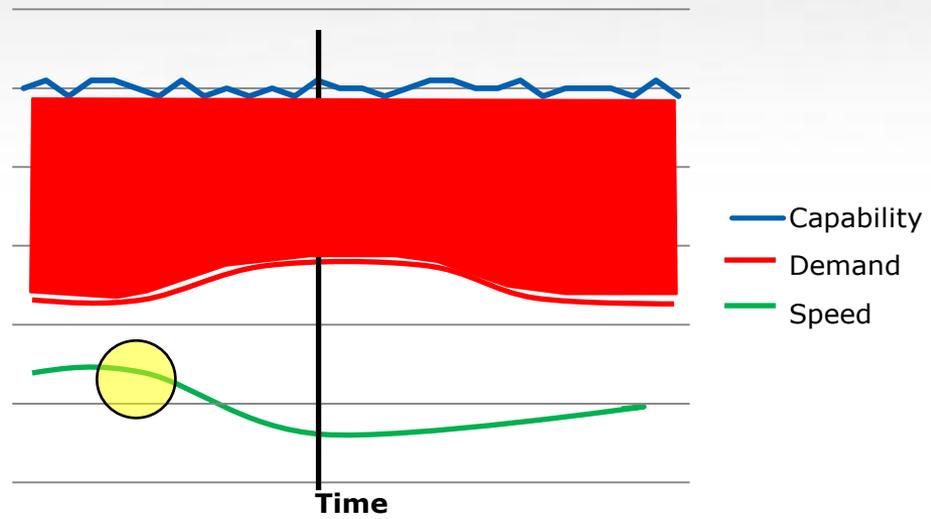
- We know that as they accumulate experience, drivers get better at not crashing



Inexperienced Driver



Experienced Driver



Hazard anticipation

- Part of this experience effect seems to be due to hazard anticipation skill
- Hazard anticipation can be measured using simple video-based tests
- This skill increases with experience, and is related to collision risk
 - Poor hazard anticipation = more crashes



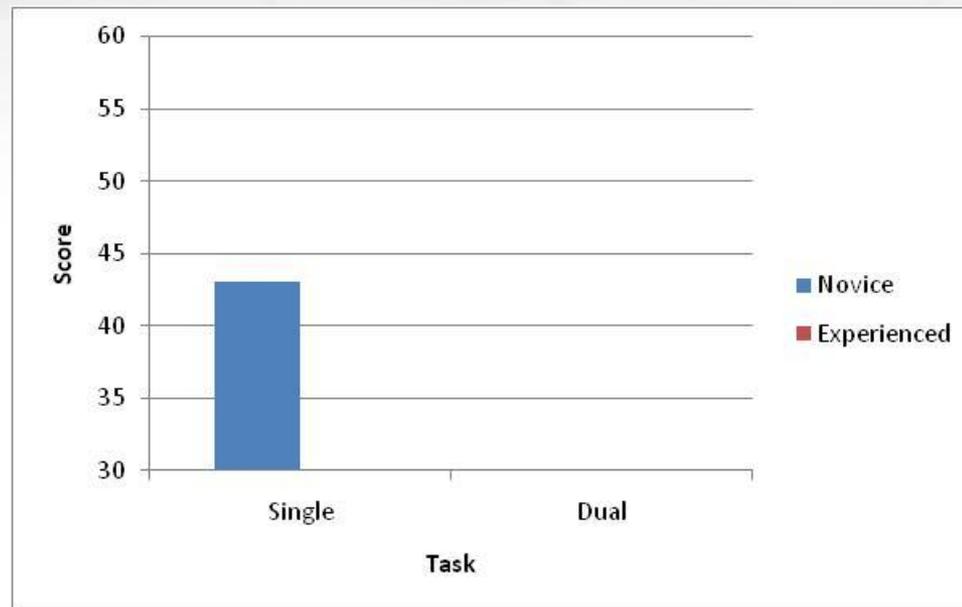
Figure 4.1 In Great Britain, learner drivers need to pass a video-based hazard-perception test as part of their driving theory test. Hazard perception refers to the ability to anticipate road hazards and respond to them early in their development.

Distraction and hazard anticipation

- McKenna and Farrand (1999) examined the effect of a conversation-like task on hazard anticipation times, using experienced and novice drivers

Distraction and hazard anticipation

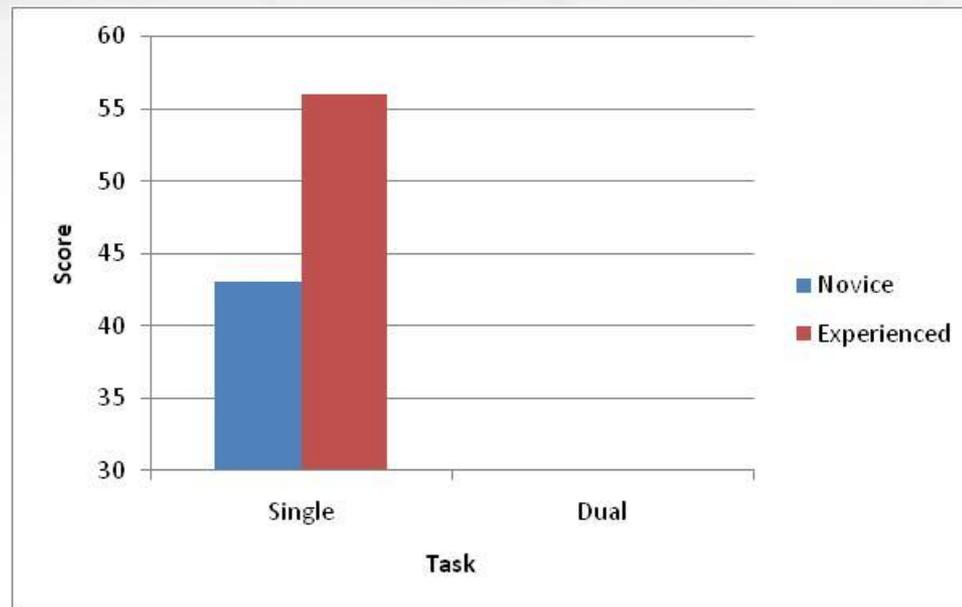
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Note graph shows approximate data from original paper.

Distraction and hazard anticipation

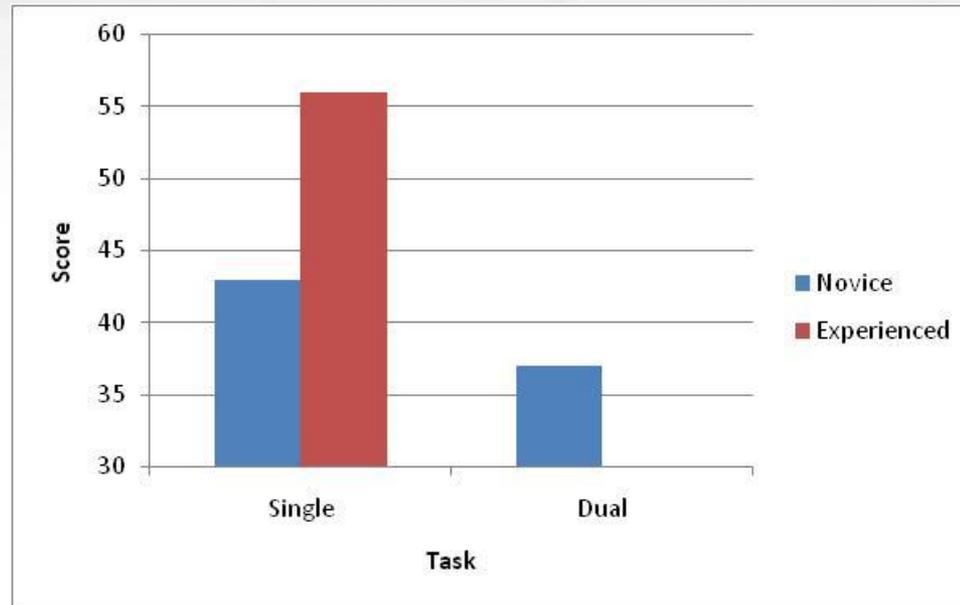
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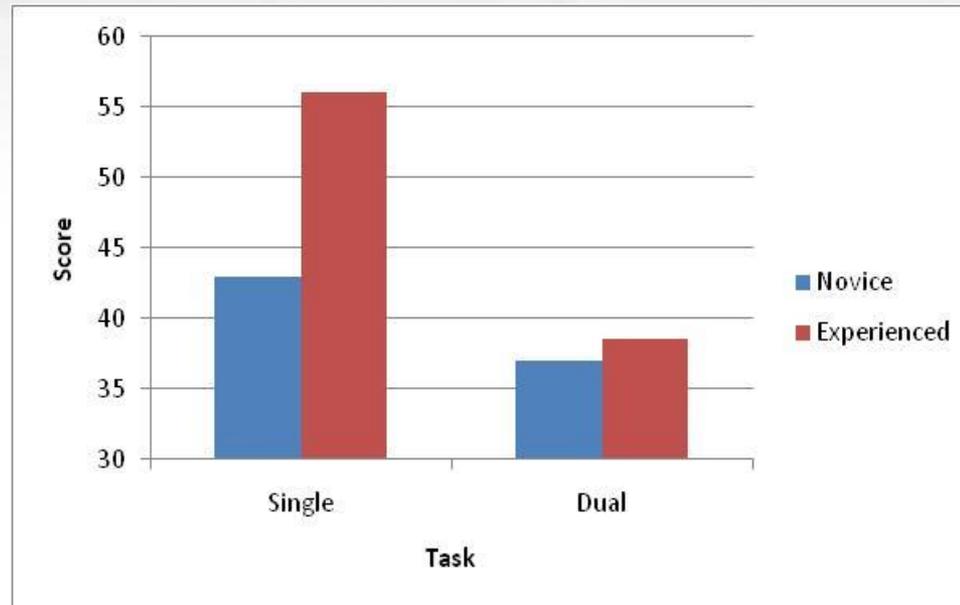
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Distraction and hazard anticipation

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Conclusion

- Conversation-like tasks interfere with the skill of hazard anticipation – **even for experienced drivers**
- Experienced drivers have been shown to **revert to the level of novices** in terms of their hazard anticipation skill, when carrying out a conversation-like task
- But what about more realistic driving tasks?

Simulator studies of driving

TRL car simulator



Scenarios



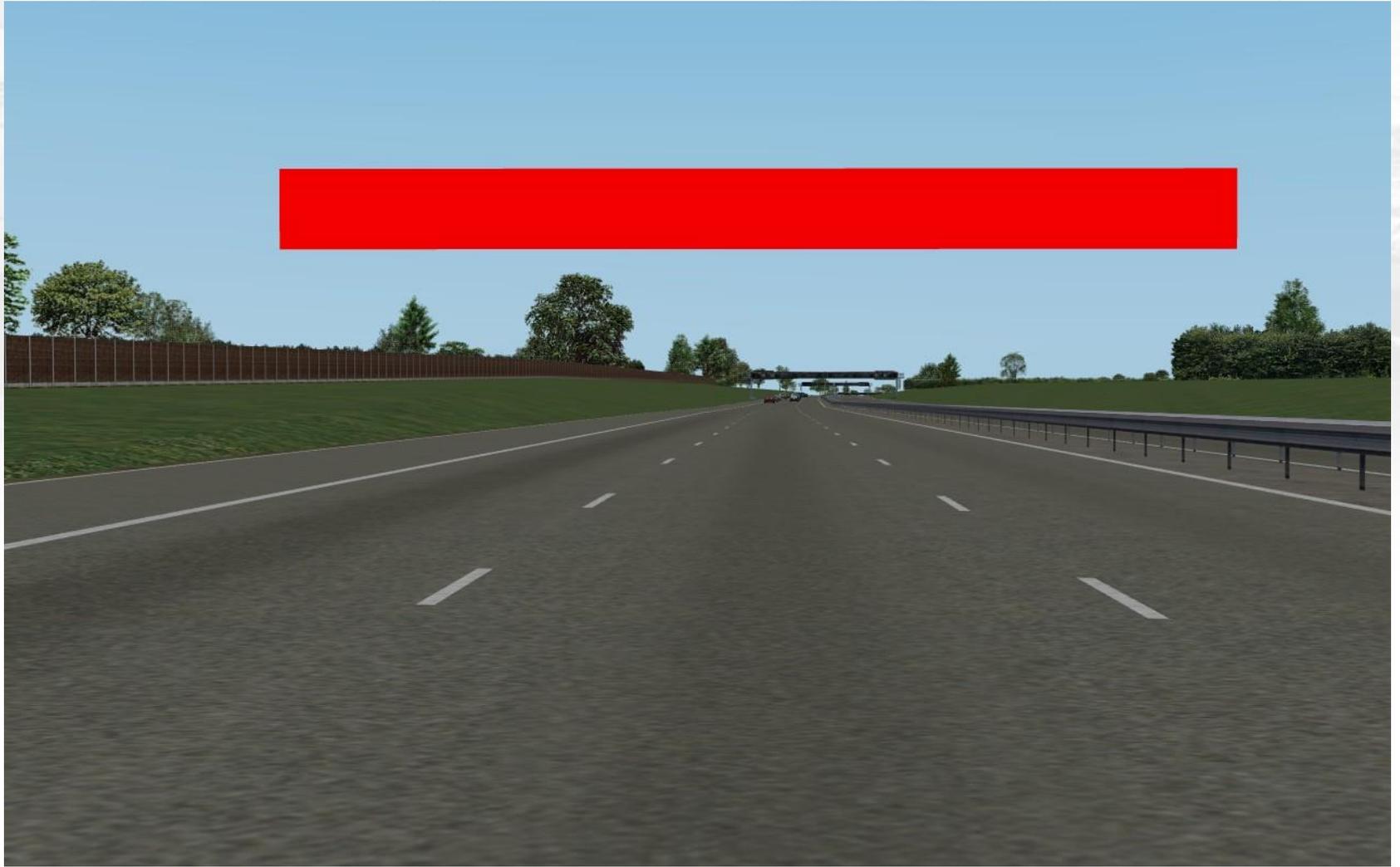
Scenarios



Scenarios

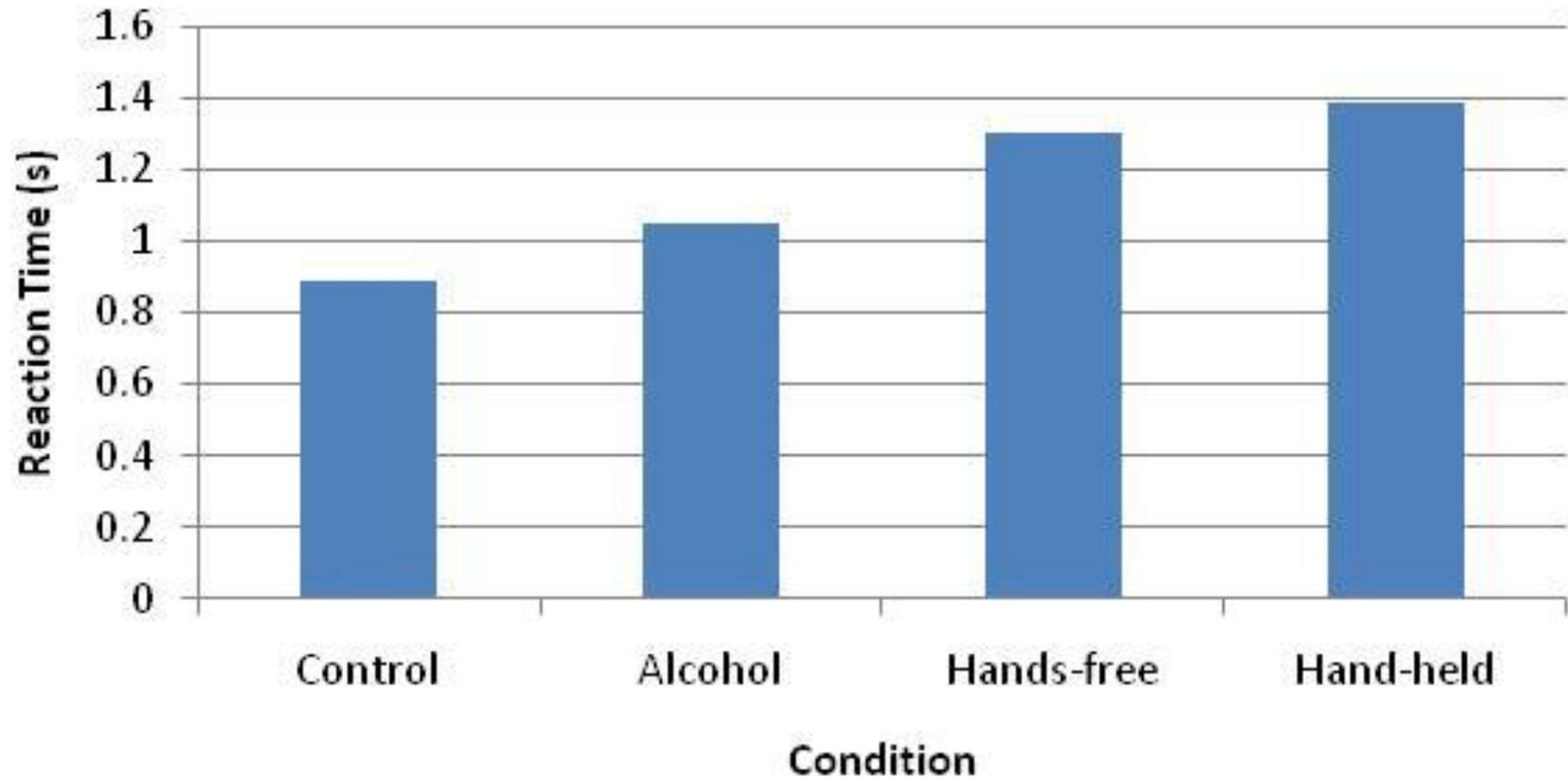


Reaction time tasks



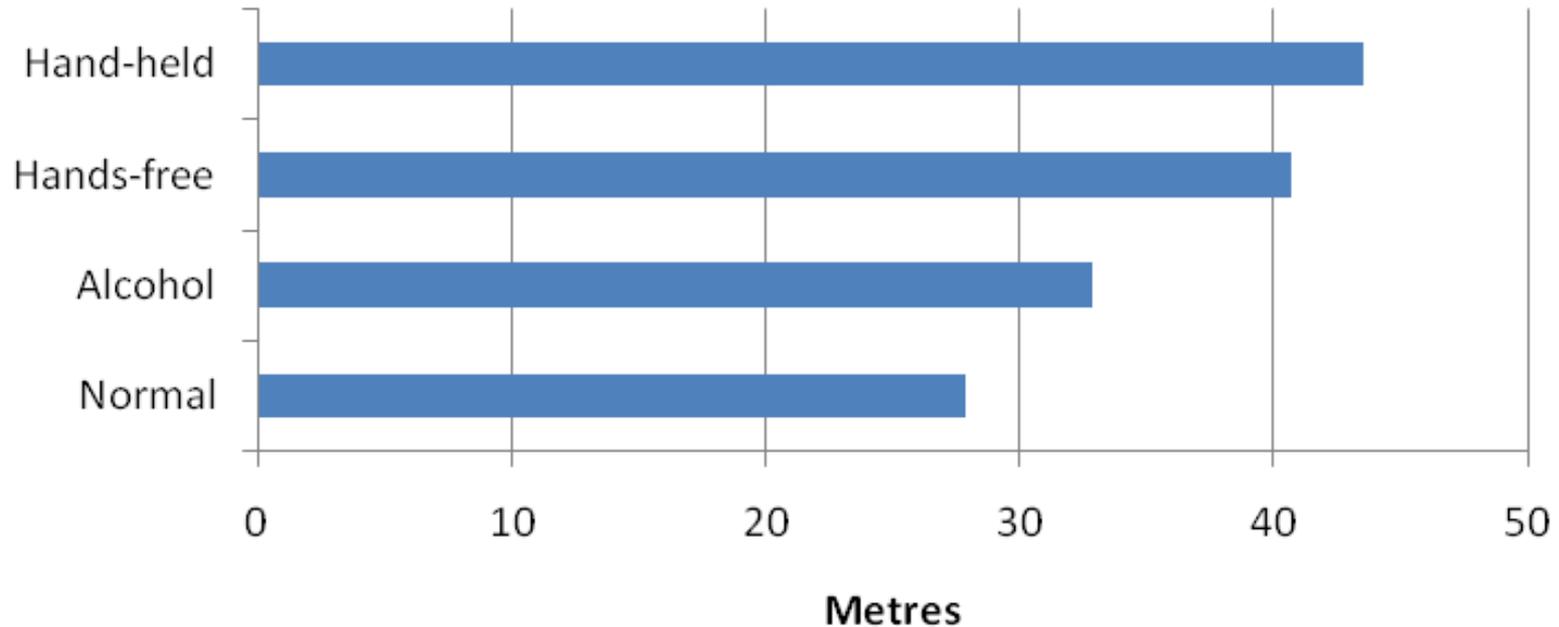
Burns et al (2002) - TRL study

Choice reaction time to sudden events



What does this mean in terms of 'thinking distance'?

Distance (m) travelled before response at 70 mph

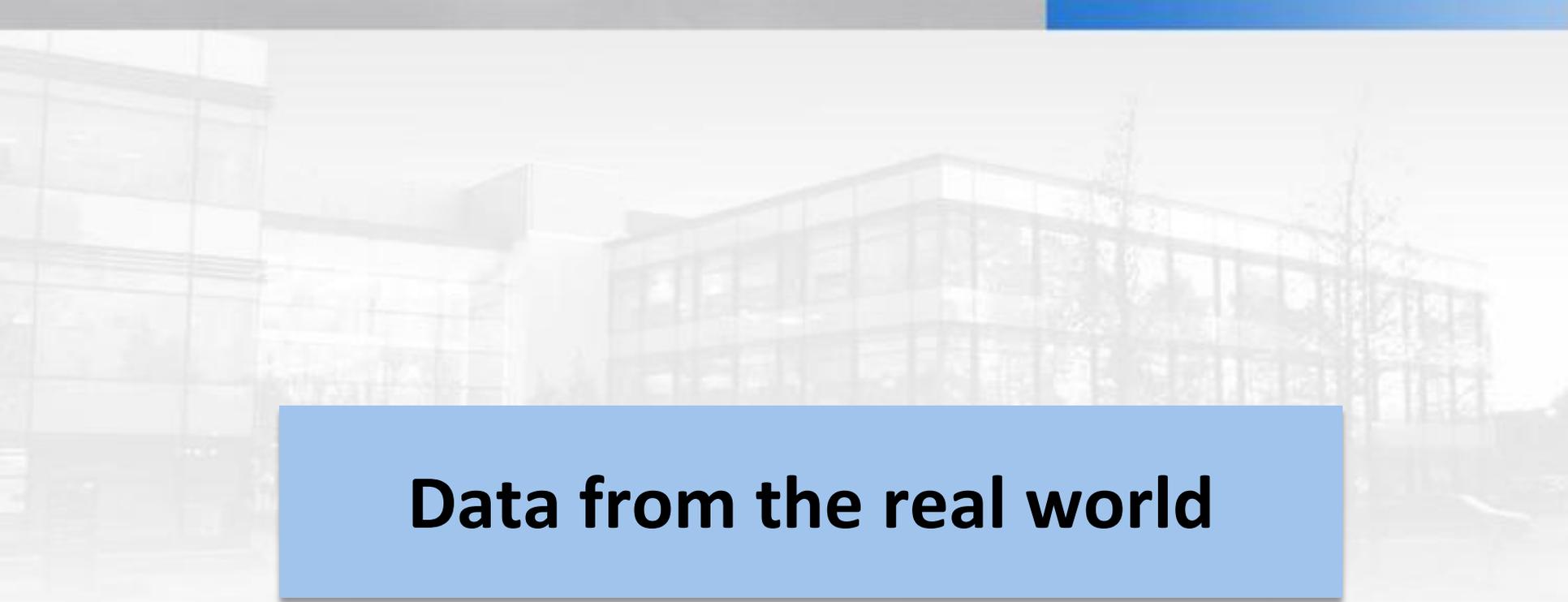


Quality of decision making

- Other differences in responses to signs:
 - Greater number of misses (i.e. drivers not responding to a sign when they should have) in hands free condition than in alcohol condition
 - Greater number of false alarms (i.e. drivers responding to a sign when they should not have) in phone conditions than in alcohol condition

Conclusion

- Key TRL study shows that hand-held and hands-free phone conversations interfere with reaction times and quality of decision making when faced with sudden events – **worse than ‘just legal’ blood alcohol limit for response times**
- Many other laboratory-based studies from around the world show similar effects – evidence base is compelling
- But what about ‘real world’ data?



Data from the real world

Redelmeier and Tibshirani (1997)

- Analysis of phone records of 699 drivers who had cell phones and had been involved in motor vehicle crashes (damage only)
- Drivers were at least four times more likely to have a crash when speaking on a phone
- No difference between hands-free and hand-held

100 car study

- Large-scale instrumented car study collecting pre-crash and near-crash naturalistic driving data
- Data collection unobtrusive
 - Video, front and rear sensors, accelerometers, GPS, vehicle speed etc.
- Drivers used cars for their everyday driving (2m miles)
 - 82 crashes
 - 761 near crashes



100 car study

■ Findings

- 80% of crashes and 65% of near crashes involved driver inattention of some kind just before the event
- Visual inattention contributed to 93% of rear-end crashes
- In-car mobile devices associated with highest frequency of distraction for near crashes



Conclusion

- Data from real-world studies is also compelling
- **Large increases in the risk of crashing when using a phone**
- Hand-held and hands-free often not different, or not much different
- Phone use is an important source of distraction – distraction is bad!!!

Summary

Summary – mobile phone use increases collision risk!

- The theoretical arguments are clear
 - Cognitive psychology – interference/task switching effects
 - Distraction happens ‘in the head’ as well as ‘in the hands’
- The evidence base overall is compelling
 - Lab-based tasks (e.g. hazard anticipation)
 - Simulator driving
 - ‘Real-world driving’

Wait a minute, what about...?

Isn't talking on the phone just the same as talking to a passenger?

- No it is not - passengers in the car can stop talking when they perceive the road environment to be challenging
- Also they are more likely to understand when you stop talking to them (for example if you suddenly need to attend to the road)
- Research has shown that it is more demanding to have a conversation on the phone than with a passenger (and conversations on a phone tend to be less effective)



There are loads of other things that are distracting in cars (sat-navs, radios) – you are not saying we should ban those!

- Even tuning a radio is distracting to some degree
- The evidence suggests though that phone conversations are especially distracting AND can tend to last for longer periods of time than things like tuning a radio
- There are other activities that are even more distracting than talking on a phone (for example eating and drinking)
- But just because there are other things that are distracting, it does not make mobile phone use suddenly 'ok'



I am an experienced driver and I know when it is safe to use my phone!

- Even experienced drivers overestimate their abilities, and it has been shown that experienced drivers can sometimes be more affected by distractions – they lose the benefits of their experience by being distracted
- Even police pursuit drivers' driving skill has been shown to reduce when talking and driving at the same time. Indeed in emergency service driving it is standard protocol to give communications duties to the non-driver if possible, so that driving performance (and communication performance) is not impacted



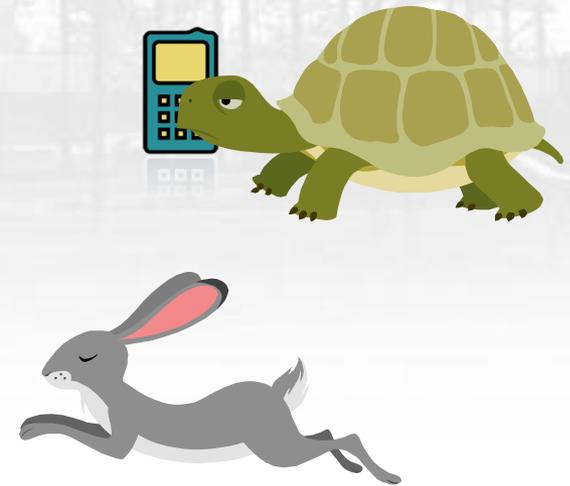
I do this every day and I have never had an accident.

- Nonetheless, your risk level does increase by at least four times according to the evidence
- Lots of drivers are not as lucky as you have been – the accident statistics and research evidence tell us this
- In addition, other aspects of your driving may suffer without you realising – for example you may be less aware of other drivers' actions and may make bad decisions
- Even if you do not crash, you may put others on the road in danger



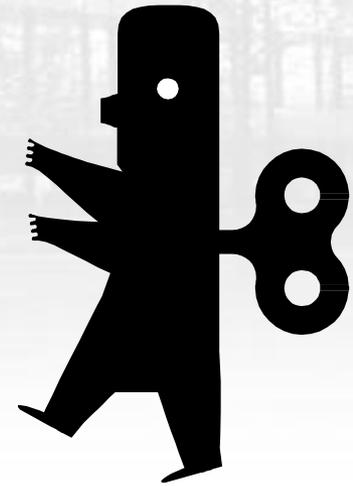
Surely I can just slow down when I talk on the phone?

- Even if you do, it is unlikely that you will completely offset the safety deficit
- In addition, you may make sudden changes in speed to which other drivers may find it difficult to react
- All drivers tend to overestimate their skill – you are unlikely to be able to know for sure if you are slowing down enough



Isn't driving 'automatic'?

- No it is not – this is a common misperception – for example the skill of 'reading the road' or 'hazard anticipation' has been shown to be especially badly affected by having a phone conversation – even in experienced drivers
- The bottom line is that whenever people do more than one thing at once, they inevitably perform one of those things (and often both of those things) worse than if they performed either task by itself



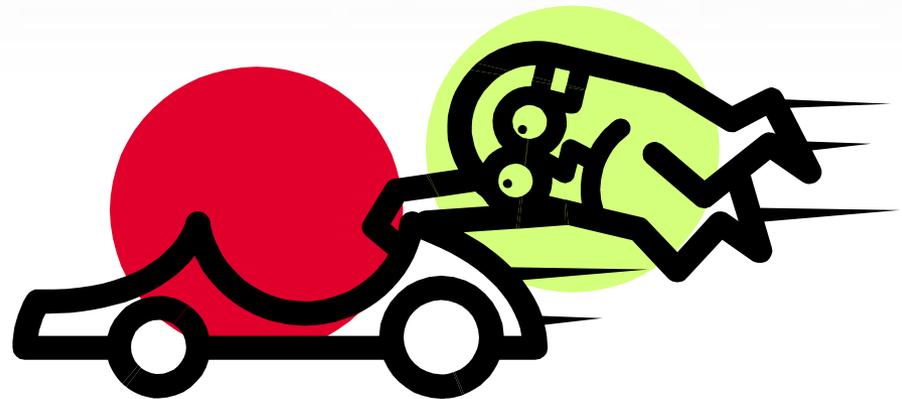
I need to use my phone for work!

- Companies who change their policy to move away from phone use while driving tend to do so on the basis of caring about the health and safety of employees; companies also have a legal obligation to reduce risk
- Many companies now accept that it looks more professional to have a workforce that does not use their phone while on the move
- And many companies have made this change successfully!



Many modern cars come 'phone-ready' – doesn't this indicate that it is acceptable?

- All modern cars also come 'speeding-ready' – they can all be driven quite easily at speeds far in excess of the speed limit!
- Conclusion – what a car is 'prepared' to do is not a good indicator of the safety of that behaviour



Hands-free phone use is not illegal – so why are we going ‘beyond the law’?

- Using a hands-free mobile phone or other equipment is not specifically prohibited in many countries because it is difficult for the police to see it in use and enforce
- However, driving poorly because you are distracted by using a mobile phone **can** result in the police charging you with failing to have proper control of your vehicle (handheld or hands-free)
- If you had a crash the police could check if you were using your phone (hands-free or handheld) at the time and may choose to prosecute you – you could be responsible for causing a crash and potentially injuring or killing another person



Thank You

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