



Driver Behaviour Issues relevant to Temporary Traffic Management solutions

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- ITS is one of the largest academic centres for transport studies in the world with 70 academic staff:

- ✓ Engineers
- ✓ Economists
- ✓ Geographers
- ✓ Statisticians
- ✓ Computer Scientists
- ✓ Psychologists



Interface between psychology and engineering



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- Safety and human factors aspects of new technologies
 - Effects of automating the driving task on awareness & workload
 - Development and testing of systems that support driving – e.g. adaptive systems



- But also more “traditional” driving problems such as:

Drivers' speed

Young (and elderly) drivers

Impairment (fatigue/alcohol)

Engineering solutions (Road layout and roadside features)



- Roads are designed by engineers, but are used by humans:
 - users often don't use systems/products in the way a designer intended them to
- Humans readily adapt to novel situations:
 - a clear advantage under most circumstances
- Humans are intelligent and aware of their intelligence:
 - but suffer from overestimation of their skills,
- Humans build up experience and skill over time:
 - but suffer from impairment (chronic and acute)

In fact we are so clever, we can even train.....

- [learn to drive a car in New Zealand.3gp](#)

- There is no significant increase in crash risk to road users when roadworks are present (DfT, 2004)
- Setting up TTM is regarded as one of the most dangerous activities for road workers. (Clark et al., 2011)
- Rear end crashes are the most frequent type of incident recorded at roadworks (Freeman et al., 2000)
 - Travelling too close to vehicle in front/too fast
 - Distraction/workload

- As professionals we know that effective speed management is necessary in order:
 - for road users to read signs,
 - act on instructions,
 - to ensure that barriers are suitable for speeds,
 - and to reduce the severity of crashes should they occur.
- Road users however can view speed management as being:
 - A revenue activity
 - Not applying to them personally
 - Not appropriate to the situation
 - An impediment to their progress



Advice v enforcement

- Advisory speed limits have been shown to be ineffective
- Many drivers perceive that advisory signal settings are inaccurate and over one third of drivers do not correctly understand the purpose of an advisory signal
- Time over distance (average speed) cameras tend to produce more stable speed reductions
- Variable speed limits have been trialled both by simulation and on-road and have been shown to actually reduce speed variance (hence reducing crash risk).

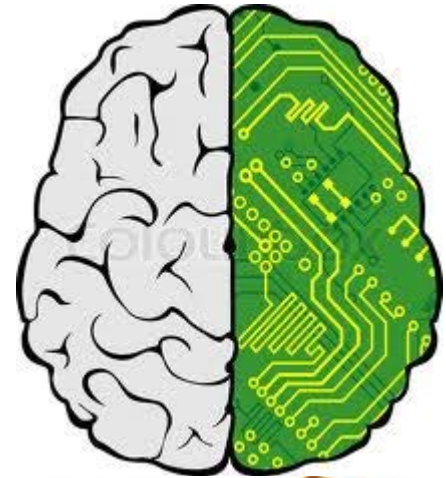
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Drivers as multitaskers

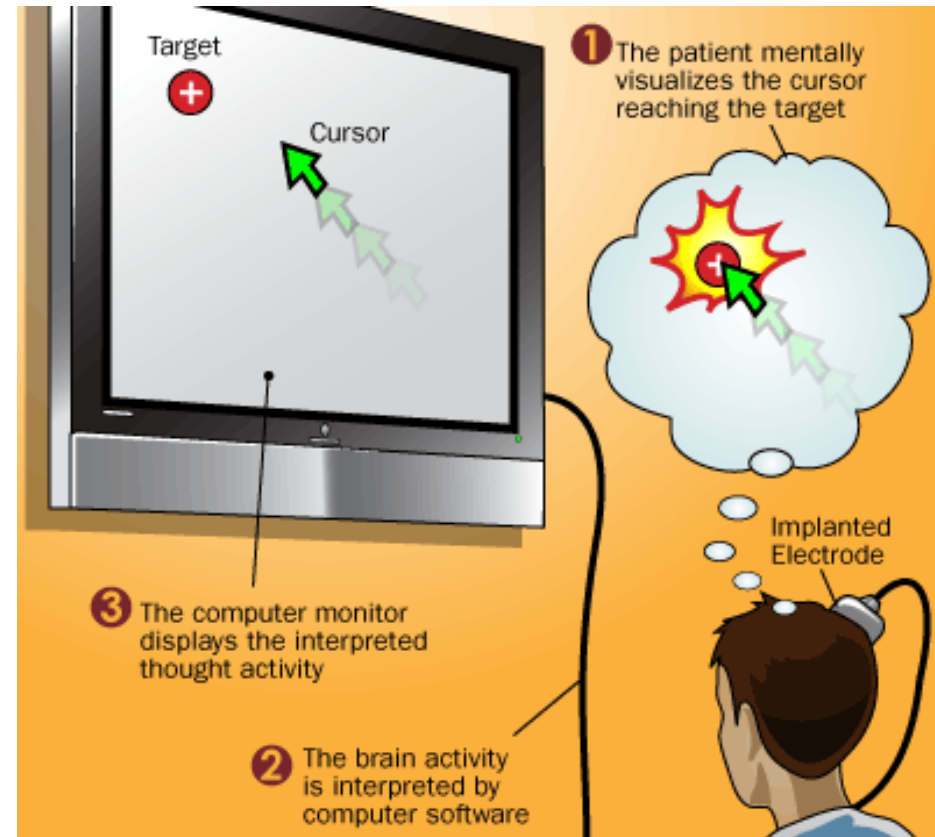
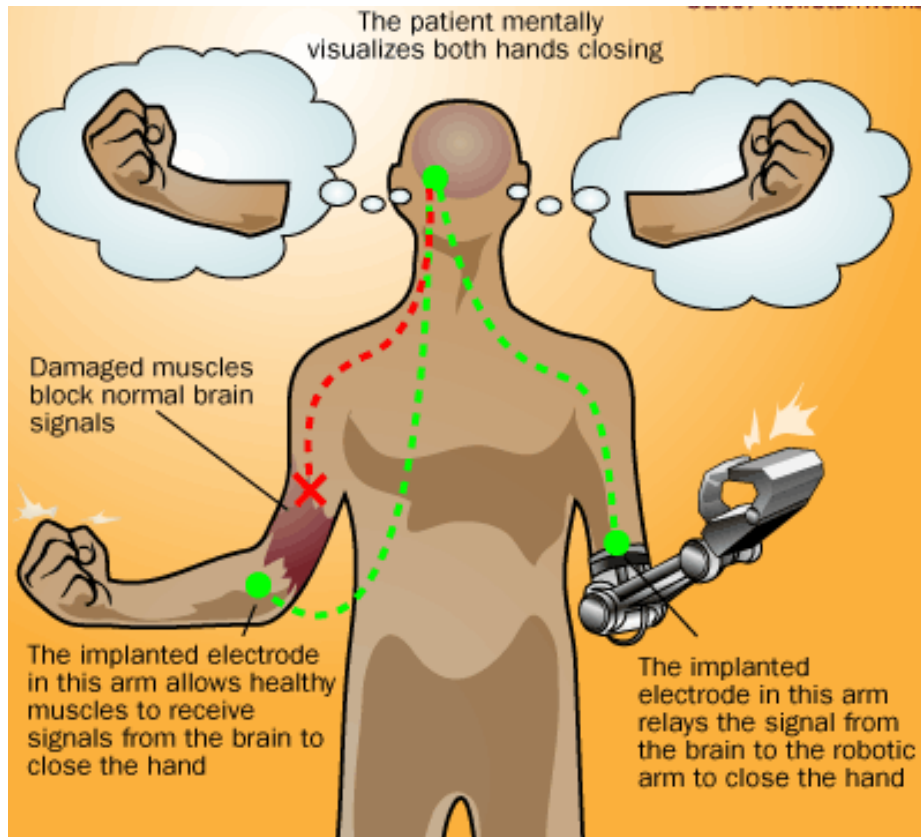


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- The term "multitasking" originated in the computer engineering industry.
- It refers to the ability of a computer to apparently process several tasks simultaneously
- Multitasking in single core computers actually involves time-sharing the processor; only one task can actually be active at a time, but tasks are rotated through many times a second.
- With multi-core computers, each core can perform a separate task simultaneously.



ITS



This interface, as yet, does not exist between a driver and their vehicle

- People show severe **interference** when even very simple tasks are performed at the same time
- Many researchers believe there to be a “**bottleneck**” that whereby the human brain can only perform one task at a time
- Multitasking has been described as a “mythical activity in which people believe they can perform two or more tasks simultaneously as effectively as one.”
- It is difficult to learn new information while engaging in multitasking.
 - Students using Facebook and text messaging while studying achieved poorer grades

Are some people better at multitasking than others?

- Recently, a study by British psychologist Professor Keith Laws was widely reported in the press to have provided the first evidence of female multitasking superiority. A formal research paper has yet to be published.
- In another study, females were found to perform better at coordinating a primary test with a secondary test, however, the authors concluded their tests may not reflect real life multitasking and that further research was required.
- The apparently advanced multitasking capabilities of the youngest generations of humans. No evidence to support this.

Multitasking – whats happening ?

- The brain cannot fully focus when multitasking,
 - takes longer to complete tasks
 - error rates increase
- The brain is forced to pause and refocus continuously
- Though the brain is complex and can perform a myriad of tasks, it cannot multitask well.

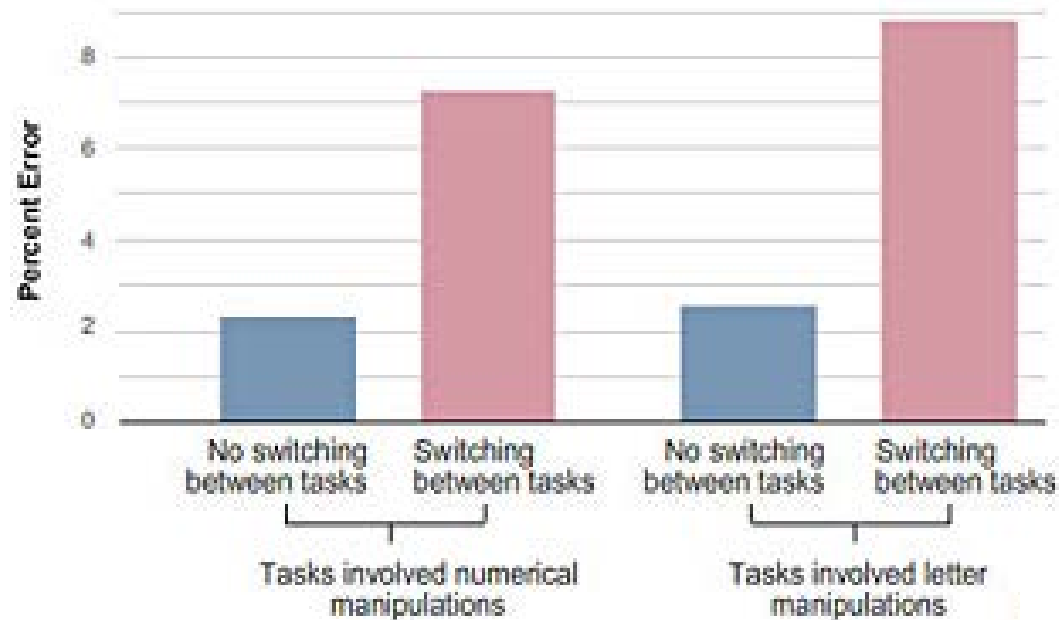
But we do multitask:

You can walk and talk

Breath and read

Pianists can play a piece with left and right hands simultaneously.

error percentages for
no-switching and switching activities





Attention matters

- The resource you “forcibly” deploy while, for example, attending a boring meeting
- This attentional ability is not capable of multitasking.



Transport for London challenged motorists to test their change blindness in a campaign designed to increase the safety of cyclists

[Test Your Awareness Whodunnit .3gp](#)



Change blindness

- People often fail to see a change in their surroundings because their attention is elsewhere.
- [The Door Study.3gp](#)

If you are concentrating on something, you can become blind to other events [that you would normally notice]. This "inattention blindness" has been suggested as a reason why motorists collide with cyclists.



Limits of human performance



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- Evolution made humans fit for:
 - adapting
 - Learning
 - But do we overestimate our skills?
- Humans are not evolved for :
 - moving at high speeds
 - controlling technology
- Combine the two.....



Driver Distraction and Crashes



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| Distraction source | % of drivers |
|-------------------------------|--------------|
| Outside person, object, event | 29% |
| Adjusting radio, CD | 11% |
| Passenger | 11% |
| Moving object ahead | 4% |
| Device brought into vehicle | 3% |
| Adjusting climate control | 3% |
| Eating or drinking | 2% |
| Using mobile phone | 1% |
| Smoking | 1% |
| Other | 26% |

(2002)

| Distraction source | % of drivers |
|------------------------|--------------|
| Music | 61% |
| Food and drink | 51% |
| Made/taken phone calls | 23% |
| Rubbernecking | 21% |
| Send a text message | 16% |
| Sleeping/dozing | 5% |
| Cosmetics | 5% |
| Updating Facebook | 2% |
| Tweeting | 1% |

(2010)



Types of distraction #1

- Visual:
 - driver's visual field is blocked by objects, e.g. stickers on the car's windscreen that prevent them from detecting or recognising hazards
 - driver neglects to look at the road and instead focuses on another visual target, such as an in-car route navigation system or billboard
 - loss of visual “attentiveness”, “looked, but did not see”, and interferes with ability to recognise hazards





Types of distraction #2

• Auditory Distraction

- Auditory distraction occurs when the driver momentarily or continually focuses their attention on sounds or auditory signals rather than on the road environment.
- Auditory distraction can occur when listening to the radio or when holding a conversation with a passenger, but is most pronounced when using a mobile phone



Top 5 Most Dangerous Driving Songs

“Hey Mama” by The Black Eyed Peas

“Dead on Arrival” by Fall Out Boy

“Paper Planes” by M.I.A

“Walkie Talkie Man” by Steriogram

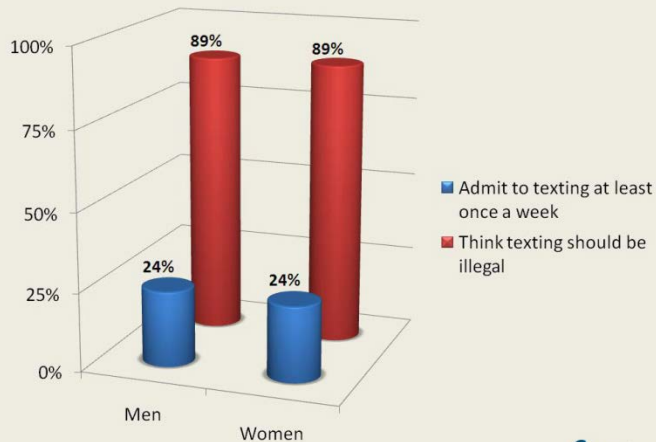
“Paradise City” by Guns N’ Roses

Types of distraction #3

- Biomechanical (Physical) Distraction

- occurs when drivers remove one or both hands from the steering wheel to physically manipulate an object instead of focusing on the physical tasks required to drive safely such as steering in the appropriate direction or changing gears
- Examples include tuning the radio, unwrapping food, passing objects to children behind

Who Texts While Driving?



Source: TeleNav, July 2010

Sample Size: 251 Male/251 Female U.S. Drivers





Types of distraction #4

- Cognitive Distraction

- Cognitive distraction includes any thoughts that absorb the driver's attention to the point where they are unable to navigate through the road network safely and their reaction time is reduced
- Talking on a mobile phone while driving is one of the most well documented forms of cognitive distraction, however it can also occur when trying to operate in-vehicle devices such as route navigation systems or talking to a passenger.
- Daydreaming and mindlessness are also noteworthy (How did I get here?)



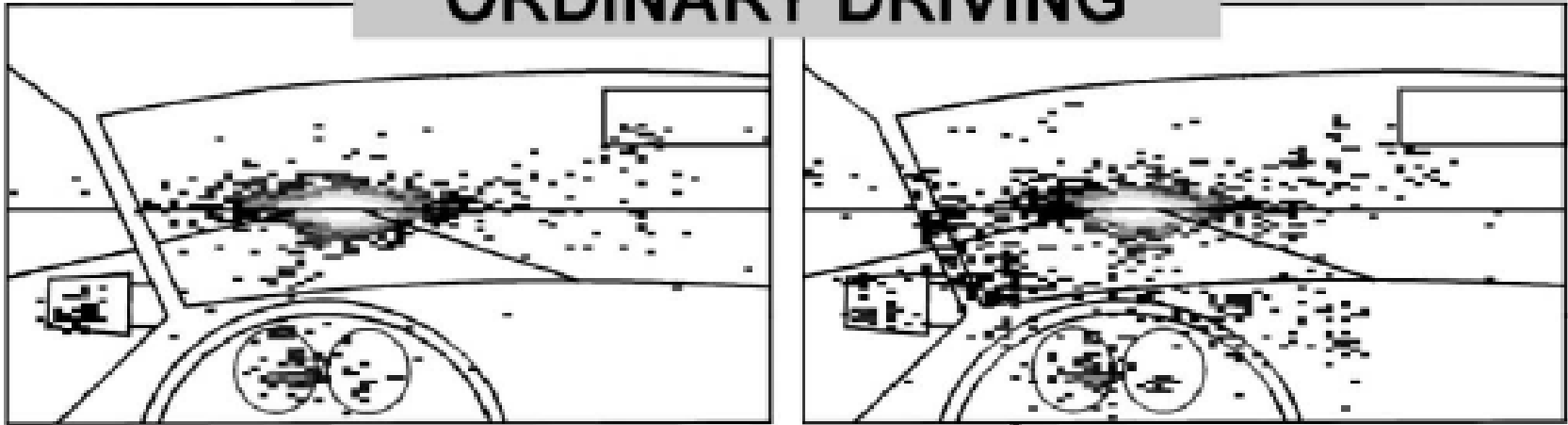
- Hands-free phones are no safer than hand-held ones.
- Can increase risk of being involved in a crash by 4 times.
- The physical and cognitive distraction impairs visual search patterns, reaction times, decision-making processes.
- Often involves associated tasks that may further distract the driver (writing down phone numbers etc)
- Sending text message more distracting than talking on mobile
- Talking on a mobile is more distracting than holding an intelligent conversation with a passenger, but no more distracting than eating a cheeseburger.

Spatial gaze (Nunes 2002)

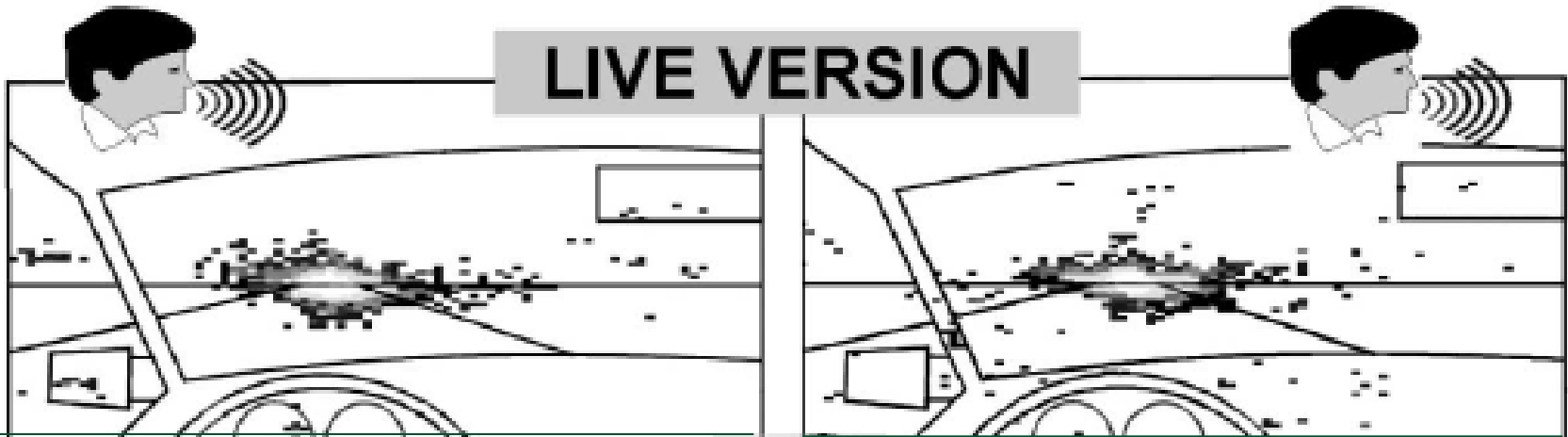


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ORDINARY DRIVING



LIVE VERSION



Consider the implications for a TTM environment...



When distracted, what happens to behaviour?



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- Drivers make greater lane position deviations and exceedences while using either a hand-held or hands-free mobile phone, even when driving on straight roads
- Drivers tend to display larger variations in driving speeds when using a mobile phone. In particular, drivers tend to reduce their speed when talking on a mobile phone
- Drivers' reactions to external events or objects are generally slower when using a mobile phone, particularly when engaging in a complex conversation.
- When using a mobile phone, drivers tend to accept shorter gaps in traffic when turning compared to when driving without using a phone

How does the risk of using a mobile phone compare with drink driving?



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- Research has been carried out that compares the risks of using a mobile phone in the car with drink driving
- This research shows that it is almost equally hazardous for a driver to use a mobile phone, as it is to drive with a 0.8‰ blood alcohol concentration.
- Although the risks are similar, the specific effects actually differ: while using the mobile phone, drivers mostly tend to drive more slowly, react more slowly to road signs and they fail to notice a considerably larger number of direction signs.



Who are we designing for?

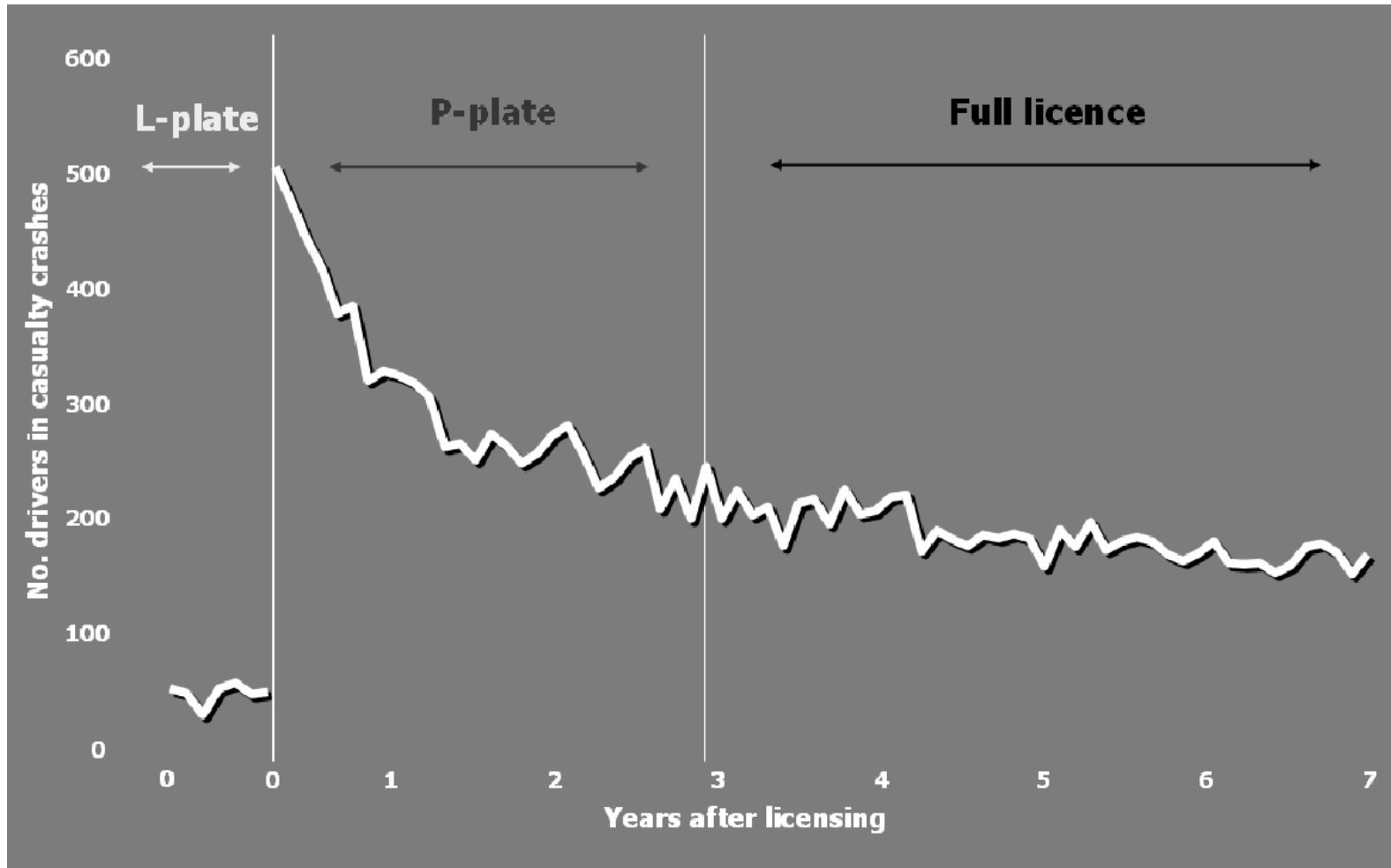
- From birth we all begin to lose brain cells. By the age of 80 your brain will occupy 15% less of the space within your skull.
- But our knowledge and repertoire of skills continues to grow
- ***connections between cells are reinforced***, leading to efficiencies in processing
- Hence we can do more with less as we age.



Role of experience in crash rate



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- i. Slower to detect hazards, and identify fewer hazards, particularly hazards that are located further away (Lee 2007).
- ii. Ability to manage workload across multiple tasks is poorer (Underwood 2007)
- iii. They allocate proportionately more attention to the forward view, paying less attention further ahead or to the sides or rear (Wikman et al 1998)
- iv. They pay more attention than they should to secondary tasks (e.g., Hosking et al 2009)
- v. They over-estimate their own ability (Twisk et al., 2007)

Model of novice driver behaviour



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Peer influence



Willingness to take risks

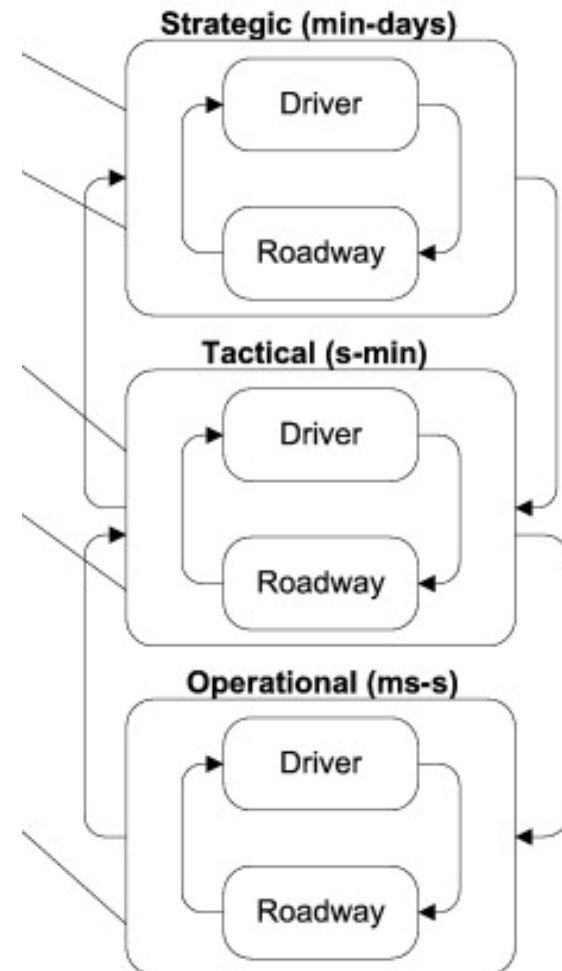
Poor hazard identification & anticipation



Overconfidence



Inadequate control skills



Older drivers



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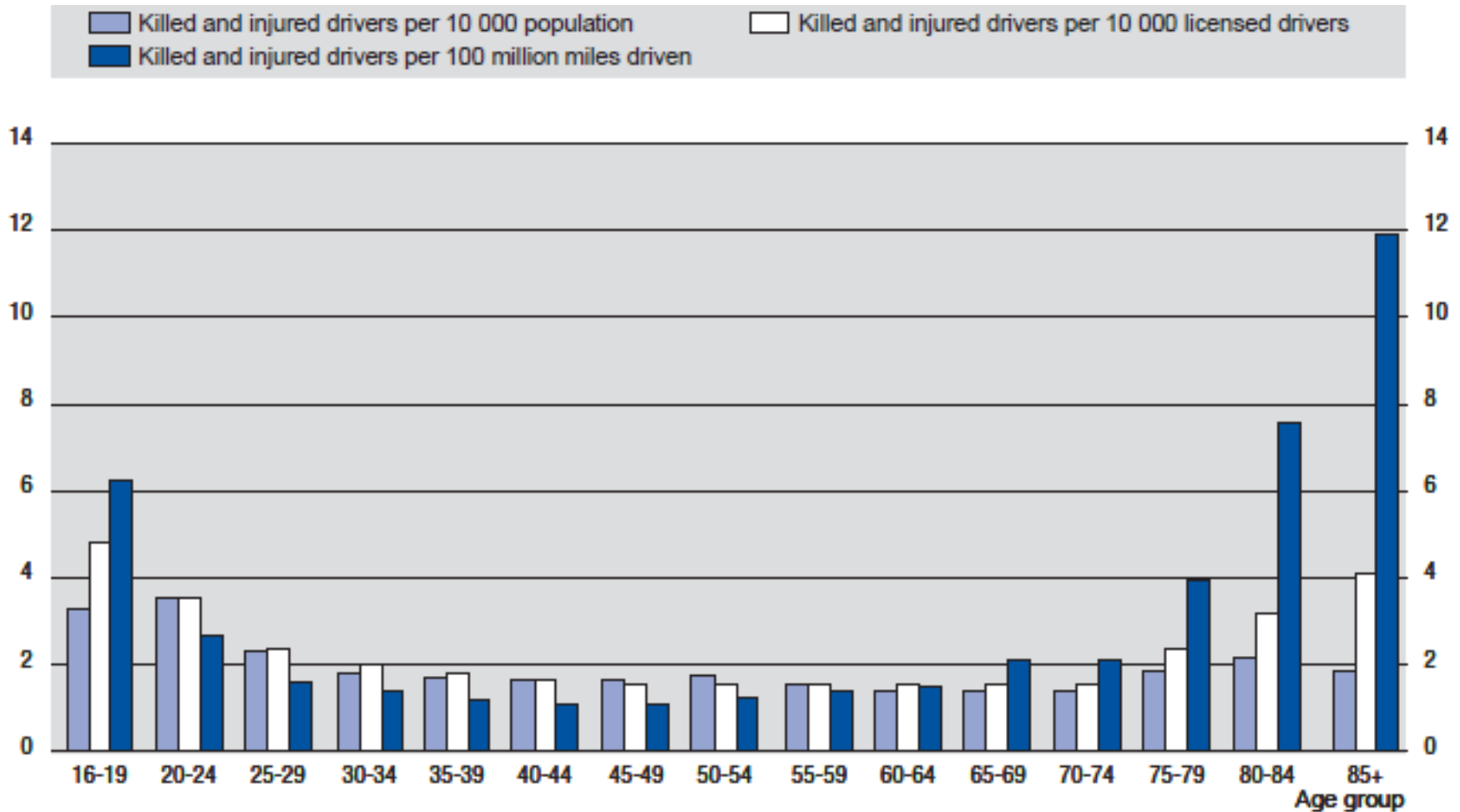
- i. With the aging of the population, it is also anticipated that there will be an increase in older drivers' licensing rates (Sivak & Schoettle, 2011).
- ii. Older drivers will be more mobile, travel more frequently, and greater distances (OECD, 2001)
- iii. Older drivers represent one of the highest risk categories for crashes involving serious injury and death per number of drivers and per distance travelled (OECD, 2001)



Age and accident involvement



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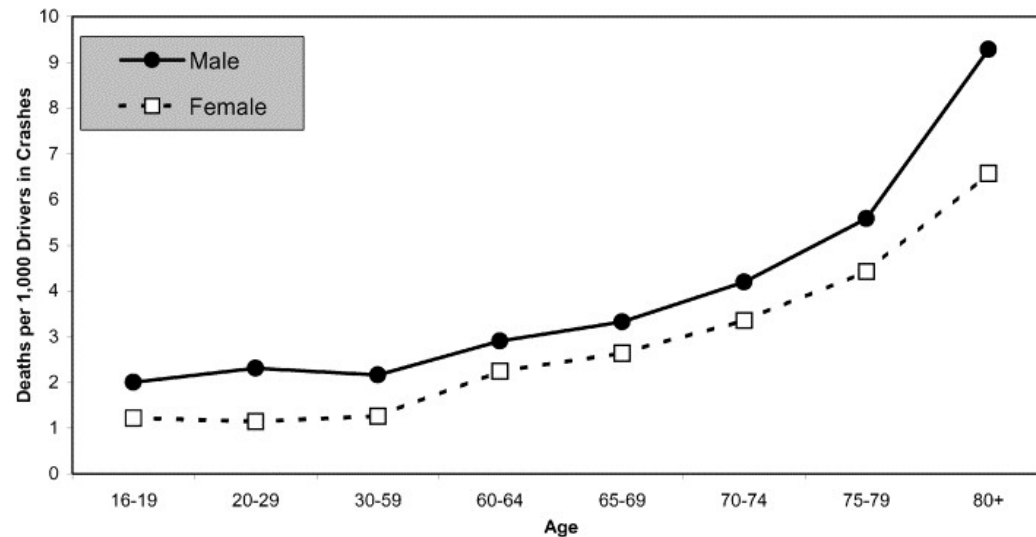


Source: FARS, National Highway Traffic Safety Administration, US Department of Transportation, 1999.

- The energy required to cause injury reduces as a person ages (Augenstein, 2001) primarily due to reductions in bone and neuromuscular strength and fracture tolerance
- Evans (2004) estimates, in crashes of equal severity, a 79-year-old man is 3.2 times more likely to die as a 32-year-old man



Li et al (2003) computed the role of frailty in older driver crashes and reported that older drivers' over representation in fatalities could be explained mainly by fragility.



Visual aging



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- i. lens becomes yellower, making discrimination of blue colours more difficult.
- ii. less light entering the eye reaches the photoreceptors.
- iii. the pupil shrinks, allowing less light to enter the eye.
- iv. At age 60, the amount of light reaching the photoreceptors is only 33% of the amount seen at age 20.



- Contrast Sensitivity decreases
- Light and Dark Adaptation
- Glare
- Restricted Field of View





Implications for TTM design

- Effective speed management (e.g. average speed cameras) should be policy (not pressure group) driven
- TTM scenarios should be stripped off superfluous and irrelevant signing
- Prior to entering TTM scenarios, timely reminders to not use mobile phones
- Signing should be accessible and comprehended by the majority, and the rising minority.



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By Mirror.co.uk | Comments | 26 May 2011 00:00

Attack of the cones: Drivers' three days a year stuck in roadworks

THEY drive even the most cool headed of us crazy.

Tweet 0 Like 0 Send

THEY drive even the most cool headed of us crazy.

Roadworks cost Britain's infuriated motorists three days a year in lost time, a survey yesterday revealed.

Traffic cones are everywhere you look - and all the signs are Britain is heading for gridlock.

An estimated three million holes are dug in our roads every year by more than 200 companies.

It causes eight out of 10 drivers to get stuck in roadworks every day and makes 70% of them late for work.

