55TH CIECA CONGRESS 23-26 MAY 2023 VIENNA

# “Is our current driving training and testing system ready for preparing all drivers (Novice as well as experienced) to drive autonomous features in modern cars?


## Dr Anuraj Varshney

Driving Mobility UK

# My presentation will consist of

- Current system for driver training & teaching
- Challenges posed by autonomous features in car for drivers - novice/experienced drivers and for those with medical conditions
- Current state of play for product penetration of autonomous vehicles (AV)
- Gaps in research and policy
- Potential solution

# Current Driver Training & Testing system
# Standards for safe driving

| | | |
|---|---|---|
| **Vision** | **Visuospatial perception** | **Attention & concentration** |
| **Memory** | **Insight & understanding** | **Judgement** |
| **Adaptive Strategies** | **Good Reaction time** | **Planning & Organisation** |
| **Ability to self- monitor** | **Sensation** | **Muscle power & Control** |
| **Co-ordination** | | |

**Source:** *DVLA*

# Current Driver Training & Testing system

UK, Germany: New learners have to pass two tests before they can drive unaccompanied on the road.

| Multiple choice Theoretical test : | Practical driving test on the road: |
| --- | --- |
| To test knowledge on highway code, traffic signs, essential driving skills & hazard perception ability | To test general driving ability in different roads and traffic conditions, ability to perform manoeuvres (Bay parking) and ability to follow directions using SATNAV |

*Source:* (GOV.UK, 2017).

# Current Driver Training & Testing system

In the United States, Canada, New Zealand and Australia, a graduated driver's licence programme (GDL) is used.

3 stage learning process:

| A learning phase: | An Intermediate phase: drive unaccompanied | A full unrestricted driving licence |
|---|---|---|
| a minimum number of supervised practical driving lessons on the road | but only in low-risk situations (e.g. not at night or with teenage passengers) | |

(Shope, 2007; Williams, 2017).

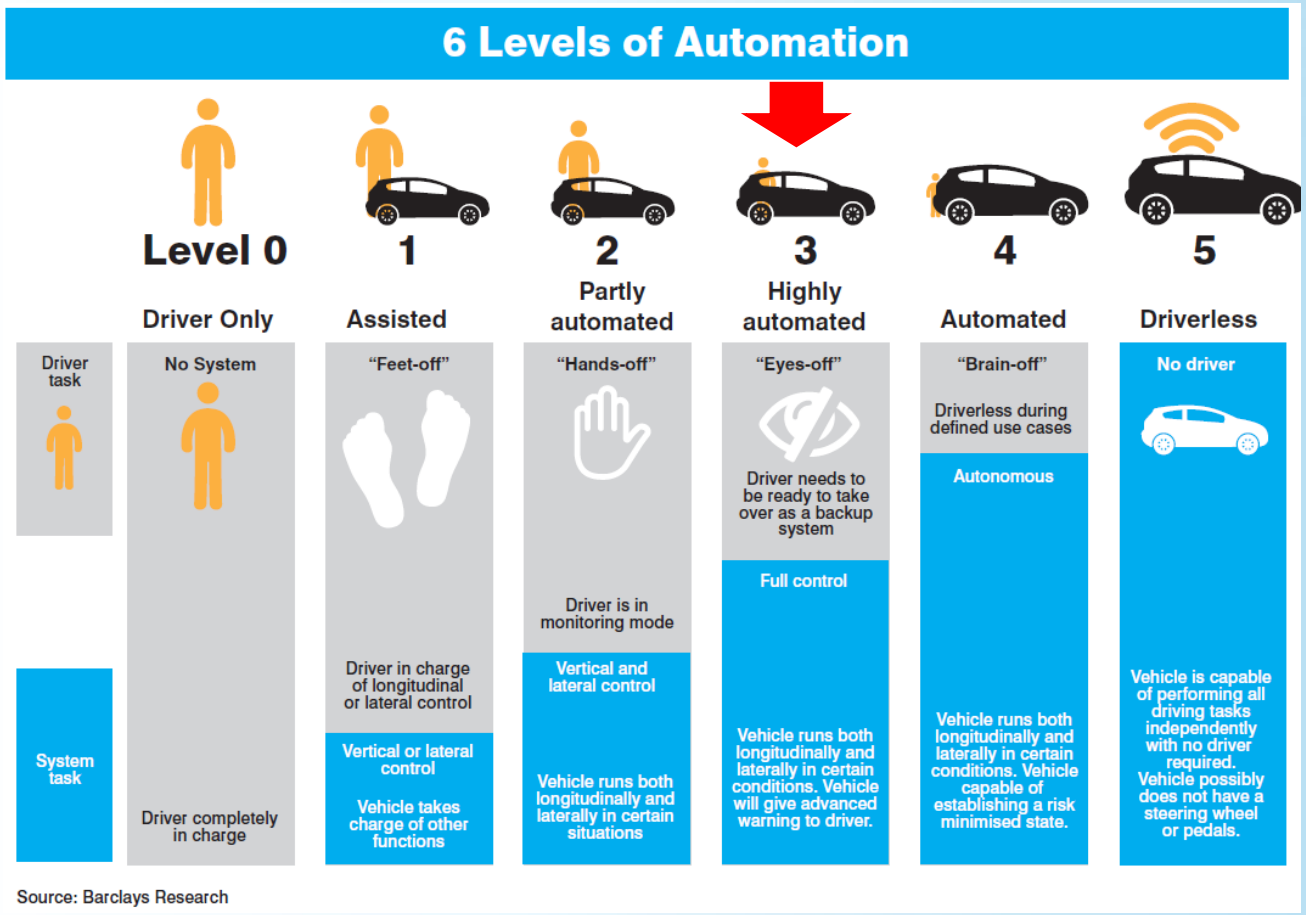
# Current system

Points for consideration

Advanced driver training courses (Pass Plus)
Defensive driving courses optional.

Most drivers pass their test at 17-18 years and rarely do any further driver training throughout their driving career (DfT, 2020)

# Challenges with Autonomous cars




Drivers will have to :

- Have a greater situational awareness of the road environment
- Attend to more hazards/risks in the environment
- See these hazards earlier

Merriman et al (2021)

# Challenge posed by AVs for all drivers Incl.older drivers and their varied needs

## Challenges of AVs for Existing Drivers with no underlying medical conditions

- Increase **mental workload** and **reduce situational awareness** of the road environment (Endsley,2017,2019)
- Degrade **driving skills** and **impair** ability to **TOR** when required (Bainbridge, 1983, Parusaman,2000)

## Challenges of AVs for Older Drivers

- Visual scanning declines with age (Circelli et.al, 2013, Muller –Oehring et.al, 2013)
- Decline in executive functioning can lead to reduction in speed to process visual information when switching between two aspects of driving
- (Knoefel et.al. 2019)

# Potential Challenge for Drivers with Dementia with use of AVs

- Fail to **adapt** their decision-making strategies to the situation in hand, leading to higher frequencies of **random decisions** (Paire-Ficout et.al,2016)
- AD patients showed **poorer performance** in making turns across the flow of traffic, (Paire-Ficout et.al,2016)
- Drivers with dementia are cognitively **slower** than healthy older people (Tuokko, H., et.al,1995) (Kent, R., et.al, 2005)

"A 'U' shaped curve may exist whereby young drivers display **lower situational awareness** compared to mature drivers, and senior drivers decline in situation awareness when experience is no longer able to **compensate for neurodegeneration."** (Scott-Parker et.al, 2018)

# Service user's perspective

- In a poll of 500 car owners of vehicles less than two years old,  68%  claimed they struggle to get to grips with everything.
- Features such as sports mode, electronic handbrakes, and autonomous emergency braking makes drivers feel a little uneasy.

Source: New research finds modern car features overwhelming for drivers - Driver Trainer

# Service user's perspective

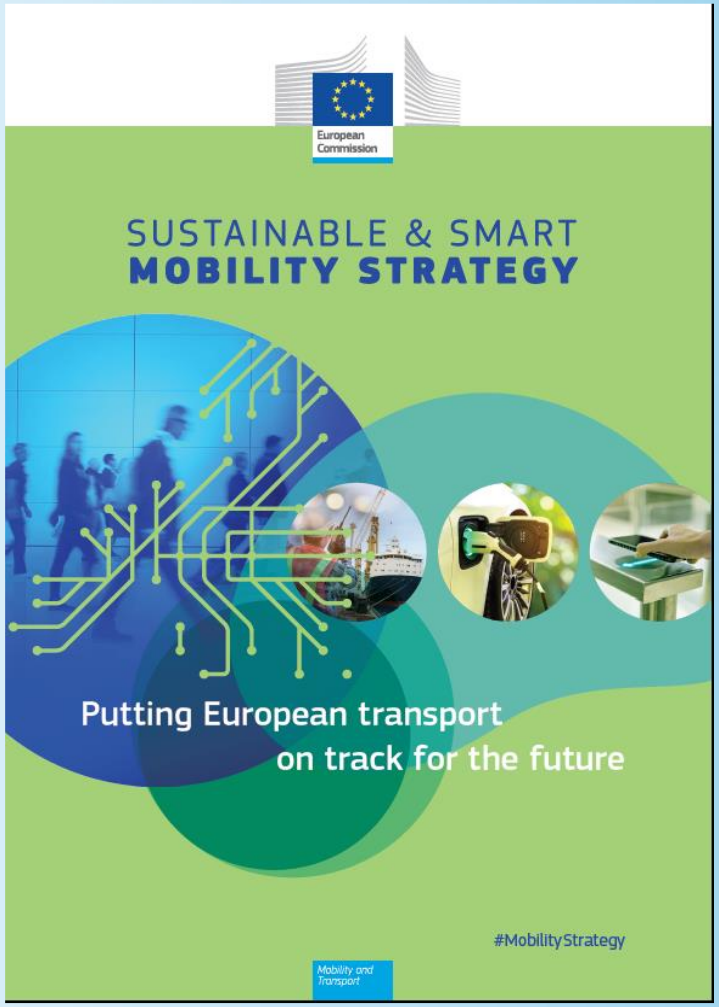
Top 20 pieces of technology in car that baffle modern car owners

| | | | | |
|---|---|---|---|---|
| Cruise Control | Lane assist | Electronic handbrakes | Voice activation / recognition | Automatic boot |
| Assisted Parking | Assisted breaking | Sat-Nav | Blind Spot detection | Blind spot alert |
| Bluetooth connection | Fog lights switch locations | Heated Steering wheels | Remote engine starting | Massage seats |
| Sports Mode | Wireless smartphone connectivity /charging | Climate control | Reverse parking camera | 360-degree camera |

Source: New research finds modern car features overwhelming for drivers - Driver Trainer

55TH CIECA CONGRESS 23-26 MAY 2023 VIENNA

# Horizon Gazing


# Suggestions from Literature

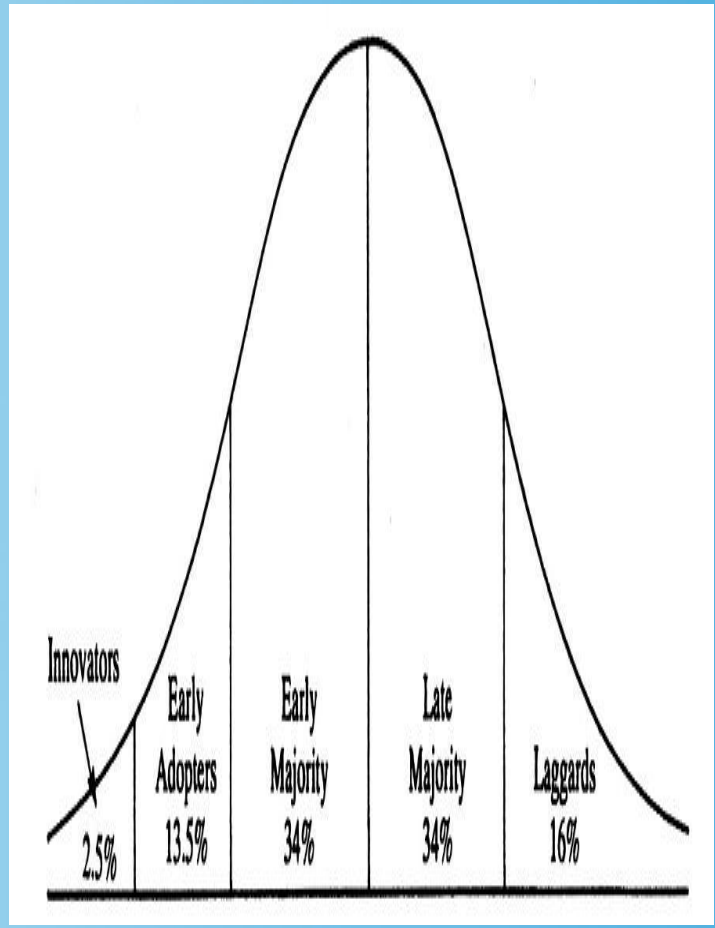
Future Training will need to consider following for all drivers

Drivers need to understand

- The capabilities and limitations of the automation,
- How the automation works,
- What their job is whilst automations being engaged,
- How to activate and deactivate the automation and how to perform a takeover request.

If Training solution to be implemented effectively, mandatory driver training will need to be enforced

Merriman et al (2021)




**Innovativeness and adopter categories**

55 TH CIECA CONGRESS
23-26 MAY 2023
VIENNA


Dr ANURAJ VARSHNEY
CONSULTANT PRACTITIONER/HEAD OF SERVICE
South East Drive*Ability* (S.E.D.),
Kent Community Health *NHS* Foundation Trust
Strategic Director of Research, Education & Innovation for Driving Mobility
Email: anuraj.varshney@nhs.net
P0091894@brookes.ac.uk (For Driving Mobility & Oxford Brookes University job related)
Website: www.kentcht.nhs.uk/sed
Driving Mobility website: http://www.drivingmobility.org.uk/

# References/Bibliography


- Varshney, A. (2020). The experiences of older drivers in adopting new technologies in cars: an exploratory study. (Doctoral dissertation). University of Chester, United Kingdom.
- Haghzare, S., Stasiulis, E., Delfi, G., Mohamud, H., Rapoport, M. J., Naglie, G., ... & Campos, J. L. (2022). *Automated Vehicles for People With Dementia: A "Tremendous Potential" That "Has Ways to go"—Reports of a Qualitative Study.* The Gerontologist.
- Knoefel, F., Wallace, B., Goubran, R., Sabra, I., & Marshall, S. (2019). Semi-autonomous vehicles as a cognitive assistive device for older adults. *Geriatrics*, *4*(4), 63.
- Merriman, S. E., Plant, K. L., Revell, K. M., & Stanton, N. A. (2021). Challenges for automated vehicle driver training: A thematic analysis from manual and automated driving. *Transportation research part F: traffic psychology and behaviour*, *76*, 238-268.
- Gandolfi, J. (2020). Supporting older driver mobility and effective self- regulation. *Royal Automobile Club Foundation for Motoring Ltd*.
- Kaltenegger, A., safe Implementation traffic of modern technologies into road – KFV (Austrian Road Safety Board) code of conduct: 51st CIECA Congress TBILISI, 4.6.2019
- Harmon,A.C.(2020) Dementia and Driving: Helping Caregivers Connect Clues and Prepare for Loved Ones' Driving Cessation; https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiyg73994b9AhWm_bsIHZXHAFkQFnoECBEQAQ&url=https%3A%2F%2Fwww.slu.edu%2Fmedicine%2Ffamily-medicine%2Fcenter-counseling-family-therapy%2Fdriving-and-dementia.pdf&usg=AOvVaw1VnmZveCimFVZHGrTMTQXW

# References/Bibliography


- **Connected and automated Mobility 2025**:https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAIQw7AJahcKEwiw6v3QpuX-AhUAAAAAHQAAAAAQAg&url=https%3A%2F%2Fassets.publishing.service.gov.uk%2Fgovernment%2Fuploads%2Fsystem%2Fuploads%2Fattachment_data%2Ffile%2F1099178%2Fcam-2025-realising-benefits-self-driving-vehicles-print.pdf&psig=AOvVaw2F8X61phgfjatoHP1IcUUt&ust=1683620859700468
- **European Commission Proposes updated requirements for driving licences** https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAIQw7AJahcKEwig-omFqOX-AhUAAAAAHQAAAAAQAg&url=https%3A%2F%2Ftransport.ec.europa.eu%2Fnews%2Feuropean-commission-proposes-updated-requirements-driving-licences-and-better-cross-border-2023-03-01_en&psig=AOvVaw2B3oMFf9qYK3Ety-pzlich&ust=1683621193933605
- **Sustainable and Smart Mobility strategy:** https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAIQw7AJahcKEwio17vCqOX-AhUAAAAAHQAAAAAQAg&url=https%3A%2F%2Fec.europa.eu%2Finfo%2Flaw%2Fbetter-regulation%2Fhave-your-say%2Finitiatives%2F12438-Sustainable-and-Smart-Mobility-Strategy&psig=AOvVaw2ZOEpwGK5l1FFmNPvxkbN6&ust=1683621366965698