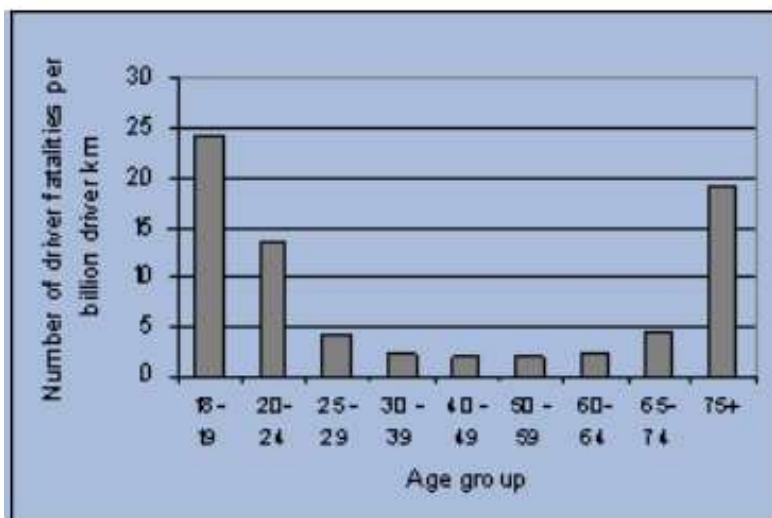


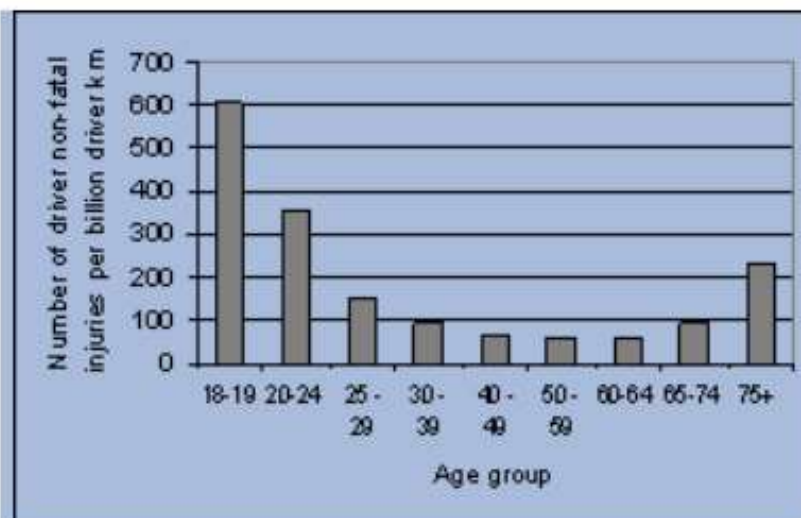
Situation awareness in simulation as a surrogate measure of road safety of older drivers

Dr Bridie Scott-Parker,
Senior Research Fellow

Older driver road safety

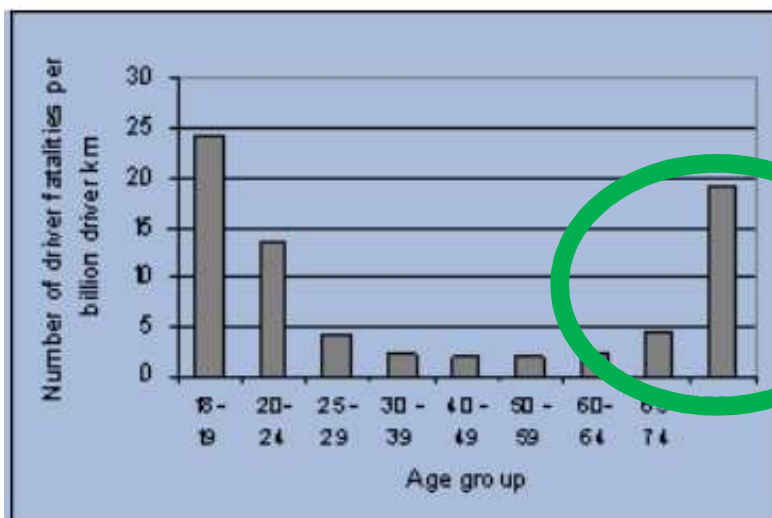


Fatality rate: traffic fatalities per billion kilometres travelled by age, Netherlands (2001-2005). Source: SWOV/Transport Research Centre, CBS.

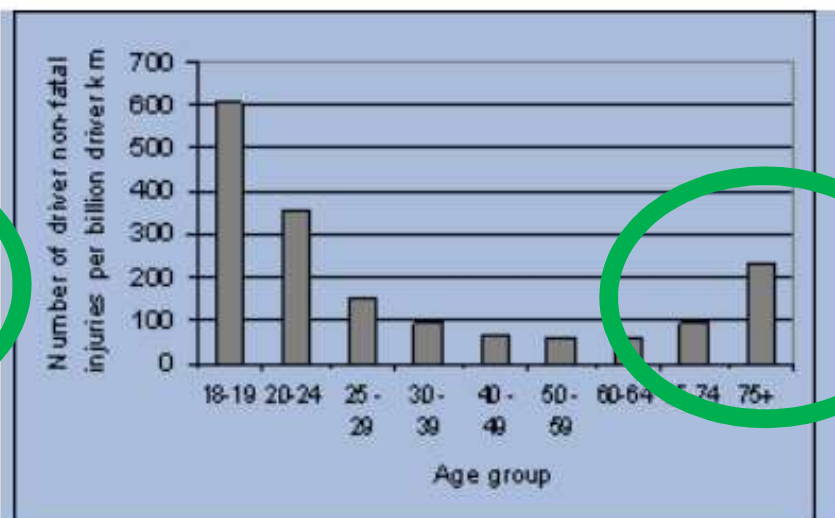


Injury rate: non-fatal traffic injuries per billion kilometres travelled, by age, Netherlands (2001-2005). Source: SWOV/Transport Research Centre, CBS.

Older driver road safety



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Ageing population.....

Ageing and Health

#yearsahead

Populations are getting older



2015



World Health
Organization

<http://www.who.int/ageing/events/world-report-2015-launch/populations-are-getting-older-full.gif>

Ageing population.....

- **HUGE** interest in road safety skills
 - 80% of older driver crashes involve death of vehicle occupant (vs 66%)
 - Queensland, Australia 2015, drivers >74 years
 - 5.5% of licensed population
 - 14.4% of fatalities
 - Involved in 12.8% of road crash fatalities

Ageing population.....

- How do we manage road risks?
 - Mandatory testing (e.g., in Australia)
 - New South Wales: Annual medical testing from age 75
 - Queensland: Medical certificate from 75 years
 - Nominated/voluntary testing
 - On-road driving assessment
 - Self-regulation
 - High-risk exposure (e.g., driving at night, driving in rain)
 - Mandatory removal of driving privileges

Ageing population.....

- Situation awareness skills (SAS) are critical for safe road use

Situation awareness

- What is it?

Knowing what is going on around you

- 1. Perception***
- 2. Comprehension***
- 3. Projection***

Situation awareness

- What is it?

Knowing what is going on around you

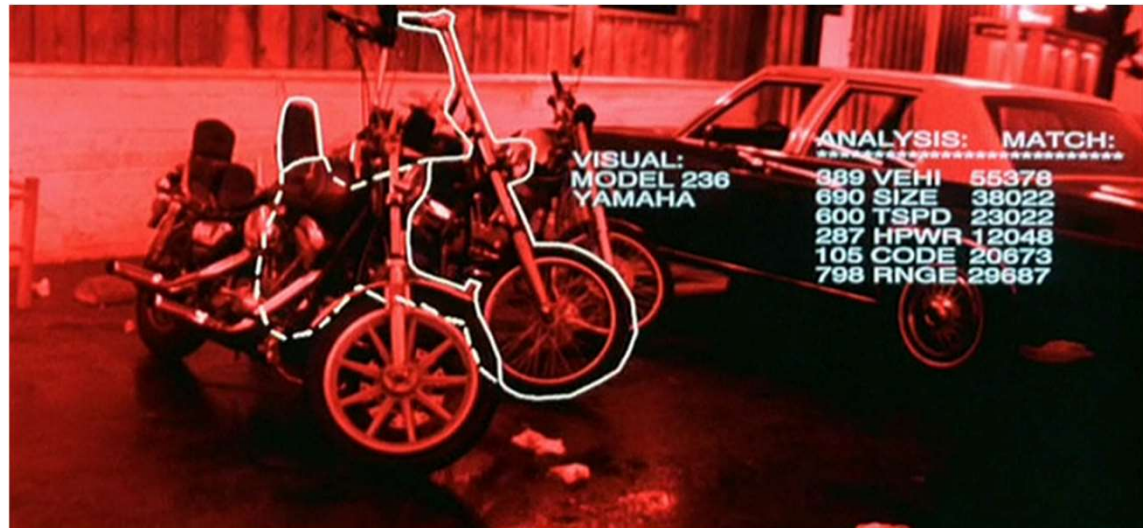
1. Perception

2. Comprehension

3. Projection

- Situation awareness skills are directly related to road safety

Situation Awareness Skills



Older driver road safety

- Situation awareness skills?
 - Related to driving exposure
 - Time spent driving
 - Distance driven
 - Driving contexts
 - Personal circumstances
 - But what about ageing-related factors.....

Older driver road safety

- Ageing-related factors
 - Normal declines and deficits
 - Slower reaction times
 - Increased frailty

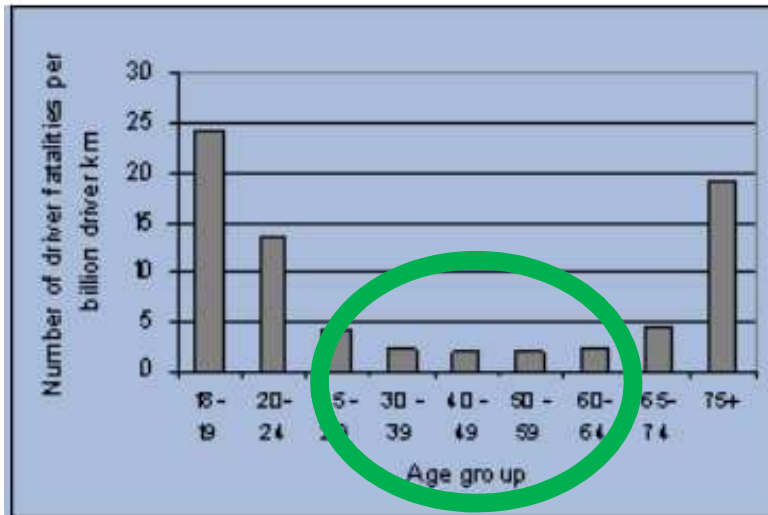
Older driver road safety

- Ageing-related factors
 - Normal declines and deficits
 - Slower reaction times
 - Increased frailty
 - Abnormal declines and deficits
 - Disease (e.g., dementia)
 - Disability (e.g., brain injury)

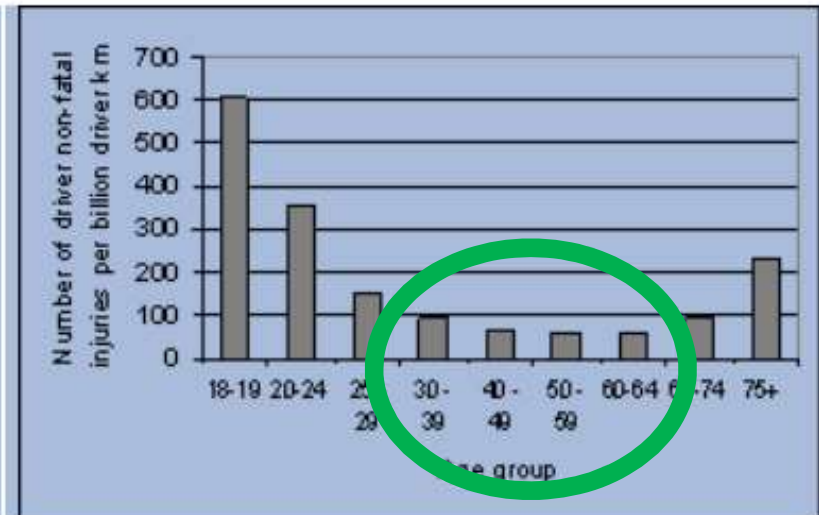
Study aim

- Explore situation awareness skills of older drivers
- Compare their SAS to the SAS of middle-aged drivers

Middle-aged driver road safety



Fatality rate: traffic fatalities per billion kilometres travelled by age, Netherlands (2001-2005). Source: SWOV/Transport Research Centre, CBS.



Injury rate: non-fatal traffic injuries per billion kilometres travelled, by age, Netherlands (2001-2005). Source: SWOV/Transport Research Centre, CBS.

http://ec.europa.eu/transport/wcm/road_safety/erso/knowledge/Content/07_old/high_fatality_rate_more_crashes_or_more_severe_injuries_.htm

Measuring situation awareness skills: *Immerse* cave simulator



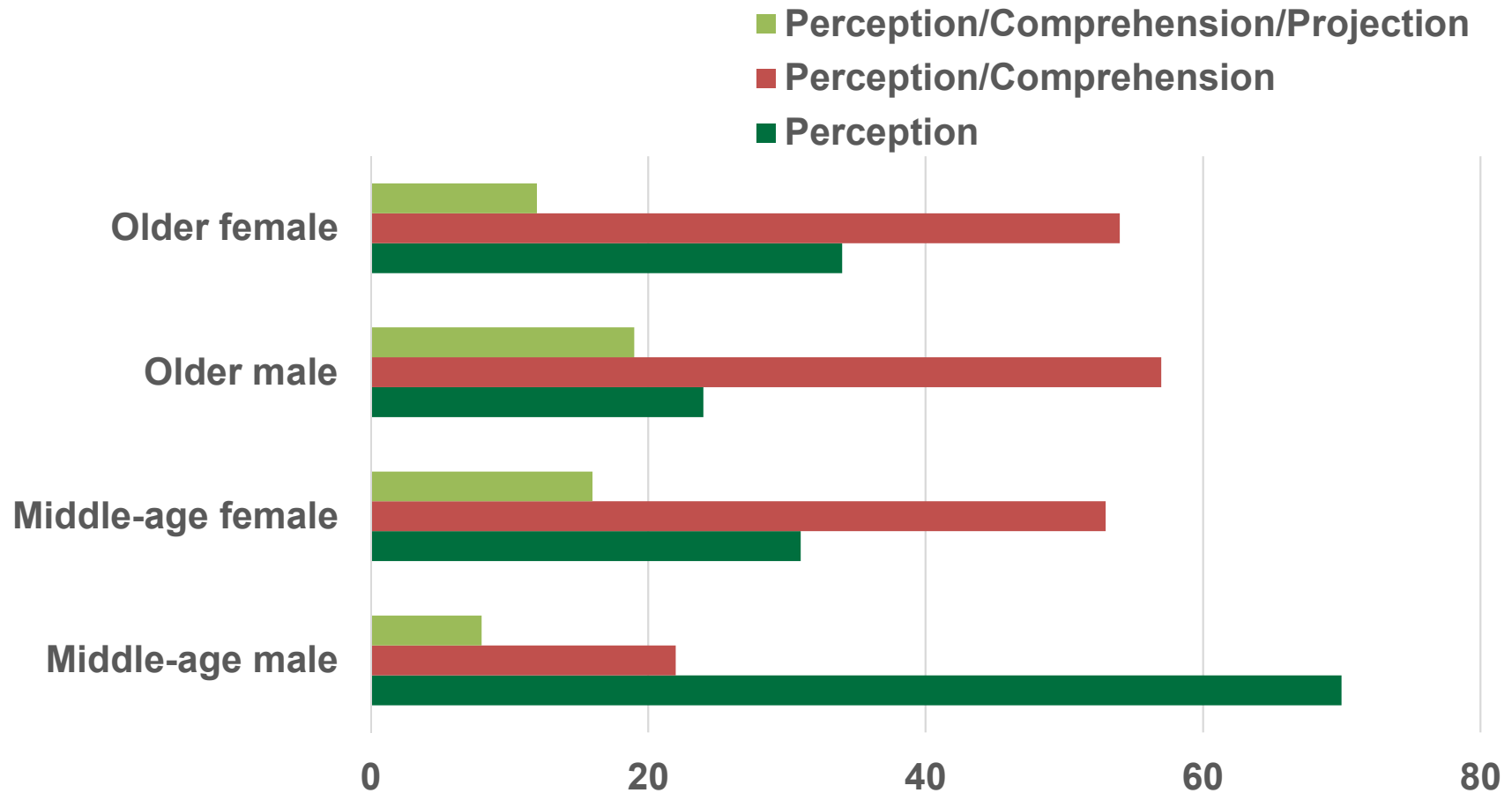
Method

- Verbal commentary
 - Transcribed verbatim
 - Cleaned
 - 12 drivers aged 75-84 years (7 males)
 - 12 drivers aged 43-62 years (7 males)
- Day-time driving clip
- 76.7 second clip (merging, motorway, highway)
- Situation awareness skills coding taxonomy
 - 2 independent coders
 - 1 tie-breaker

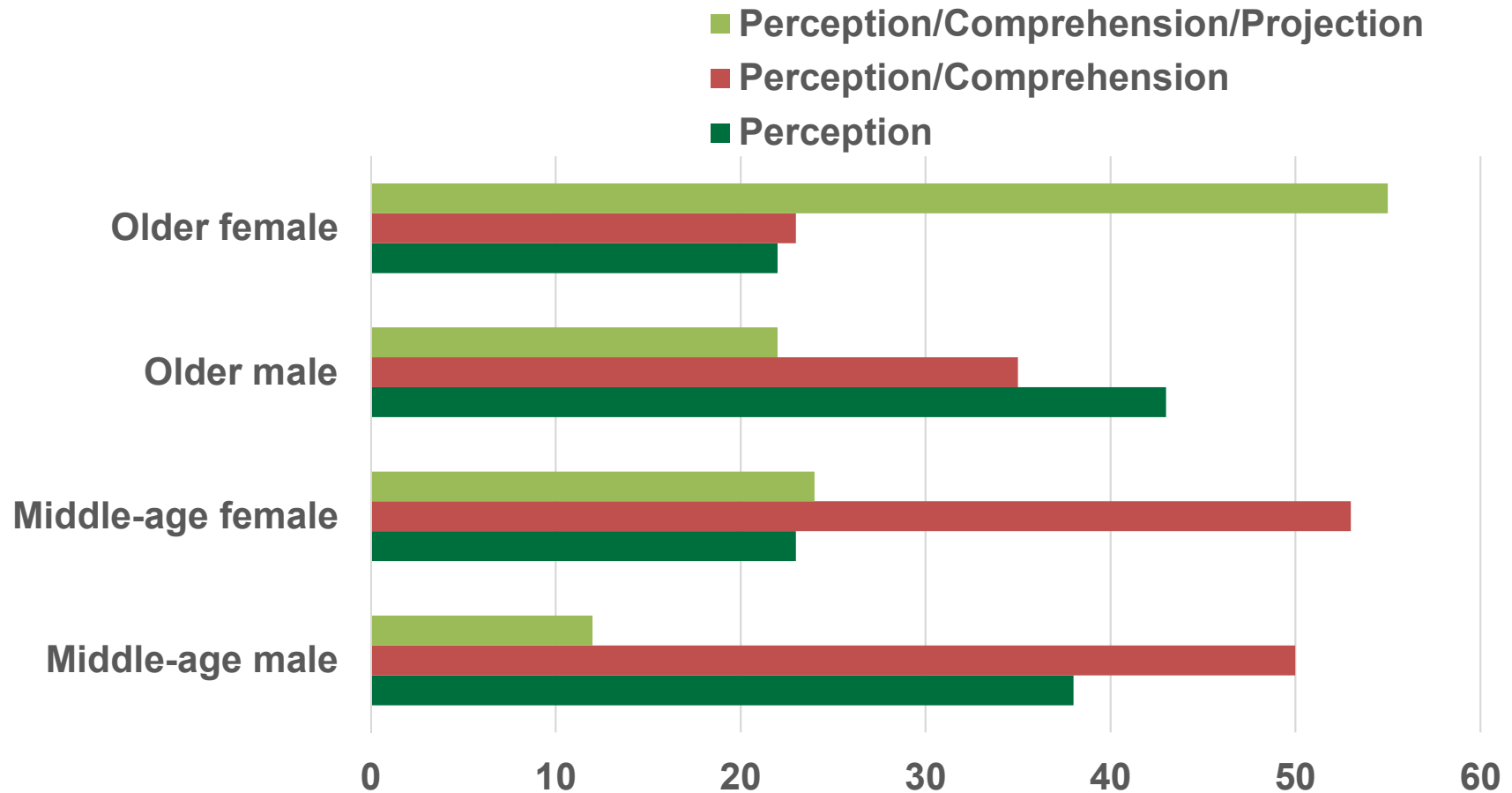
Data coding

- SAS coding taxonomy (Endsley, 1995)
 - Perception
 - *Green signs; 100 k zone*
 - Perception/comprehension
 - *Big sign about entering the motorway*
 - Perception/comprehension/projection
 - *We can turn at any time but we need to take care that nothing's coming up on my right*

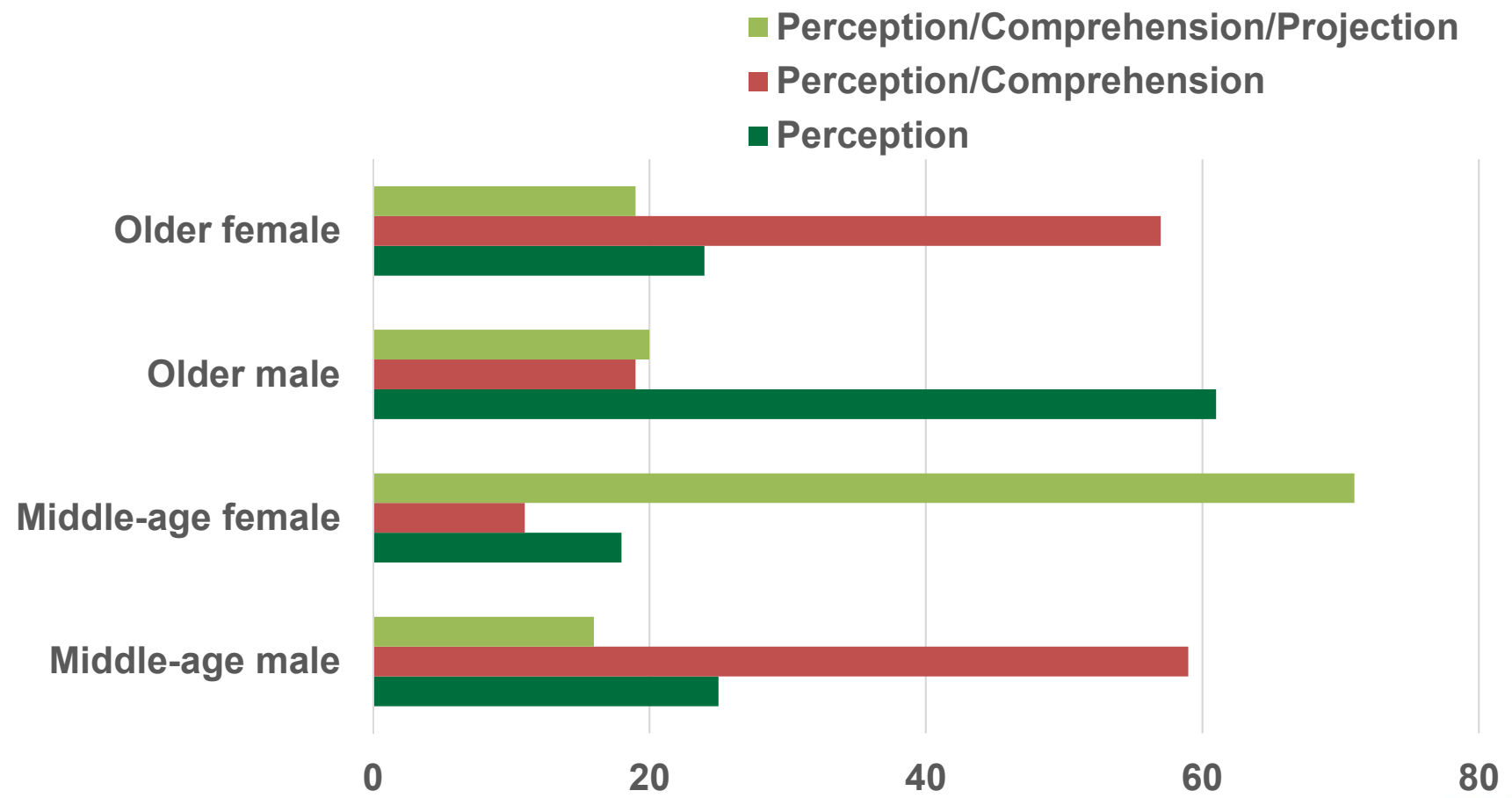
Results: **Left turn** (%)



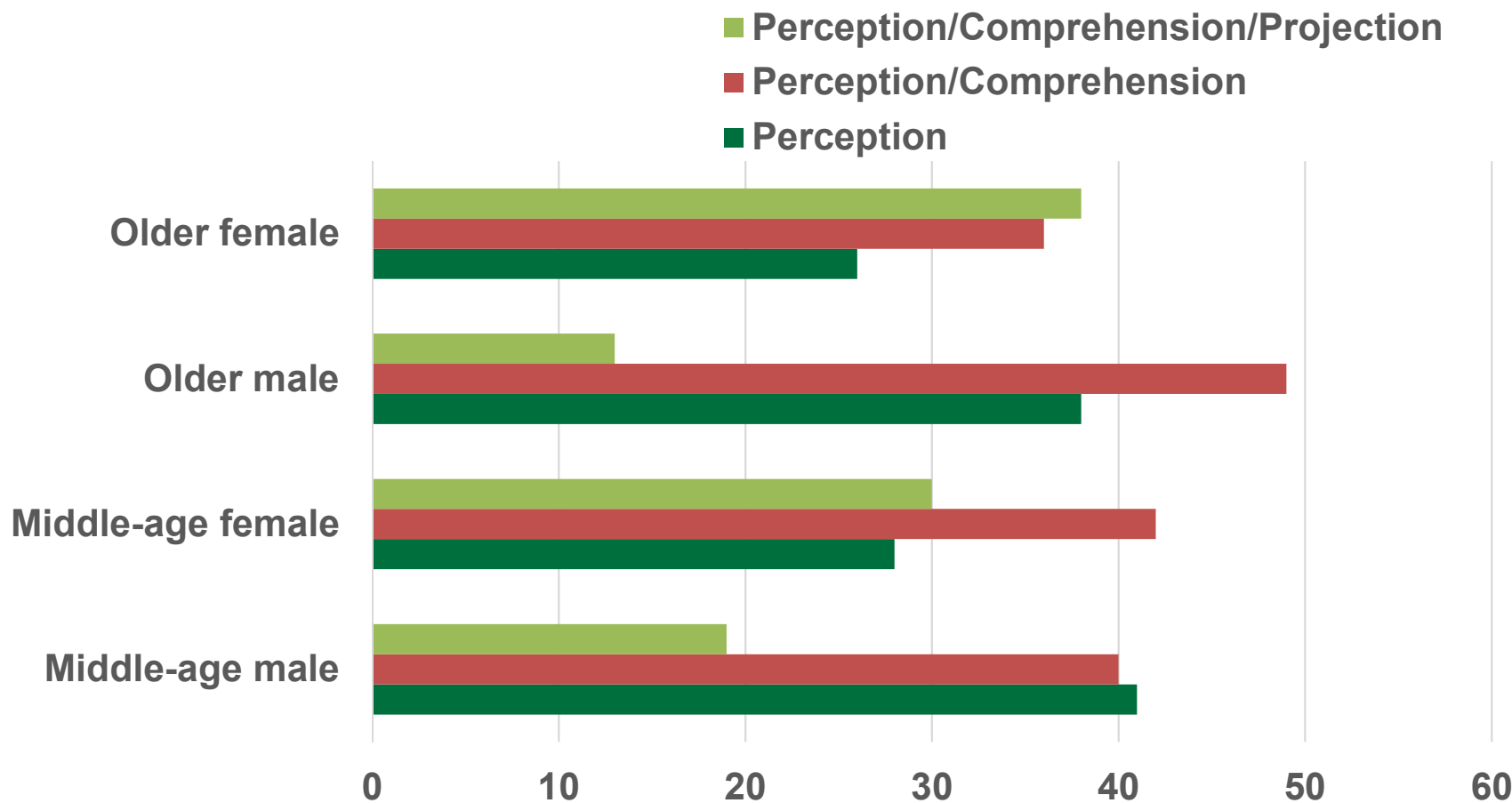
Results: Motorway ramp (%)



Results: Motorway merge (%)



Results: Highway merge (%)



But is it that simple?

- **Results:** Older female drivers have the greatest situation awareness skills
 - Does this match the age-related crash statistics?
- In-depth investigation of commentary
 - Considerable differences in SAS
- Middle aged males **ONLY** participant group to mention
 - Checking adjacent lane
 - Keeping a safe distance
 - Looking for a gap in traffic
 - Increasing safe following distance as increase speed during merge

But is it that simple....

- SAS for males of both age groups differ considerably to females
 - Males make a greater number of observations
- SAS for females of both age groups differ considerable to males
 - Females used more general language across P/PC/PCP (not as detailed as male commentary)
 - *Okay, I've merged, same speed as the rest of the traffic*

Musings.....

- Simulator
 - Provided safe and comfortable environment to explore road behavior
 - Use real-world footage capture by GoPro
 - Less anxiety for participants
- Need to balance mobility and safety
 - Social justice?
 - Mental health
 - Active longevity

Musings.....

- Assessing on-road road safety risk isn't straightforward
 - Does higher proportions of PCP (eg., older females on the motorway ramp) mask deficits in PCP (eg., less detailed/complete commentary in all categories)
 - Older females typically passengers of older males
 - No need to develop PCP?
 - » attention, etc....
 - Fewer words uttered by females – does this mean SAS deficits?

Musings.....

- Does the simulated drive approximate the real world drive (greater cognitive load etc)
 - SAS in simulator related to real-world risks?
- Identification of objects/risk (perception) is a precursor to comprehension, which is a precursor to projection
 - Do we need PCP all the time?
 - Are there occasions when P, or PC, is sufficient?
 - How does P scaffold PC, and how does PC scaffold PCP?
- Can we build PC and PCP in older drivers?
 - SAFER-Senior (Situation Awareness Fast tracking including identifying Escape Routes, for senior drivers)

Questions?



Dr Bridie Scott-Parker
bscottpa@usc.edu.au

Adolescent Risk Research Unit
<http://www.usc.edu.au/arru>

Consortium of Adolescent Road Safety
www.cadrosa.org

Dr Bridie Facebook
<https://www.facebook.com/DrBridie>

Dr Bridie Twitter
https://twitter.com/Dr_Bridie