DESIGNING A USER-CENTRIC OLDER DRIVER SUPPORT SYSTEM: A CASE FOR UNIVERSAL DESIGN TO SUPPORT ALL VULNERABLE DRIVER GROUPS

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Older Driver Risks

• The US population 65 years and older is expected to increase from 13.5% in 2012 to 20% in 2030 \[^{2,3}\]

• Older drivers represent:
  – 2\textsuperscript{nd} highest injury and fatality rate per 10,000 licensed drivers (next to teenage drivers)
  – 1\textsuperscript{st} in fatalities per 100 million miles driven \[^{1,4}\]

• Older drivers (75+ years) are represented in a relatively low percent of total US crashes (~3%), but account for nearly 11% of driver deaths \[^{10}\]
Older Driver Crash Involvement

Figure 1. FARS National fatal passenger vehicle driver crash involvements per 100 million vehicle miles traveled by age group, 2008 [9].
Older Driver Risks

• Disproportionate fatality risk is linked to:
  – Normal declines in information processing [5]
  – Decreased visual search abilities [6]
  – Declined physical factors and maladaptive behavioral factors:
    • Failure to yield [7]
    • Lower seatbelt use [7]
    • Overall fragility [8, 10]
Addressing Older Driver Needs

- **Study Purpose**: adapt the Teen Driver Support System (TDSS) smartphone application into an Older Driver Support System
  - Carefully the needs and limitations of an aging drivers.
- Advanced in-vehicle sensing and warning systems are well-positioned to offer tailored support for older drivers
  - Iterative design and testing to determine user requirements
- **Study Results**:
  - Older drivers can best be supported with a universally designed system, created to address the needs and risks of all drivers: Not specifically targeted for older drivers.
Universal Design

• “The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.”  –*Mace (1997; 11)*

• Re-examining older driver shared risks
  – Novices also have poorer information processing and visual search strategies \[^{12}\]
  – Rural drivers are also less likely to wear seatbelts \[^{13}\]
  – Both older drivers and novice drivers inaccurately judge their own hazard detection skills \[^{14}\]
Talking with Older Drivers

• Focus Groups:
  – Tech-Savvy Older Drivers
    • Rejected ODSS premise
    • Did not want a system catered for their age group
    • Resisted notion of needing support in 10 years time
    • **Wanted system for ALL Drivers**
  – Non-tech Savvy Older Drivers
    • Far more accepting of system
    • Open to use
Recommending System Changes

- Teen Driver Support System (TDSS)
  - Smartphone-based software & hardware package that provides in-vehicle feedback to teens about potentially unsafe driving behaviors
    - Excessive maneuvers (braking, acceleration, turning)
    - Speeding
    - Advanced Curve Notifications
    - Stop sign violations
Adapting the TDSS to Older Drivers

- In-depth interviews with older drivers and experts
  - Recommended modifications to interface icons to provide additional contextual information (i.e., current speed limit and upcoming speed limit), under-speed feedback

- Tested interface in driving simulator
  - Recorded user feedback

- Results:
  - Drivers reported lower than expected mental workload and distraction from system
  - Additional contextual information felt like overkill
  - Under-speeding feedback went unnoticed
Universal Design

• Final recommendations for adapting the teen system for older drivers revealed few to no significant necessary changes

• Outcome: Create a universal platform of the TDSS to serve all drivers
  – RoadCoach
  – Increase buy-in of all age groups to use the system

DRIVERS OF ALL AGES ARE AT RISK ON OUR ROADS
References

Thank you!

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