

# AAA Foundation for Traffic Safety

## FACT SHEET

### Measuring Cognitive Distraction in the Automobile III: A Comparison of Ten 2015 In-Vehicle Information Systems

#### Objective

- The objective of this research was to examine the impact of IVIS (*in-vehicle information systems*) interactions on the driver's cognitive workload.

#### Methods

- The selected tasks and experimental structure were designed to extend prior work using embedded vehicle systems:
  - Evaluated cognitive demands of 10 2015 vehicles' IVIS
    - 257 subjects participated; 127 males and 130 females, with an average age of 44 and divided into three age categories: young (21-34), middle aged (35-53) and old (54-70).
    - 6 distinct tasks were given to participants utilizing the vehicles' unique voice activated information system – including contact calling, number dialing, and music selection while they were driving.
    - Post-test evaluation captured participants' results after a week of practice time with the tasks in the research vehicle.
    - Cognitive workload was assessed on a 5-point scale, where 1 represented just driving (no interaction with IVIS) and 5 represented the workload associated with the OSPAN task (mentally challenging math and memory tasks).

#### Key Findings

##### Major Findings:

- (IVIS) use is associated with moderate to high levels of cognitive distraction for the driver.
  - Overall workload ratings associated with IVIS interactions ranged from 2.37 to 4.58, which depicts a moderate to high level of cognitive workload – while drivers were at no time required to take their eyes off the road or hands off the wheel.

2015 Vehicles and Systems Tested		
Make	Model	IVIS
Chrysler	200c	Uconnect
Chevy	Malibu	MyLink
Chevy	Equinox	MyLink
Mazda	6	Connect
Ford	Taurus	MyFord Touch
Hyundai	Sonata	Blue Link
Toyota	4Runner	Entune
Buick	LaCrosse	IntelliLink
Nissan	Altima	NissanConnect
Volkswagen	Passat	Car-Net

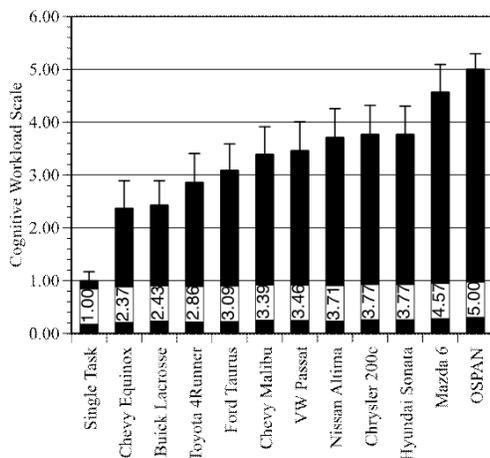


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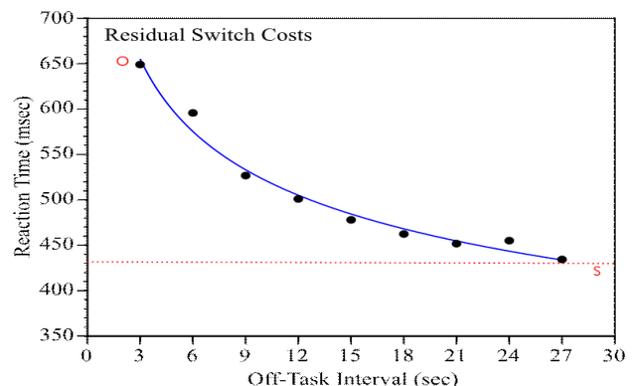


## Key Findings (continued)

- Practice doesn't eliminate the cognitive distraction caused by IVIS interactions.
  - Practice improved IVIS interactions slightly, but intuitiveness and complexity ratings were not affected as a result of practice.
- Older drivers experience a higher level of cognitive distraction with IVIS interactions, compared to younger and middle-aged drivers.
  - Older adults also rated IVIS interactions as more complex than the two younger groups.
- There were considerable differences in the cognitive workload of the different IVIS systems
  - Chevy Equinox *MyLink* had the lowest rating, while the Mazda 6's *Connect* had the highest rating on the cognitive workload scale.
  - Robust, intuitive systems with lower levels of complexity and shorter task durations result in less cognitive distraction.
- Cognitive distraction associated with task performance was surprisingly high
  - Serves as a warning that "hands-free" technologies can be very cognitively demanding.
  - Compared to our earlier research, many of the IVIS interactions appear to be significantly more demanding than typical cell phone conversations (rated 2.3 on the same scale).
- There were residual costs after IVIS interactions were over.
  - Just because a driver terminates a call or music selection doesn't mean they are no longer impaired – impairment lingered up to 27 seconds after a task was completed.



**Figure 17.** The cognitive workload scale for the IVIS interactions compared to single-task (category 1) and OSPAN (category 5). Error bars reflect the standard error around the point estimate.



**Figure 6.** Residual switch costs in transitioning from on-task to off-task performance. Residual switch costs were significantly different from the single-task baseline up to 27 seconds after the on-task interval had terminated.

For more information on this study and the AAA Foundation's other traffic safety research and materials, please visit [AAAFoundation.org](http://AAAFoundation.org).

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