

Driver Distraction and Cognitive Load

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Auto-UI CLW

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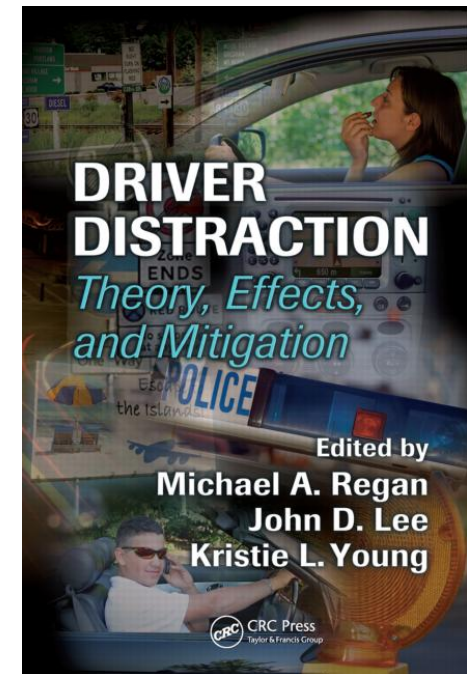
What is Driver Distraction?



Multiple Definitions Exist with Little Agreement Among the Scientific Community

“Driver distraction is the diversion of attention away from activities critical for safe driving toward a competing activity, *which may result in insufficient or no attention to activities critical for safe driving.*”

Based on Regan et al. (2011, p. 1776) as amended at Toyota CSRC Driver Distraction Definitions Workshop March, 2012



Sources of Distraction

- Cognitive
- Auditory
- Vocal /Verbal
- Visual
- Motoric
- Somatosensory/Vestibular
- Smell
- Taste



Source: Toyota CSRC Driver Distraction Definitions Workshop March, 2012

Cognitive Workload

- Cognitive
- Auditory
- Vocal / Verbal
- Visual
- Motoric
- Somatosensory / Vestibular
- Smell
- Taste



Three categories often grouped together in simplified discussions of “cognitive workload” but have different neurological underpinnings and potential effects on attention and behavior

Source: Toyota CSRC Driver Distraction Definitions Workshop March, 2012

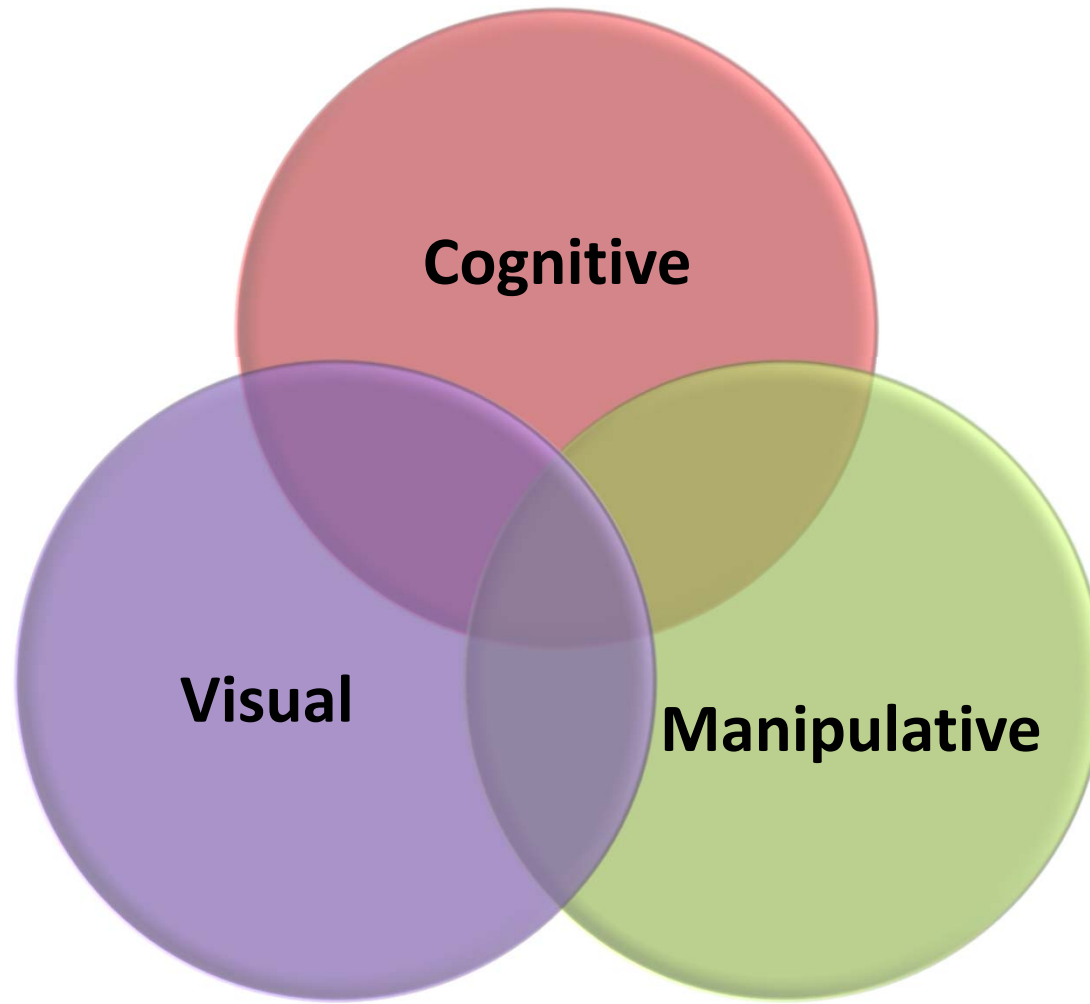
The MIT n-back

An Evolving International Procedure for Grading Cognitive Workload

- Series of 10 single digit numbers (0-9) presented in random order aurally at 2.25 sec intervals
- Subject instructed to respond with n^{th} digit back
- Across levels
 - Auditory demands constant
 - Vocal demands “relatively” constant
- Aims to manipulate secondary cognitive demand

Stimulus	6 9 1 7 0 8 4
0-back Response	6 9 1 7 0 8 4
1-back Response	. 6 9 1 7 0 8
2-back Response	. . 6 9 1 7 0

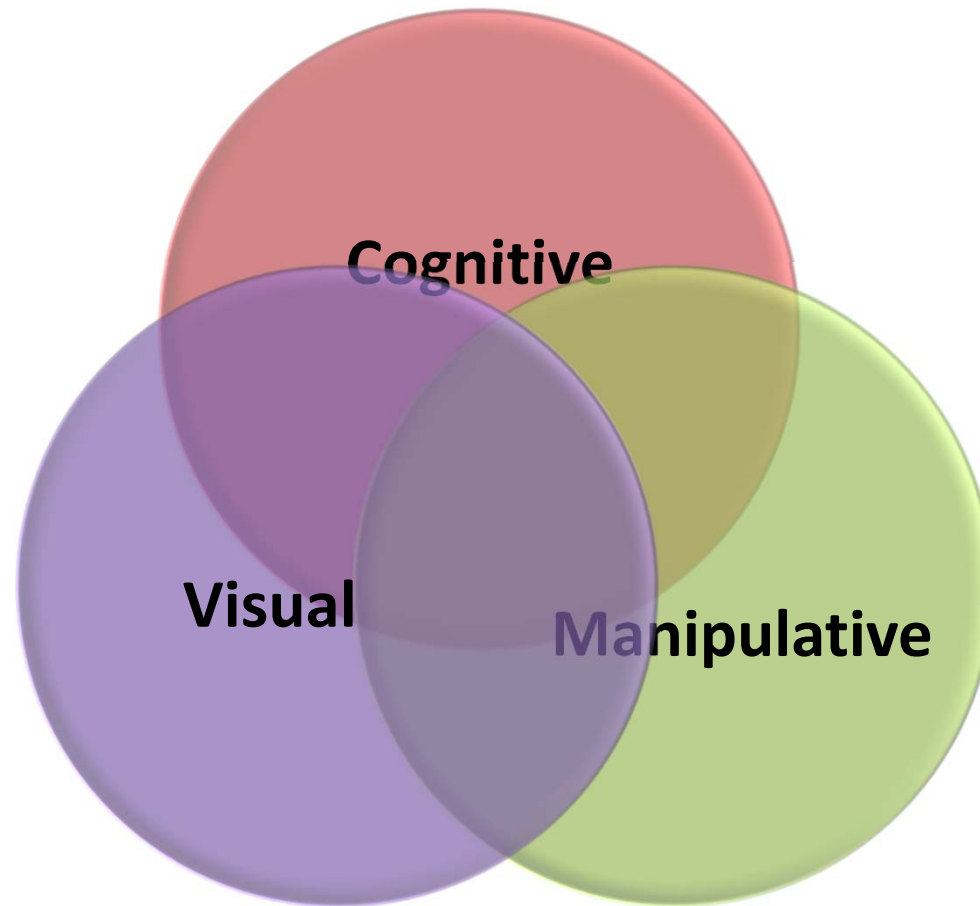
A Common Perception of The Three Major Pillars of Distraction



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In reality

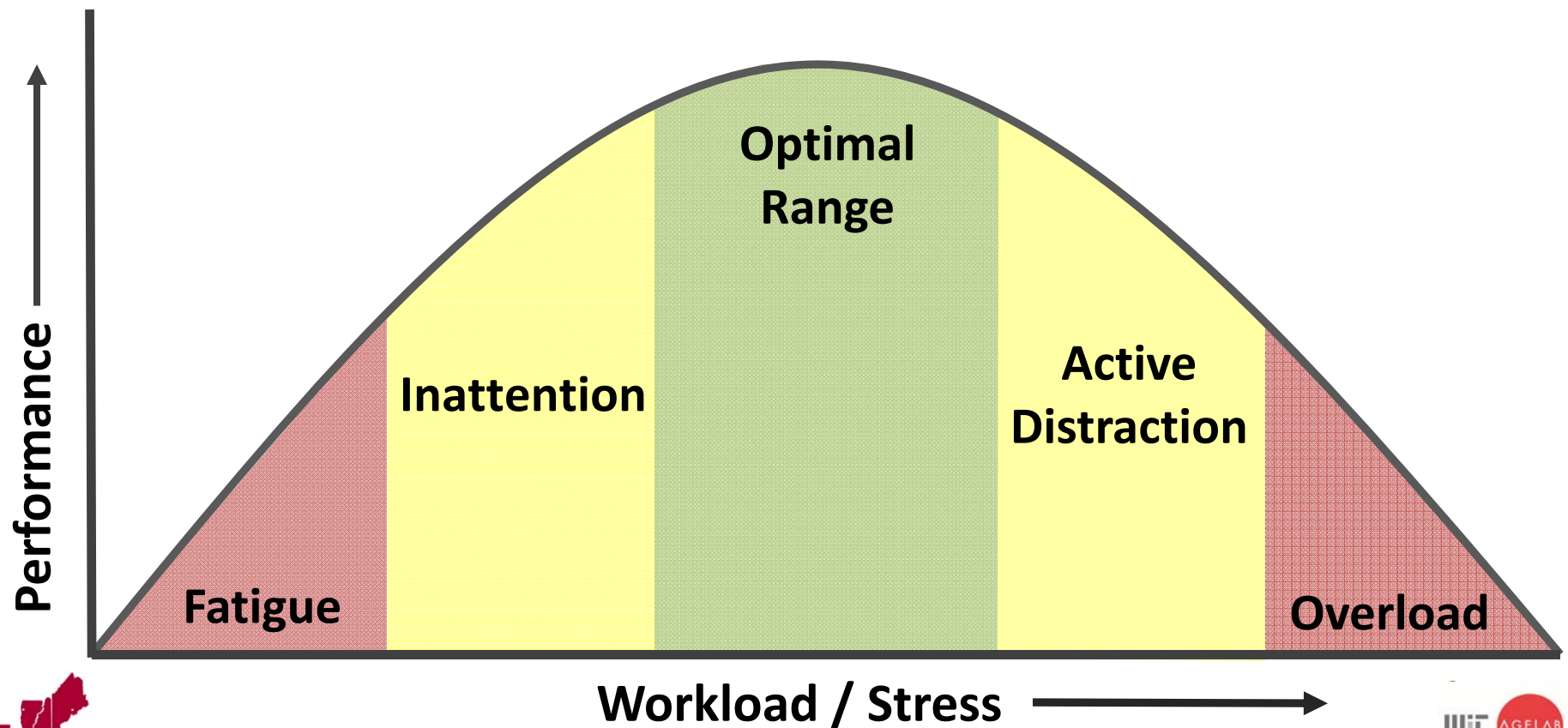
..... the pillars are highly overlapping



Workload & General Arousal

Yerkes-Dodson Law

The relationship between performance and physiological or mental arousal

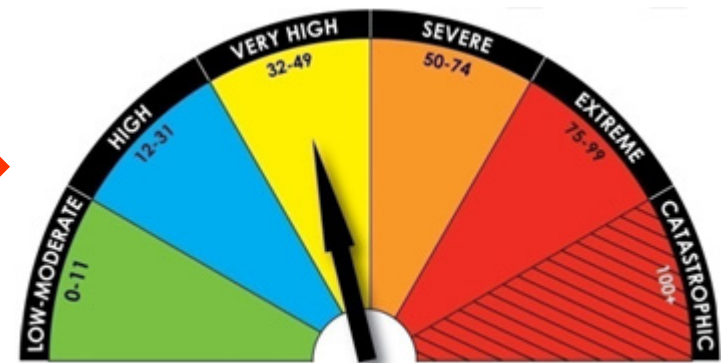


Cognitive Oriented Interfaces.....

...using voice and hands free technology offer the promise of reducing the time a driver's eyes are drawn away from the roadway and maximizing the time a driver's hands are on the wheel, however



Distraction Related Accident Risk



Visual Distraction Is Obvious

Eyes on road



Mind on road



Cognitive demand is harder to “see”